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Abbreviations:

AIVD	General intelligence and security service (Algemene Inlichtingen- en Veiligheidsdienst)
ACM	Netherlands Consumer Agency (Autoriteit Consument & Markt)
AD	Algemeen Dagblad
AIESEC	Association Internationale des Etudiants en Sciences
ANVS	Nuclear Safety and Radiation Protection Authority (Autoriteit Nucleaire Veiligheid en Stralingsbescherming)
AOCS NM	Air Operations Control Station in Nieuw Milligen
APX	Amsterdam Power Exchange
AT	The Advisory Team (Adviesteam)
AZ	Ministry of General Affairs (Ministerie van Algemene Zaken)
AZN	Ambulance Care Association Netherlands (Ambulancezorg Nederland)
B.V.	private limited liability company (besloten vennootschap <i>met beperkte aansprakelijkheid</i>)
BZ	Ministry of Foreign Affairs (Ministerie van Buitenlandse Zaken)
BZK	Ministry of Interior and Kingdom Relation (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties)
CARE	Cooperative for Assistance and Relief Everywhere
CBG	Medicines Evaluation Board (College ter Beoordeling van Geneesmiddelen)
CBRN	chemical, biological, radiological, and nuclear material
CdK	Commissioner of the King (Commissaris van de Koning)
CEG	Centre for Ethics and Health (Centrum voor Ethiek en Gezondheid)
CHOD	Chief of Defence (Commandant der Strijdkrachten)
CIA	Central Intelligence Agency (USA)
CML	Institute of Environmental Science (Centrum voor Milieuwetenschappen)

CPME	Comité Permanent des Médecins Européens (Standing Committee of European Physicians)
CSAN	Cyber Security Assessment Netherlands
CSR	Cyber Security Raad (Cyber Security Council)
DARES	Dutch Amateur Radio Emergency Service
DCBRNC	Defensie CBRN Centrum (Defense CBRN Centre)
DCC	Departmental Crisis Cooperation Centre (Departementaal Coördinatiecentrum Crisisbeheersing)
DCS	Cyber Security Department (Directie Cyber Security)
DEF	Ministry of Defence (Ministerie van Defensie)
DDA	Dutch Dakota Association
DHL	Dalsey, Hillblom & Lynn
DMO	Defence Material Organization
DPC	Public Information and Communication Service Dienst (Publiek en Communicatie)
DSL	Digital Subscriber Line
DSM	Nederlandse Staatsmijnen
EATC	European Air Transport Command
ECID	Expertise Centre for Identity Fraud and Documents (Expertisecentrum Identiteitsfraude en Documenten)
ECO	Communications Unit (Eenheid Communicatie)
ECR	Crisis Coordination Unit (Eenheid Crisiscoördinatie)
EMA	European Medicine Agency
EU	European Union
EZK	Ministry of Economic Affairs and Climate Policy (Ministerie van Economische Zaken)
FIN	Ministry of Finance (Ministerie van Financiën)
FRONTEX	European Border and Coast Guard Agency (Frontières extérieures)

G4S	Group 4 Securicor
GDN	Geological Survey of the Netherlands (Geologische Dienst Nederland)
GDP	Gross Domestic Product
GGD	Community Health Service (Gemeentelijke of Gemeenschappelijke Gezondheidsdienst)
GHOR	Regional Medical Emergency Preparedness Office (Geneeskundige Hulpverleningsorganisatie in de Regio)
GLS	General Logistics Systems B.V.
GoN	Government of the Netherlands
GP	General practitioner
GVB	Amsterdam Municipal Transport Company (Gemeente Vervoerbedrijf Amsterdam)
HTM	Haagsche Tramweg Maatschappij Personenvervoer NV
HVC	Huisvuilcentrale (HVC)
IFV	The Institute for Physical Safety (Instituut Fysieke Veiligheid)
ICMC	The Interdepartmental Crisis Management Committee (Interdepartementale Commissie Crisisbeheersing)
IGZ	Health Care Inspectorate (Inspectie Gezondheidszorg en Jeugd)
IHO	International Hydrographic Organization
IPCC	Intergovernmental Panel on Climate Change
ISPS	Ship and Port Facility Security Code
I&W	Ministry of Infrastructure and Water Management (Ministerie van Infrastructuur en Waterstaat)
JSCU	Joint Cyber Unit (Joint Sigint Cyber Unit)
J&V	Ministry of Justice and Security (Ministerie van Justitie en Veiligheid)
KL	Royal Netherlands Army (Koninklijke Landmacht)
KLM	Royal Aviation Company, Inc. (Koninklijke Luchtvaart Maatschappij N.V.)

KLPD	National Police Service (Korps Landelijk Politiediensten)
KLu	Royal Netherlands Air Force (Koninklijke Luchtmacht)
KM	Royal Netherlands Navy (Koninklijke Marine)
Km	Kilometres
KMar	Royal Netherlands Marechaussee (Koninklijke Marechaussee)
KNMI	The Royal Netherlands Meteorological Institute (Koninklijk Nederlands Meteorologisch Instituut)
KNRM	Royal Netherlands Sea Rescue Institution (Koninklijke Nederlandse Redding Maatschappij)
KNMP	Royal Dutch Pharmacists' Association (Koninklijke Nederlandse Maatschappij ter bevordering der Pharmacie)
KPN	Royal KPN NV (Koninklijke KPN NV)
kWh	Kilowatt hour
LCMS	Dutch National Crisis Management System (landelijk crisismanagement system)
LNv	Ministry Agriculture, Nature, and Food Quality (Ministerie van Landbouw, Natuur en Voedselkwaliteit)
LOCC	National Operational Coordination Centre (Landelijk Operationeel Coördinatie Centrum)
LVNL	Air Traffic Control of the Netherlands (Luchtverkeersleiding Nederland)
MCCB	Ministerial Commission on Crisis Management (Ministeriële Commissie Crisisbeheersing)
MCCE	Movement Coordination Centre Europe
MCMC	The Ministerial Crisis Management Committee (Ministeriële Commissie Crisisbeheersing)
MHPSS	Mental Health and Psychosocial Support
MHS	Municipal Health Service
MIVD	Military Intelligence and Security Service (Militaire Inlichtingen- en Veiligheidsdienst)

MSD	Merck Sharp & Dohme B.V.
MTV	Mobile Surveillance Security (Mobiel Toezicht Veiligheid)
NATO	North Atlantic Treaty Organization
NBV	National Security Agency (Nationaal Bureau Verbindingsbeveiliging)
NCC	National Crisis Centre (Nationaal Crisis Centrum)
NCSC	National Cyber Security Centre (Nationaal Cyber Security Centrum)
NCTV	National Coordinator for Security and Counterterrorism (Nationaal Coördinator Terrorismebestrijding en Veiligheid)
NGO	Non-governmental Organization
NLDA	Dutch Defence Academy (Netherlands Defence Academy)
NOS	Dutch Broadcast Foundation (Nederlandse Omroep Stichting)
NOV	Vereniging Nederlandse Organisaties Vrijwilligerswerk
NPO	Nederlandse Publieke Omroep
NTC	National Tactical Command
NRC	Nieuwe Rotterdamsche Courant
NRV	National Rescue Fleet (National Reddingsvloot)
NS	Dutch Railways (Nederlandse Spoorwegen)
NSA	National Security Agency (of the USA)
NSO	Netherlands Space Office
NSS	National Security Strategies
NVWA	<i>Netherlands Food and Consumer Product Safety Authority</i> (Nederlandse Voedsel- en Warenautoriteit)
NWO	Dutch Research Council (Nederlandse Organisatie voor Wetenschappelijk Onderzoek)
NZa	Dutch Healthcare Authority (Nederlandse Zorgautoriteit)
OCW	Ministry of Education, Culture and Science (Ministerie van Onderwijs, Cultuur en Wetenschap)

OPTA	Independent Post and Telecommunication Authority (Onafhankelijke Post en Telecommunicatie Autoriteit)
OVV	Dutch Safety Board (Onderzoeksraad Voor Veiligheid)
PBL	Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving)
PM	Prime Minister
R&D	Research and Development
RAM	Risk Analysis Model
RAV	Regional Ambulance Services (Regionale Ambulancevoorzieningen)
RBC	Board of Fire Chiefs (Raad van Brandweercommandanten)
RET	Rotterdam Electric Tram (Rotterdamse Elektrische Tram)
RIVM	National Institute for Public Health and Environment (Rijksinstituut voor Volksgezondheid en Milieu)
RVD	Government Information Service
RVS	Council for Health and Society (Raad voor Volksgezondheid en Samenleving)
SBS	Scandinavian Broadcasting System
S-HELP	Securing Health.Emergency.Learning.Planning
SIGMA	Rapid Deployable Medical Assistance Group (Snel Inzetbare Groep ter Medische Assistentie)
SRON	Space Research Organisation Netherlands
SZW	Ministry of Social Affairs and Employment (Ministerie van Sociale Zaken en Werkgelegenheid)
TechMed	Medical Technology
TETRA	Terrestrial Trunked Radio
TEU	Twenty-foot Equivalent units
TMG	Telegraaf Mediagroep
TNO	Netherlands Organisation for Applied Scientific Research (Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek)

TNT	Thomas Nationawide Transport N.V.
TUI	Touristik Union International Airlines
TV	Television
Twaz	Temporary Ambulance Care Act (Tijdelijke Wet Ambulancezorg)
UMC	University medical centers
UN	United Nations
UNICEF	United Nations Children's Fund
UNIVIE	University of Vienna
UPS	United Parcel Service
USA	United States of America
USAR	Urban Search and Rescue
VVD	People's Party for Freedom and Democracy (Volkspartij voor Vrijheid en Democratie)
VWS	Ministry of Health, Welfare and Sport (Ministerie van Volksgezondheid Welzijn en Sport)
Wghor	The Medical Assistance at Accidents and Disasters Act (Wet geneeskundige hulpverlening bij ongevallen en rampen)
WKO	Chamber of Economics Austria (Wirtschaftskammer Österreich)
WP	Work Package
Wpg	Public Health Act (Wet Publieke gezondheid)
Wrzo	The Disaster and Major Accident Act (Wet rampen en zware ongevallen)
Wvr	Security Regions Act (Wet veiligheidsregio's)
ZIN	Zorginstituut Nederland

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Introduction

The world is continuously changing and with it national emergencies, which countries are facing today. Especially, the changing climate will strongly influence the occurrences of natural disasters, but also new risks, like cybercrime, are posing challenges in today's world. Without any well-thought-out preparation, countries can be aimless and under too much pressure to act swiftly and well-directed. To set up nations with precise instructions in situations of national emergencies, the University of Cork, Ireland, together with partners, conducted FP7-SEC-2013-1, S-HELP: Securing Health. Emergency. Learning. Planning. The project was funded by the European Union (EU).

The following Master Thesis is established upon chapter 7 of the deliverable 2.11 "S-HELP Interoperability Standard" (Rauner et al. 2016a) as well as Chapter 3.2 of the deliverable 2.4 "Draft Skills Taxonomy Template" (Rauner et al. 2015) of the University of Vienna in Austria. Furthermore, the publication "Decision support for strategic disaster management: the first release of a wiki" by Rauner et al. (2016b) also serves as the basis for this work. This thesis is an extension of the Master Thesis by Golovescu (2016), which was founded within the framework of the collaborative project of the named sources to provide a uniform structure of the disaster relief organizations.

The main objective of this project was the development of a decision-making tool, to ultimately improve disaster management. Three pivotal phases of disaster management have to be considered by policymakers, which are preparedness, response, and recovery. The tool is intended to provide support in all those phases and enable better control in a situation of disaster (S-HELP Project Fact Sheet 2013).

In table 1 below, the seven work packages (WP) of S-HELP are shown. Private, as well as public partners, were involved in the realization of this project.

Table 1: Project participants of S-HELP

Partner	Country
University College Cork	Ireland
Accelopment	Switzerland
Magen David Adom of Israel	Israel
Future Analytics Ltd.	Ireland
Graz University of Technologies	Austria
Health Service Executive	Ireland
Lund University	Sweden
Public Health Agency Northern Ireland	United Kingdom
University of Vienna	Austria
Vector Command Ltd.	United Kingdom

Source: S-Help Project Factsheet (2013, page 2)

This EU-project consists of various work packages, which are shown in figure 1. WP2 was conducted by the University of Vienna (UNIVIE) under the guidance of ao.Univ.-Prof. Dr. Marion S. Rauner. In this work package, the aim was to structure a uniform basic structure for the Decision Support System called S-Help, which is specifically designed to support organizations participating in crises. The task was to create an overview to provide uniform vocabulary, definitions, and standards. This information is used as a basis for cooperation among the various decision-makers in disaster management. Besides, this overview was intended to ensure communication among the multiple stakeholders within the EU project. The task was the structuring of a common framework that used for the S-HELP decision support system. For the overview and access to all terms and the taxonomy, a wiki was created and is available under the following link: <https://wiki.univie.ac.at/display/SHELP/>. Further literature is given by Rauner et al. (2016b).

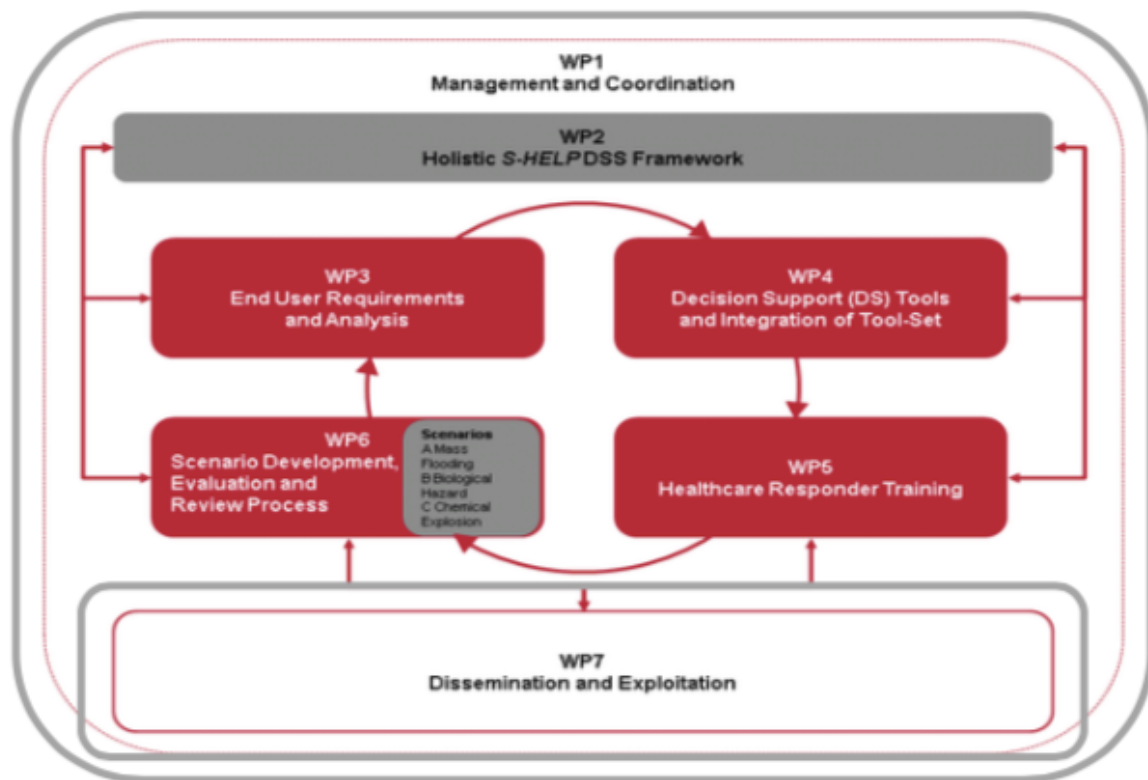


Figure 1: Work packages of S-HELP
Source: S-HELP (2013, S. 2)

Based on the deliverable (Deliverable 2.11, Chapter 7) by Rauner et al. (2016a) and the Master Thesis of Golovescu (2016), the countries United Kingdom, Ireland, North Ireland, Israel, and Austria were analyzed to provide a structure for national emergency responders. Table 2 shows the countries that have been evaluated subsequently after the EU project.

Table 2: Structures of disaster management in selected countries

Author	Country/Countries
Golovescu (2016)	United Kingdom Ireland Israel Northern Ireland Austria
Gullar (2017)	Czech Republic Slovakia
Kirchpfenig (2017)	Germany Switzerland

Predic (2017)	Bosnia and Herzegovina Serbia
Muqaj (2018)	Romania
Gazarek (2018)	France
Napieralska (2018)	Poland
Stojcic (2018)	Croatia
Holubar (2018)	Norway
Bubeck (2019)	Sweden
Jenk (2019)	Italy

This Master Thesis is also an enhancement of the countries mentioned in table 2 and is based in the Taxonomy deliverables (Deliverable 2.11 and Deliverable 2.4) of Rauner et al. (2016a). Five tables and thirteen figures support the presentation of the leading national emergency responders in the Kingdom of the Netherlands. Those are intended to serve as an overview of the structure of the disaster relief stakeholders in the country, with the goal of enhancing the awareness of the involved parties with regards to the structure and cooperation of the individual players.

Following this introduction, this Master Thesis is followed by a brief overview of the leading general groups of international disaster relief Stakeholders in chapter 1.

Chapter 2 provides a summary of the structure used by relief organizations during a disaster. Furthermore, the adaptation of the former taxonomy, by prior Master Theses, is presented.

The central part of this Master Thesis is presented in the third chapter and analyses the country-specific structure of the stakeholders and main agents of disaster management in the Netherlands.

Chapter 4 compares the findings of specifics identified for the Dutch disaster management with a selection of the countries already examined, such as Austria, Germany, Sweden, Norway, and France. Furthermore, a summary of the main findings of the special features of Dutch disaster management can be found here.

1. Main Groups of International Disaster Relief Organizations

This short overview summarizes chapter 3 of the Deliverable 2.4, “Draft Skills Taxonomy Template” which was conducted at the University of Vienna, Austria, in the course of the EU-Project FP7-SEC-2013-1, S-HELP: Securing Health.Emergency.Learning. Planning (Rauner et al. 2015). Subsequent enhancements of Rauner et al. (2016b) in the structure of international emergency responders will also be taken into consideration.

The main groups of international emergency response are illustrated in figure 2. It shows the differentiation between governmental organizations and non-governmental organizations (NGOs).

For the further course of this work, two sources for international disaster organizations by Coppola 2011 are used.

1. Diverse emergency and disaster management systems and structures that exist throughout the world, and
2. Disaster management scenarios which overwhelmed the capacity of a single nation's response mechanism

In this context, governmental organizations are multilateral organizations consisting of the governments of several countries. Countries that have joined these national organizations commit themselves to jointly defined rules. The responsibilities of government institutions can be differentiated at the regional political level (e.g., European Union, EU), military or security agreements (e.g., North Atlantic Treaty Organization, NATO), or at global contracts (e.g., United Nations, UN) (Coppola 2015). The UN, with its 193 member states, plays an essential role in disaster management (United Nations 2019).

The second leading group consists of *non-governmental organizations* and portrays another critical part of the international disaster management. *NGOs* are represented in every part of public life and can be categorized into global and regional political institutions, as well as military or security agreements. They are represented in all of the four phases of the disaster management cycle. *NGOs* usually have noticeable infrastructure and specific experiences in disaster relief, which makes them indispensable in the field of disaster management. They are

also likely to react faster compared to governmental organizations, due to the fact that there is less bureaucracy to be taken into account (Coppola 2011).

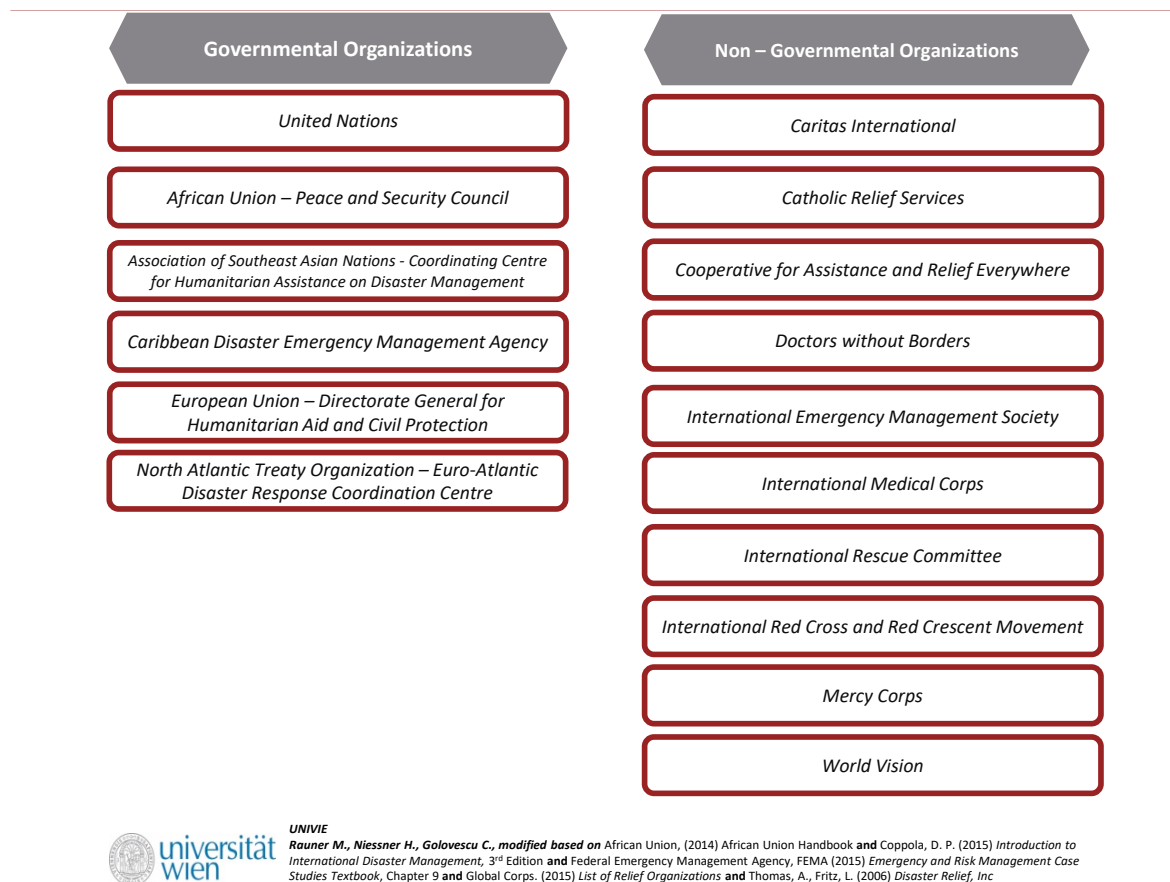


Figure 2: Main groups of international disaster relief organizations

Source: Rauner et al. (2015, S. 16)

2. General Structure for Emergency Responders

The following chapter includes a summary of chapter 7 of the Deliverable 2.11 “S-Help Interoperability Standard,” which was developed in collaboration project **FP7-SEC-2013-1, S-HELP: Securing Health.Emergency.Learning.Planning**, at the University of Vienna by Rauner et al. (2016a). The core S-HELP UNIVIE-Team (Rauner, Niessner, Sasse, Tomic, and Golovescu) conducted changes to the general structure. All additional amendments are illustrated in this chapter.

While the main objective of emergency responders is the containment and minimize the negative consequences of disasters, the challenge lies in the organization of the main

responders. The difficult task is the division of the strategic, operative, and tactical details and authority (Rauner, et al. 2016a). Table 3 illustrates the main groups of emergency responders. Chapters 3.1., 3.2. and 3. 3. provide a summary and revision of the emergency responders of the skill taxonomy (Rauner et al. 2016a).

Table 3: Structures of the General Emergency Responders

Main Groups of National Emergency Responders	
1. Core Emergency responders	
1.1. Government	
1.1.1. National Government	
1.1.2. Provincial Government	
1.1.3. Municipal Government	
1.1.4. Government agencies	
1.2. Health Care Organizations	
1.2.1. Primary Care	
1.2.1.1. Emergency Department	
1.2.1.2. General Practitioners	
1.2.1.3. Primary Care Centers	
1.2.2. Secondary Care	
1.2.2.1. Hospitals	
1.2.3. Other Health Care Organizations	
1.2.3.1. Blood Laboratories	
1.2.3.2. Other Medical Laboratories	
1.2.3.3. Pharmacies	
1.3. Emergency Services	
1.3.1. Emergency Medical Services	
1.3.2. Fire Brigade	
1.3.3. Police	
1.3.4. Search and Rescue Teams	
1.3.4.1. Cave Rescue Teams	
1.3.4.2. Chemical, Biological, Radiological and Nuclear Rescue Teams	
1.3.4.3. Maritime and Coastguard Rescue Teams	
1.3.4.4. Mountain Rescue Teams	
1.3.4.5. Water Rescue Teams	
1.3.4.6. Other Search and Rescue Teams	

2. Non-core emergency responders
 - 2.1. Government
 - 2.1.1. National Government
 - 2.1.2. Provincial Government
 - 2.1.3. Municipal Government
 - 2.1.4. Government agencies
 - 2.2. Strategic Health Authorities
 - 2.3. Health Care Organizations
 - 2.3.1. Secondary Care
 - 2.3.1.1. Outpatients
 - 2.3.1.1.1. Hospital Outpatient Clinics
 - 2.3.1.1.2. Non-Hospital Outpatient Clinics
 - 2.3.1.2. Specialized Doctors
 - 2.3.2. Tertiary Care
 - 2.3.2.1. Specialized Care Centre's
 - 2.3.3. Other Health Care Organizations
 - 2.3.3.1. Imaging Techniques Laboratories
 - 2.3.3.2. Large Medical Devices Producers
 - 2.3.3.3. Medical Products Suppliers
 - 2.3.3.4. Pharmaceutical and Research Companies
 - 2.4. Energy Provider
 - 2.4.1. Electricity Providers
 - 2.4.1.1. Transmission grid
 - 2.4.1.2. Providers with own network
 - 2.4.1.3. Electricity producers
 - 2.4.2. Fuel Providers
 - 2.4.2.1. Infrastructure
 - 2.4.2.2. Resource
 - 2.4.3. Gas Provider
 - 2.4.3.1. Transmission grid
 - 2.4.3.1. Providers with own network
 - 2.4.3.1. Storage providers
 - 2.4.4. Heating Providers
 - 2.4.4.1. Infrastructure
 - 2.4.4.2. Resource
 - 2.5. Food and Beverage Provider
 - 2.5.1. Producers
 - 2.5.2. Wholesalers

- 2.6. Information and Communication Service
 - 2.6.1. Internet Providers
 - 2.6.1.1. Cable Internet Providers
 - 2.6.1.2. Mobile Internet Providers
 - 2.6.2. Postal Service Providers
 - 2.6.2.1. Private
 - 2.6.2.2. Public
 - 2.6.3. Radio Providers
 - 2.6.3.1. Infrastructure
 - 2.6.4. Telephone Providers
 - 2.6.4.1. Cell Phone Providers
 - 2.6.4.2. Landline Telephone Providers
 - 2.6.5. Television Providers
 - 2.6.5.1. Infrastructure
 - 2.6.5.1.1. Digital Video Broadcasting – Cable
 - 2.6.5.1.2. Digital Video Broadcasting – Satellite
 - 2.6.5.1.3. Digital Video Broadcasting – Terrestrial
 - 2.6.6. Two-Way Radio Providers
 - 2.6.6.1. Emergency Service Radio
 - 2.6.6.2. Amateur Radio
- 2.7. Transportation Services
 - 2.7.1. Airport Operators
 - 2.7.1.1. Civilian Airports (Main Civilian Airports, Operator)
 - 2.7.1.2. Military Airports (Main Military Airports, Operator)
 - 2.7.2. Port Operators (Main Body of Water, Main Port, Operator)
 - 2.7.3. Railway Operators
 - 2.7.3.1. Infrastructure
 - 2.7.3.2. Service
 - 2.7.4. Road Operator
 - 2.7.4.1. Arterials
 - 2.7.4.2. Collectors
 - 2.7.4.3. Locals
 - 2.7.5. Other Transport Operators
 - 2.7.5.1. Private
 - 2.7.5.1.1. Bus Services
 - 2.7.5.1.2. Patient Transport Services
 - 2.7.5.1.3. Taxi Services
 - 2.7.5.1.4. Other private Transport Operators
 - 2.7.5.2. Public
- 2.8. Waste Disposal Services
 - 2.8.1. Private
 - 2.8.2. Public
- 2.9. Water and Sewerage Undertaker
 - 2.9.1. Private
 - 2.9.2. Public

- 3. Co-operating Bodies
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 - 3.1.1. Regional Command Structure
 - 3.1.2. Join Forces Command
 - 3.2. Communities
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 - 3.4.1. Online Media
 - 3.4.1.1. Blogs
 - 3.4.1.2. Content Communities
 - 3.4.1.3. News Sites
 - 3.4.1.4. Podcasts
 - 3.4.1.5. Videos
 - 3.4.2. Print Media
 - 3.4.3. Radio Broadcast
 - 3.4.4. Social Media
 - 3.4.5. Television Broadcast
 - 3.5. Voluntary Sector
 - 3.5.1. Donors
 - 3.5.2. Humanitarian Organizations
 - 3.5.3. Volunteers
 - 3.6. Cyber Security

Source: Rauner et al. (2016a); Kirchpfening (2017)

The following table 4 shows the revised structure of the main group's emergency responders in comparison to Rauner et al. (2016a) used by Gullar (2017) and Kirchpfening (2017).

Table 4: Revisions made to the Main Groups of National Emergency Responders

Revisions Made to the Main Groups of National Emergency Responders	
Original Rauner, Niessner, Sasse, Tomic and Golovescu (2016a)	Revision: Gullar (2017) Kirchpfening (2017)
Non-Core Responders	
	<i>Gas Providers</i> New Structure: • Transmission grid • Providers with own networks • Storage providers
	<i>Electricity Providers</i> New Structure • Transmission grid providers • Providers with own networks • Electricity producers
Co-Operating Bodies	
	• The category of Cyber Security has been added.

Source: Rauner et al. (2016a) revised by Gullar (2017) and Kirchpfening (2017)

2.1 Core Emergency Responders

The first group also represents the most relevant fraction of disaster management, the Core Emergency Responders. The group can be divided into three sub-groups (FLOODsite 2007; Digital Humanitarian Network 2014).

1. *Government,*
2. *Health Care Organization and,*
3. *Emergency Services.*

The strategic planning of civil protection is carried out at the government level. In particular, risk assessment and deployment planning are of great importance here. The government is also entrusted with warning the population in the event of a disaster (Coppola 2015).

The sector of *Health Care Organizations* is divided into three fractions: *Primary Care*, *Secondary Care*, and other *Health Care Organizations*. The *Emergency Services* include the *fire brigade*, *police forces*, *rescue services* as well as the *search and rescue divisions*. The rescue services have specially trained specialists and equipment to ensure close cooperation with *medical emergency services*, *police*, *fire brigades*, and *health organizations* (FLOODsite 2007; Digital Humanitarian Network 2014).

2.2 Non-Core Emergency Responders

While the *Core Emergency Responders* represented the group of first responders in disaster management, the *Non-core Responders* are not necessarily involved in the disaster relief process. Those parts of the government, as well as strategic health care organizations, rather have an advisory or supporting function. The private sector is playing a major role with regards to *Non-core Emergency Responders* (FLOODsite 2007; Digital Humanitarian Network 2014).

Based on Rauner et al. (2018), this group includes advisory and financially supporting government units as well as strategic health organizations such as the national health authorities. *Secondary* and *Tertiary health care organizations* also form a significant part of this group. Besides the health care organizations, certain branches of private and non-profit organizations are also assigned to this group. Those branches, for example are *energy service providers*, *communications service providers*, *transport service providers*, and *food and beverage providers*. They are an essential part of disaster management and, in the event of a disaster, assume the task of providing vital resources such as food, beverages, or effective communication (Rauner et al. 2018).

There have been some changes in the structure, established by Rauner et al. (2016a) regarding gas and electricity provider, which can be inferred from table 4. The former structure of *gas service providers* is now divided into *transmission system operators*, *distribution system operators*, and *storage companies*. *Electricity service providers* are now divided into *transmission system operators*, *suppliers with their own networks*, and *electricity producers*.

2.3 Co-Operating Bodies

The third group of stakeholders includes the *Co-operating Bodies* and is divided into the following six sectors; 1) *Military*, 2) *Communities*, 3) *Environmental Agencies*, 4) *Media*, and 5) *Voluntary Sector* (FLOODsite 2007; Digital Humanitarian Network 2014). A new sector was added, which represents the field of 6) *Cyber Security*. Those amendments were included in the taxonomy of Rauner et al. (2018) in the section of Co-operating Bodies and fulfill an essential function supporting disaster management in this digital world.

There are three areas

- Ensuring that Core-Emergency Responders receive relevant and important information,
- rescue services are supported and
- can be provided and guaranteed at various stages of the operation.

that comprise the tasks of *the Co-Operating Bodies* (FLOODsite 2007; Digital Humanitarian Network 2014).

By the various and increasing threats that countries today face a new sector, Cyber Security was incorporated into the taxonomy of Rauner et al. (2018).

3. Specific Structure of emergency responders in the Netherlands

The elemental part of this Master Thesis focuses on presenting the emergency responders in the Netherlands in detail. The emphasis lays on the country located in Europ and does not include the other constituent countries, which are also part of the Kingdom of the Netherlands. The chapter will begin with a general country profile in 4.1. Chapter 4.2. addresses past Catastrophic events in the history of the Netherlands and concludes with a summary of the legal basis of the Dutch Crisis management. Chapters 4.3., 4.4., and 4.5 discuss in detail the roles of the country's core responders, non-core responders, and co-operating bodies.

3.1 General country profile

The Netherlands is a European country located in the west of the continent. It is the best known of the four constituent countries of the Kingdom of the Netherlands, next to Aruba, Curaçao, and Sint Maarten. All of those are autonomous states, and therefore, very different in all aspects (CIA 2018). The following thesis, if not explicitly mentioned otherwise, only focuses on the Netherlands as the country situated on mainland Europe and not further addresses the other parts belonging to the Kingdom of the Netherlands.

The country is located in western Europe, with a total of 41,543 square kilometers (km). It is bordering the North Sea and contains a coastline of 451 km. On land, it is sharing borders with neighboring countries Germany (575 km) and Belgium (478 km). The terrain is mostly consisting of lowland and reclaimed so-called polders. Only in the southeast part of the country, some hills can be found (CIA 2018). Polders are areas in which the land lies beyond sea level and are therefore enclosed by multiple dykes to protect the nation from water masses. There are currently 53 polders in the Netherlands (Eijgenraam 2016).

Roughly about one-third of the country is situated below sea level, and not more than half of the country is higher than one meter above the sea (CIA 2018). This ensures a flood risk for roughly two-thirds of the Dutch populations and is prone to affect 70% of the gross domestic product (GDP). There are three main rivers, the Rhine, which enters from Germany on the eastern border, the Meuse, and the Scheldt (Eijgenraam 2016). In 2012, more than 10% of the country, 4.860 square km, consisted of irrigated land. These geographic preconditions partly explain the most inherent natural hazard that the country faces are floods. Initially, building polders was mostly for gaining land usage for the growth of the agricultural sector, which

accounts for more than 55% of the land usage in the Netherlands. The country enjoys a maritime climate, in which the summers are colder and the winters reasonably mild (CIA 2018)

The total population of the Netherlands at the beginning of 2020 was 17,128,604. 91.5% of which live in urban areas of the country. The two largest cities which both have a population above one million are Amsterdam, followed by Rotterdam. As of 2019, the country is divided into twelve separate provinces (WKO 2018; CIA 2018):

- 1) Drenthe,
- 2) Flevoland,
- 3) Fryslan (Friesland),
- 4) Gelderland,
- 5) Groningen,
- 6) Limburg,
- 7) Noord-Brabant,
- 8) Noord-Holland,
- 9) Over Ijssel,
- 10) Utrecht,
- 11) Zeeland, and
- 12) Zuid-Holland.



Figure 3: Provinces of the Netherlands
Source: Netherlands Tourism (2018)

Every province is governed by the provincial authorities, which consist of the provincial council and the provincial executives (Netherlands Institute for Multiparty Democracy 2008). Furthermore, the country is divided into 25 security regions and 431 municipalities (Ministry of Justice and Security 2013). Like the 12 provincials, the municipalities also have a *municipalities* council executive, which represents the third administrative level of the Dutch Government. (Netherlands Institute for Multiparty Democracy 2008).

Since 1846, the Netherlands is governed as a parliamentary constitutional monarchy. While Amsterdam is the official capital of the country and the largest city, the seat of the Government is located in The Hague (CIA 2018). Due to the constitutional monarchy, the King/Queen functions as the head of the state. The power of the monarch is laid down in the constitution, and in reality, is very limited. Responsibility for the Government is held by the ministers (Government of the Netherlands 2018a). On April 30th, 2013, King Willem-Alexander succeeded his mother Princess and former Queen Beatrix, who resigned from the throne after 33 years as head of the state. Willem-Alexander has become the first male heir to the throne of the Netherlands for the last 123 years (Die Presse 2013). The current Prime Minister and Minister of General Affairs is Mark Rutte of the People's Party for Freedom and Democracy

(Volkspartij voor Vrijheid en Democratie VVD). He was first elected to Prime Minister in 2010 and is currently serving his 3rd term (Government of the Netherlands 2018a).

The official language, spoken in the Netherlands, is Dutch. However, English has been playing an essential role in Government, as well as the entertainment sector of the country (CIA 2008; Hall, 2017). All students are required to start learning English as is the practice in many other European school systems. However, in most schools, German has remained to be the mandatory second language as well. Some regions located on the border even provide German as the compulsory foreign language, and put English as a second language (Jentges 2016).

The Netherlands was one of the six founding member states of the *European Union* (Jones 2008). It has been a member of the North Atlantic Treaty Organization since its establishment in 1949. At the moment, there are 29 countries in this treaty. NATO is an intergovernmental alliance between 29 states of European and North American countries. The coalition has political as well as military significance, with the main goal of promoting democratic values to resolve conflicts around the world peacefully. In most extreme situations, when diplomatic negotiations might fail, NATO has the military power to act in such cases of crisis under the collective defense clause (North Atlantic Treaty Organization 2018). While the NATO itself does not possess any weapons, it relies on the military equipment of its member states, especially the United States of America (USA) (Military Times 2017). The role of the military is discussed later in section 4.5.1.

3.2 Catastrophic events

The following subsection provides an overview of the key catastrophic events in the history of the Netherlands. The Netherlands strictly distinguish between a crisis and a disaster. Disasters are classified as a crisis that only applies to concerns of public safety, such as natural disasters or accidents. A crisis, in general, also includes new threats such as terrorism. In an attempted to organize and prepare for emergencies, the Netherlands have been divided into security regions. The geographical subdivisions will be obligated to work together if a disaster or crisis will occur (Sholtens 2018).

3.2.1 Natural disaster

As mentioned, the most imminent threat in the Netherlands concerning natural disasters is flooding. This is primarily due to the special conditions of the country and the high amount of land below the sea level (Gerritsen 2005). The government spends about 1.2 billion Euros on flood risk prevention and protection yearly (Ministry of Justice and Security 2017). The last massive flood was in 1953, killing more than 1,800 people and causing immense damage to the economy (Eijgenraam 2016). After that flood, the Deltawerken (Delta Works) were built and are known today as the most significant anti-flood efforts worldwide (Gerritsen 2005).

8000 Dutch citizens had to be evacuated when the province of Limburg was flooded in December of 1993. The flood occurred because of the rivers Meuse's and Rhine's rising water levels. As a consequence, the Netherlands faced 122 million Euros in damages. About one year later, in January 1995, more than a quarter-million Dutch people were evacuated from their homes, when the rivers the Meuse, the Rhine, and the Waal rose to dangerous levels and caused the flooding of the surrounding areas (Kaufmann et al. 2016).

There are no volcanos located in the Netherlands, only on the islands belonging to the Kingdom of the Netherlands, which is not relevant for this Master Thesis (CIA 2018).

3.2.2 Accidents

One of the deadliest fires in the last year took place in May of 2000 when firework explosions in Enschede killed 24 people, including four firefighters and injured nearly 1000 more people. The fire started at the fireworks factory and spread to the neighboring residential area where about 400 houses burned to the ground in a 500 square meter area (BBC 2000a). Firefighters and ambulance services from Germany were also called to the scene to assist the Dutch authorities (BBC 2000b). The court later sentenced the two owners of the fireworks company for illegally storing fireworks (BBC 2000c).

In the early hours of January 1st of 2005, the worst mass burn accident in Dutch history occurred in the Café fire in Volendam. Out of the approximately 350 young people at the scene, 14 died, and 245 were injured and had to be referred to nearby hospitals (Welling et al. 2005). Christmas decorations were later identified as the source of the fire. Many of the young visitors panicked after only one of the emergency exits was unblocked. Due to the high number of injured and to the extent of their burns, some of the victims had to be evacuated to neighboring countries. They were flown to Germany and Belgium by helicopters of the army, in order to receive the needed medical treatment (The Guardian 2001).

While approaching the Schiphol Airport Amsterdam, a passenger plane from Turkish Airlines crashed into a field right before the landing strip. The accident, which caused the death of nine passengers, occurred on the morning of February 25th, 2009. More than 80 more were injured when the plane broke apart into three pieces (The Guardian 2009). As the cause of the crash, the *Dutch Safety Board (Onderzoeksraad Voor Veiligheid, OVV)* found the radio altimeter of the plane defective, causing the auto flight system to assume that the plane was landing when in reality, it was still about 600 meters up in the air. The pilots, who were informed about the problem, failed to realize of the thrust control and the actions of the autopilot, when realizing their error, averting the crash was no longer possible (Dutch Safety Board 2019c).

A fire that started on a pump at Chemie-Pack in Moerdijk, on January 5th of 2011, resulted in massive material damage. While no one was severely injured during the fire, it caused severe air pollution. This led to health problems for many citizens and entailed to 545 health complaints reports to health services. The fear of water and food contamination was not confirmed but fear thereof caused a highly emotional discussion surrounding the topic (Dutch Safety Board 2012a).

More than 190 passengers were injured, 24 of which severely, when an intercity and a sprinter train collided in Amsterdam on April 21st, 2012. One of the victims later died as a result of the obtained injuries. The cause of the accident was a red light which was not observed by the driver of the sprinter, due to distraction, and resulted in the collision of the two trains. Another factor was the work on the railway lines, which caused the trains to share the same railway track that day, as well as deviations from the planned timetable. Neither traffic control nor the safety system realized the train driver passed a red light and no warning was given, neither did the automatically installed brakes bring the train to a standstill, because the error was not detected (Dutch Safety Board 2012c).

In November of 2017, a helicopter crashed into an electricity transmission tower and left 24.000 Dutch without power for more than a day. In a similar helicopter crash, ten years earlier, 100.000 citizens were out of power for two days (NL Times 2017).

3.2.3 Man-made disasters

In the 1970s, the Netherlands faced an unusually high number of hijackings. One of the reasons was the conflicts between Moluccans living in the Netherlands and the Dutch Government. The Moluccans were demanding a free Republic of South Maluku, which, when their demand was not met, entailed a series of hostage situations. Including the hijacking of trains in 1975 and 1977 as well as the incident of a north Holland school, in which more than 100 children and teachers were held hostage for 20 days. Two years later, 69 civil servants were held hostage in the county hall in Assen, where one was killed. This time also includes the occupation of the French Embassy, located in The Hague, which occurred in 1974 (BBC 1977; Van der Ploeg and Kleijn 1989).

In May of 2002, right-wing politician Pim Fortuyn was shot and killed by a left-wing environmental activist, stating that he killed the politician days before the Dutch general election to protect Muslims from Fortuyn's radical views (The Telegraph 2003). The planned elections were held only weeks after the shooting was carried out, which led to riots around the country and shaped the following election (New York Times 2002).

A radical Muslim murdered Theo Van Gogh, a filmmaker, in November of 2004 in Amsterdam by shooting and stabbing him to death (New York Times 2004). In the days after the

assassination of the filmmaker, known for controversial movies such as “Submission,” details came to light, that the real target was indeed the female Ayaan Hirsi Ali, a Somali immigrant, and Dutch politician. After she had renounced her Islamic belief, she became a target for death threats by extremists (SpiegelOnline 2005). The short film submission by Van Gogh a collaboration with Ayaan Hirsi Ali criticized the treatment and sexual and physical abuse in the name of Islam (New York Times 2004).

On May 1st, 2009, Queen Beatrix’s royal parade was attacked by a Dutch citizen. He tried to drive his car into the bus in which the Queen was seated during the parade in Apeldoorn (Reuters 2009). Eight people including, the attacker, died, and ten more were severely injured (Deutsche Welle 2010).

The Dutch former certificate company DigiNotar of the Netherlands was providing digital certificates, especially for notaries, was the target of hacker attacks. As a result, fraudulent certificates were issued, putting individuals as well as companies at risk of being the target of privacy breached and identity fraud as well as the danger of financial setbacks. The company also supplied the government with such certification, which put all communication with the public service in jeopardy and had wide-reaching consequences for the country. Especially affected were the *Minister of the Interior and Kingdom Relations* as well as the independent *Post and Telecommunication Authority (OPTA, Onafhankelijke Post en Telecommunicatie Autoriteit)* (Dutch Safety Board 2012b).

A 24-year-old gunman opened fire at a shopping mall on April 9th, 2011, in Alphen at the Rhine, killing seven people, including himself and injuring 16 people. The shooter had obtained a legal license for five guns, of which he owned three (Reuters 2011). In 2018, a court concluded that the police are at least partly liable for the event. As a reason, the court stated that the shooter was battling psychological problems and suicidal tendencies and should, therefore, not have been able to issue gun licenses (NL Times 2018).

While not a catastrophic event on Dutch territory, the incident of Flight MH17 on July 17th, 2014, should be mentioned. During the height of the Crimea conflict between Russia and Ukraine in 2014, flight MH17 of Malaysian Air was brought down over eastern Ukraine. All 283 passengers, of which 196 were Dutch citizens, as well as 15 crew members died, in what has become one of the ten most severe disasters of the aviation sector. The passenger flight en

route to Kuala Lumpur started from Schiphol International Airport in Amsterdam. While the exact background has not been fully resolved, it was a Russian missile that brought down the plane, most likely by the hands of Ukraine rebels. The high number of Dutch nationals had a significant effect on the country. Investigations and legal steps continue until today and are driven to a great deal by Dutch legal entities (Government of the Netherlands 2018c; Tagesschau 2016).

3.2.4 Legal Basis of disaster management in the Netherlands

The following sub-section gives a short overview of the main laws regarding Dutch disaster management.

On October 1st, 2010, the *Dutch Safety Regions Act (Wet veiligheidsregio's, Wvr)* was introduced and taken into law. The Act replaces three former laws regarding Disaster management. Those include the *Fire Service Act*, the *Medical Assistance at Accidents and Disasters Act (Wet geneeskundige hulpverlening bij ongevallen en rampen, Wghor)*, and the *Disasters and Major Accidents Act (Wet rampen en zware ongevallen, Wrzo)*. The country is divided into 25 security region, which tasks are laid out by the *Wvr*. It also includes several basic requirements for the emergency services and the quality of all equipment, as well as the personnel regulations (Ministry of Justice and Security 2013).

In the first paragraph, section 1, the *Safety Regions Act* distinguishes explicitly between a disaster and a crisis (Ministry of Justice and Security 2013). It states the following:

- “disaster: a serious accidents or other incident whereby the lives and the health of many people, the environment or significant material interests have been harmed or are threatened to a serious degree. Coordinated deployment of services or organizations from various disciplines is required to remove the threat or to limit the harmful consequences” (Ministry of Justice and Security 2013, p. 61).
- “crisis: a situation in which a vital interest of society is affected or at risk of being affected” (Ministry of Justice and Security 2013, p. 62).

This distinction is relevant since the demand structure differs between a situation of crisis and a case of disaster. When dealing with a disaster, the command structure is bottom-up, meaning

that the responsibility lies with the municipality and higher positions are only involved when the disaster, concerns more than one municipality, or province. In the case of a crisis, the emergency response is planned and executed by the *Ministry of Justice and Security*. The former laws, which are now joined together under the *Wvr* are briefly explained in the next paragraph. *The Disaster and Major Accident Act* was established in 1985 and entailed the coordinated cooperation, especially multi-disciplinary. According to this a disaster, also includes major accidents as defined by the *Disaster and Major Accident Act*. Severe disruption to the public safety that poses a serious threat to the health or lives of a significant number of people, requiring a coordinated organization of different disciplines to limit or remove the threat (Scholtens 2008). Therefore, the *Security Regions Act (Wet veiligheidsregio's)* is now responsible for the *Police Force*, the *Fire Brigade*, and all *medical first responders*. The *Institute for Physical Safety (Instituut Fysieke Veiligheid, IFV)* assists and also functions as a control mechanism for the *Wvr* (Ministry of Justice and Security 2013).

In 2012, the *Dutch government* decided to rearrange the *Police Act*, replacing the existing law from 1993. The task of the police is to ensure the effective enforcement of the law in subordination to the competent authority and in accordance with the legislation in force. It is also responsible for protecting all citizens living or temporarily staying in the Netherlands. At the local level, the *Police Act* under the supervision of the *Mayor* when it comes to obtaining public order. However, concerning criminal prosecution, the police operate under the control of the prosecutor. The legal role of the police includes various aspects such as surveillance, detection of crimes, and assistance. If police work requires more knowledge, the primary police will call in specialists. For their work, the police have resources such as handcuffs, pepper spray, and a firearm at their disposal. It has the so-called monopoly on the use of power: the right to use force which is supposed to be the last resort. The use of firearms is always subject to an independent investigation. The police are divided into different ranks which include: *Chief Commissioner, Commissioner, Chief Commissioner, Inspector, Inspector, Brigadier, General Representative, Agent, and Supervisor* (Politie Nederland 2019).

On January 1st, 2013 the *Temporary Ambulance Care Act (Tijdelijke Wet Ambulancezorg, Twaz)* came into effect. In February 2016, the *Minister of Health, Welfare and Sport* agreed on a bill that extended the *Twaz* for three more years until the beginning of 2019 (Government of the Netherlands 2016a). It was subsequently extended for a further two years until 2021, by then a fixed law is supposed to be passed (Ambulancezorg 2019a). This law is based on the 25

security regions and includes all regulations for ambulances, response times, and the number of ambulances that are in use at any time. It also defines the procedures to be followed from receiving an emergency call to handing over a patient (Ambulancezorg 2019b).

In 2008, the *Public Health Act (Wet Publieke gezondheid, Wpg)* replaced the *Infectious Diseases Act*, the *Public Health Collective Prevention Act*, and the *Quarantine Act*. The law regulates the organization of public health care which also includes youth and elderly care. Another issue regulated, contains the fight against infectious diseases and specific legal guidelines for isolation of people and objects in case that they pose a threat to public health (National Institute for Public Health and the Environment 2019). The municipalities are responsible for the implementation of the *Wpg*, while the central government holds the overall responsibility (Loket gezondheid leven 2018).

In some necessary situations, additional laws can be taken into effects, such as the *Coordination of Exceptional Situations Act* and the *War Act*. The parliament can enact them in the event of a declaration of a state of emergency in the country stated by the Dutch Constitution in Article 103 (Constitution of the Kingdom of the Netherlands 2008).

3.3 Core Emergency Responders in the Netherlands

The following chapter is dedicated to the Core Emergency Responders in the Netherlands. Figure 4 shows the structure as sections 3.3.1., 3.3.2., and 3.3.3. explains the individual players in detail.

Core Responders of the Netherlands

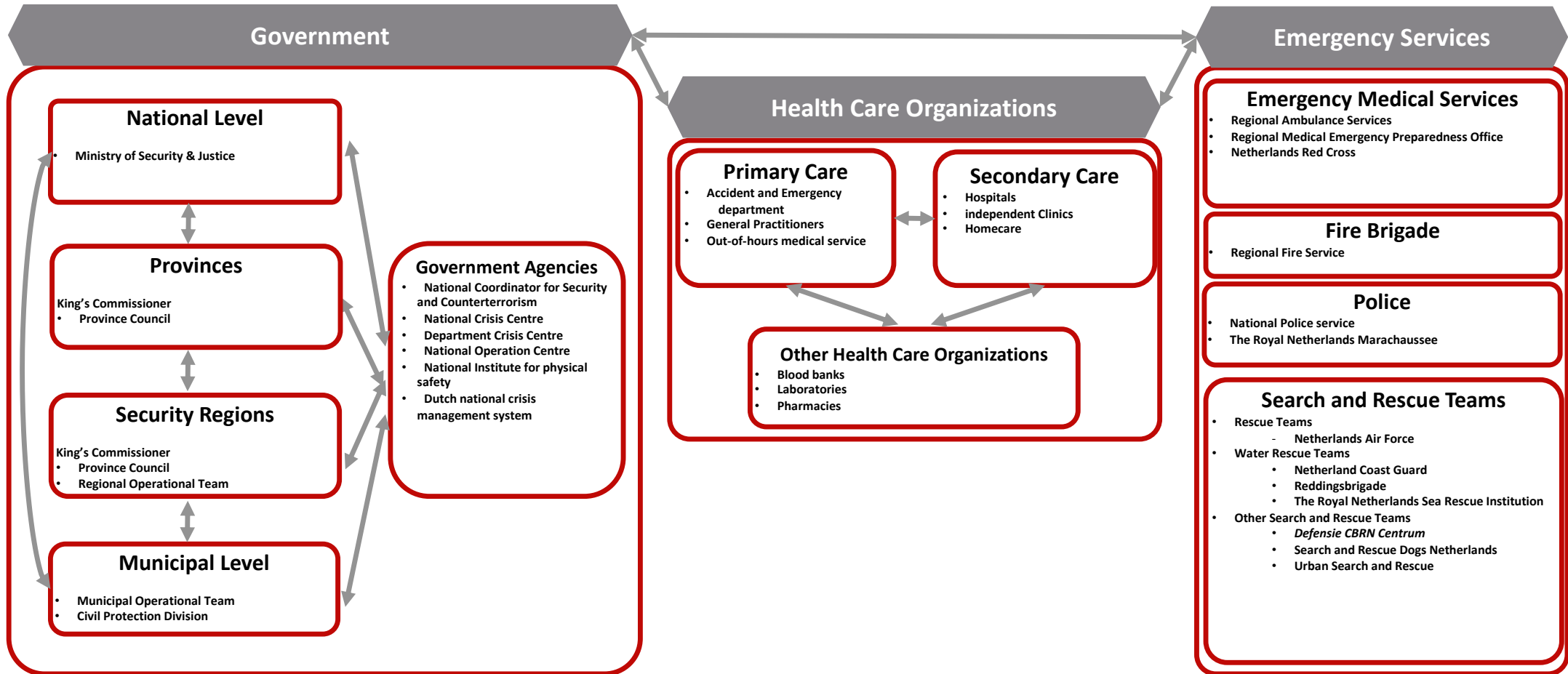


Figure 4: Core Responders of the Netherlands

3.3.1 Government

The *Dutch Government* is a decentralized unitary state in which the *Central Government* is responsible for national issues and foreign politics. However, the majority of control lies with the municipalities and provinces. Disaster Management and relief is one of the examples in which the central and decentralized governments work closely together (Figuee et al. 2008). The following section first gives an overview of the different levels of the Dutch political system, before explaining in detail the essential players in the disaster management in the Netherlands.

In the case of security issues and disasters in the Netherlands, there are three levels of coordination (Domestic Preparedness 2012):

- 1) The administrative coordination
- 2) The operational level
- 3) The crisis communication

Crisis management and, therefore, the administrative coordination in the Netherlands is mainly organized on a local level, and authority lies by Mayors and operational leaders of each municipality. This also applies to the jurisdiction of the Ministries. Depending on the type of disaster, the responsibility lies by the ministry that holds the power of the specific area. In the case of an emergency, the *National Government* is more involved and responsible for the coordinated response (Ministry of Justice and Security 2013).

The second level is the operational level which is responsible for converting strategic decisions into operations. Presence and operations at the place of the disaster are also represented in this level. It includes all first responders: the *police force*, *fire brigade*, and *medical personnel* (Sholtens 2008). The third level is mainly based on information sharing and the organizations that are tasked. The bottom-up system of the Netherlands means that responsibility starts at the local level with the *Mayor* and only becomes the responsibility of the safety region or national level if the disaster exceeds the boundaries of the municipalities or the *Mayor* asks explicitly for help (Domestic Preparedness 2012).

The responsible parties in the case of a disaster or a crisis are the *Mayors*, the *fire service*, the *regional accident*, and *disaster medical teams*, the *police services*, the *armed forces*, and the *municipality services*. Depending on the nature of the disaster or crisis, other parties, such as

the *water authorities*, the *coast guard*, the *red cross*, or the *rescue dogs*, are also deployed. In the following, the Master Thesis explains the various actors in connection with the political system and further specifies other vital players in disaster management (Government of the Netherlands 2018i).

The Dutch political system is based on the national level, the 12 provinces, and the 431 municipalities (Ministry of Justice and Security 2013). The central government in the Netherlands consists of the Cabinet, including all ministers and state secretaries, as well as the King/Queen (Ministries of the Netherlands 2018b).

National Government

All decisions on behalf of the government are agreed on in the council of ministers which does not include the state secretaries and are chaired by the prime minister, who also functions as the Minister of General Affairs. Furthermore, there are twelve different Ministries in the Netherlands, which are detailed in table 5 (Ministries of the Netherlands 2018b).

Table 5: Ministries of the Dutch Government

Ministries	Abbreviation	English Translation
Ministerie van Algemene Zaken	AZ	Ministry of General Affairs
Ministerie van Landbouw, Natuur en Voedselkwaliteit	LNV	Ministry of Agriculture, Nature, and Food Quality
Ministerie van Defensie	DEF	Ministry of Defence
Ministerie van Economische Zaken	EZK	Ministry of Economic Affairs and Climate Policy
Ministerie van Onderwijs, Cultuur en Wetenschap	OCW	Ministry of Education, Culture, and Science
Ministerie van Financiën	FIN	Ministry of Finance
Ministerie van Buitenlandse Zaken	BZ	Ministry of Foreign Affairs
Ministerie van Volksgezondheid Welzijn en Sport	VWS	Ministry of Health, Welfare, and Sport
Ministerie van Infrastructuur en Waterstaat	I&W	Ministry of Infrastructure and Water Management
Ministerie van Binnenlandse Zaken en Koninkrijksrelaties	BZK	Ministry of Interior and Kingdom Relation
Ministerie van Justitie en Veiligheid	J&V	Ministry of Justice and Security
Ministerie van Sociale Zaken en Werkgelegenheid	SZW	Ministry of Social Affairs and Employment

The parliament, which consists of the first chamber (Senate) and the second chamber (House of Representatives), holds the authorization on the national level. (Netherlands Institute for Multiparty Democracy 2008). While the Second Chamber is directly elected by the Dutch citizens and tasked with amending and approving bills, the First Chamber fulfills a supervisory role. The members of the First Chambers are not directly elected but through the 12 provincial councils (Kroneman 2016).

The administrative authority on the national level is granted to the *King's Commissioners (CdK)*, as well as the *Ministry of Justice and Security*. However, this only applies to a situation in which the disaster overreaches the provincial border or applies to more than one ministry (Domestic Preparedness 2012). On the national level, every ministry is also responsible for dealing with disasters within their ministry. Should a crisis or disaster exceed a safety region with national impact or affect several departments and ministries, the responsibility lies with the *Ministry of Justice and Security*. This Ministry is comprised of five directorates: 1) Threats (risk management and reduction), 2) Resilience (response and relief), 3) Interests (protection of critical infrastructures), 4) Cyber Security, and 5) Strategy & Management. The actions of the *Ministry of Justice and Security* will be in demand if one or more of the five national interests are threatened. Those interests include: 1) Physical Security, 2) Economic Security, 3) Environmental Security, 4) Social and Political Security, and 5) Territorial Security (Ministry of Justice and Security 2017). It is the task of the *Ministry of Justice and Security* to ensure the continuity of public administration, justice, police, and the functioning of public services. This also applies to the rescue services; in case they need assistance in coordination or psychological support. This ministry is also responsible for damage assessment in the event of a disaster (Drückers et al. 2017).

As mentioned before, the Netherlands distinguishes between a crisis and a disaster. If an event is categorized as a crisis, the command could also be executed by the ministry of that instead of the bottom-up response. This especially mainly includes terrorist attacks of all kinds as well as nuclear accidents but also infectious diseases that are at risk of spreading rapidly (Ministry of Justice and Security 2013). A national risk assessment of the whole-of-government is conducted yearly basis, impacting the annual allocations towards risk and disaster management. These data are not only presented to the cabinet and the parliament but also the public for the most part. The assessment also includes a detailed report in the following year by the prime

minister and the action that has been and will be taken in order to face the risks identified (Caudle and De Spiegeleire 2010).

Provincial Level and Security Regions

The Netherlands are further divided into 12 Provinces. The power of authority in all of the 12 provinces rests with the *Provincial Council* which the Dutch citizens elect directly. Depending on the size of the population, the size of the *Provincial Council* can also vary amongst provinces. All decisions reached by the *Provincial Council* will be implemented by the *Provincial Executives*, who also carry out decisions by the *Central Government*. Also, every province has a *King's Commissioner*, who is appointed by the *Central Government* and functions as the chair of the *Provincial Council* and *the Provincial Executive*. The *provinces* are the connection between the *Central Government* and the municipalities. Their tasks include public traffic including public transport, environment, and the financial supervision of the municipalities (Figuee et al. 2008). The provinces are responsible for environmental management including industrial waste, pollution, and water treatment. They are also accountable for the supervision of the municipalities (Netherlands Institute for Multiparty Democracy 2008).

The provincial division of the country is less relevant to the disaster management than the security regions in which the state is segmented.

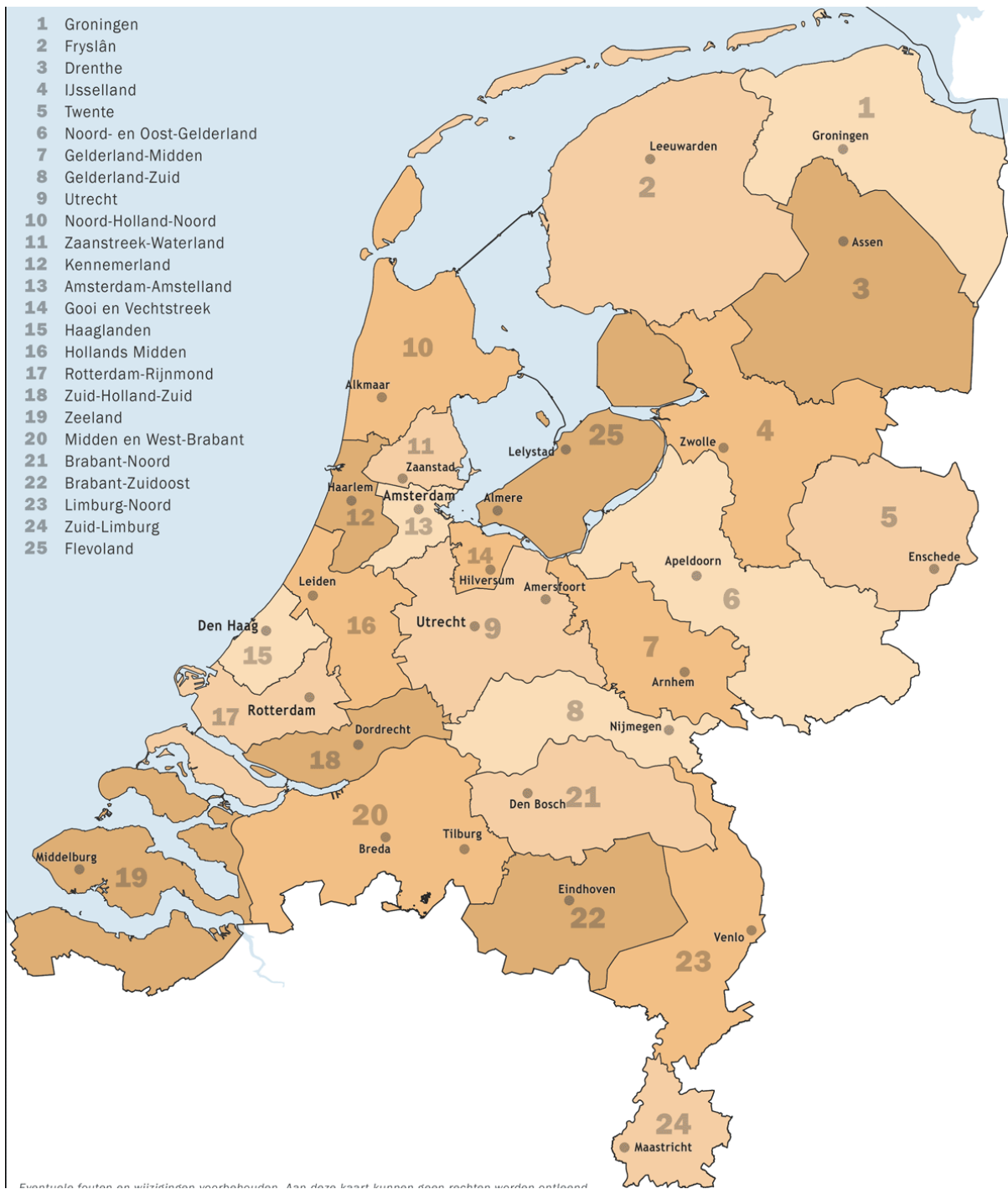


Figure 5: Security Regions of the Netherlands
Source: Ministry of Justice and Security (2013)

In 2010, the government divided the country into 25 security regions based on the former 25 police districts. The goal of the security regions is to ensure mutual assistance in the events of disasters and crises and include *fire brigades*, *medical assistance*, and the organization of those under the same regional administration (Ministry of Justice and Security 2013).

This entails that all of those stakeholders operate under one regional administrative authority (Kalkman and De Waard 2017). The security regions will step into action if a disaster affects more than one municipality within a safety region (Domestic preparedness 2012). While the second paragraph of the *Safety Regions Act* authorized the municipalities and therefore the *Mayor* for first responders and disaster management, paragraph three states that the specific responsibilities should be transferred to the *security regions*. Crisis such as the Enschede Fire in 2000, showed that some municipalities did not have the resources and experience to deal with such a major disaster. Consequently, given another critical aspect is the combination of the *fire service* and the *regional medical emergency responders* that ensure the best possible emergency service as well as after-care (Ministry of Justice and Security 2013).

The *security regions* are a way to ensure that capacity, knowledge, finances, and experience that can be combined in order to exceed municipality boundaries if necessary. Each security region can be considered as an extended *local government*, which has its separate regulations and legal framework. The management board of each *security region* is composed of all the mayors belonging to that region (Ministry of Justice and Security 2013). One of the *Mayors* of each region is appointed president and therefore also, head of the police region as well as the *regional policy team*. In addition, *liaison officers* in each area are tasked with the cooperation with other organizations such as: 1) the organization for National Infrastructure, 2) the regional military waterways, and 3) the Water Boards. The structure of the *Regional Operational Team* is very similar to the organization of the municipality *Operational Team* and differs in size and reach of the team. The *security regions* are also using the *Dutch National Crisis Management System (landelijk crisismanagement system, LCMS)* to gather and analyze real-time information (Domestic Preparedness 2012).

Thus, security regions are the connections between the *local civil protection management* and the *national bodies of the Dutch government* and, therefore, the *National Crisis Centre* (Ministry of Justice and Security 2013).

The Municipalities

The Netherlands is divided into 413 municipalities. Every municipality also has a council and a municipality executive. In addition to this, the *Mayor* is appointed by the King/Queen who is the head of the *Council* and *executive*. The *Mayor* is responsible for the *Council* and has to make sure that decision making is correctly and respectable. The *Mayor* is playing an essential role in disaster management which is explained in detail later (Figuee et al. 2008).

Duties of the *municipalities* include the authority over the *fire departments* and the *police* (Netherlands Institute for Multiparty Democracy 2008). As mentioned before, the Netherlands are operating as a decentralized unitary state, meaning a respectable amount of control lies with the *municipalities*. As the head of a *municipality*, the *Mayor* shares the authority and the responsibility regarding the public order. He/She is responsible for the public order and therefore also functions as the head of *police* for the municipality. All decisions that include significant public events such as musical events, demonstrations, or sports games have to be approved by him/her. The *Mayor* also decides whether *police* presence is necessary, and the scale needed to ensure the safety of the population (Figuee et al. 2008). While he/she has the authority to act and decide on those issues, he will have to account for all decisions afterward to the council. Besides the *police*, he/she has also the authority over the *fire brigade* and consequently a significant role in the field of disaster relief and the general security of the *municipalities*. In the case of disaster or emergency the *Mayor* has the supreme command and can give orders even to organizations that are usually not under his authority.

Nevertheless, this power of supreme only applies to situations of public order and security. In the case of a disaster or crisis, it depends on the *Mayor* to inform the general population, various emergency services, as well as any higher positions in a timely manner (Ministry of Justice and Security 2013). Every *municipality* has an *Operational Team* of which the *Commander* on the scene is in charge of together with the *Information Manager* and *Crisis Communication officer*. The team includes members of the *fire brigade*, *ambulances*, and *police services*. Responsible for all relevant information, the *Information Manager* is tasked with entering all data into the *LCMS*. The primary purpose of this system is to get a real-time operational overview of the situation and to support the decision making in the case of such crisis and urgency and can also be used to share vital information with the *National Crisis Centre (NCC)* (Domestic preparedness 2012). If an emergency or disaster involves more than one municipality, the

responsibility lies with the *King's Commissioner* of the *Province the Municipalities* are based in (Ministry of Justice and Security 2017).

The Netherlands has adopted the *GRIP* system, which stands for Coordinated Regional Emergency Management Procedure (Gecoördineerd Regionale Incidentbestrijdings Procedure). With a total of seven phases, the *GRIP* system ranges from GRIP 0 to GRIP State. It starts with the GRIP 0 phase, which is classified as an emergency with no need for centralized incident coordination. GRIP 1 includes all disasters that need inter-agency cooperation but only affect the area at the incident. The third stage, GRIP 2, requires an operational team, eventually, action centers as well and is reserved for situations in which the effects are not contained at the scene. GRIP 3 and GRIP 4 are both reserved for disasters with severe consequences for the population. While GRIP 3 is centralized to one municipality, GRIP 4 comes into effect if multiple municipalities are involved. If only one municipality is involved, the *Mayor* of that municipality heads the operation in collaboration with the *Police Commissioner* and the *Public Prosecutor*. The *municipality Policy Team* is also involved at this stage. Should the incident affect more than one municipality, the procedure is similar. Instead of the *Mayor*, the *Chair Safety Regions* takes control, and the *Regional Policy Team* is involved. In order to trigger a GRIP 5, respond, more than one Safety Regions is affected and calls for the collaboration of multiple *Chairs of safety regions*. The last and most severe response is the GRIP State and will come into effect if the national security is concerned. In this case, the *Ministerial Commission on Crisis Management (MCCB)* is in control and will be assisted by the *NCC* as well as the *National Operational Coordination Centre (Landelijk Operationeel Coördinatie Centrum, LOCC)*. This system allows for the collaboration of the government with other bodies such as *fire services* or *NGOs*. There are three main points of central government involvement in the crisis management of the country (Bram et al. 2016).

1. The *Advisory Team (Adviesteam, AT)*,
2. The *Interdepartmental Crisis Management Committee (Interdepartementale Commissie Crisisbeheersing, ICMC)*, and
3. The *Ministerial Crisis Management Committee (Ministeriële Commissie Crisisbeheersing, MCMC)*

Government Agencies

The Netherlands has different agencies, which are dedicated or involved in the crisis management of the Netherlands. This section describes the leading players in the Dutch system.

The central authority in the case of a disaster or catastrophic event is the *National Coordinator for Security and Counterterrorism (Nationaal Coördinator Terrorismebestrijding en Veiligheid, NCTV)* (Domestic Preparedness 2012). The *NCTV* is exclusively dealing with crises and disasters. One of the tasks is the management of the flow of information by ensuring the harmonized concept. This organization is also responsible for national security and identifies risks such as in the case of flooding. One task is identifying the risks and the possibilities of such an event happening. Another is the management of the emergency response and possible evacuation measures in the event of a crisis (Government of the Netherlands 2019b). No matter on which level the disaster is occurring, the crisis is dealt by multidisciplinary effort, which means that all levels and organizations share the responsibility of averting or dealing with disasters. In specific situations, the *Minister of Security and Justice* also has the authority to mandate the management of a crisis on the national level. The approach of the multidisciplinary effort also applies when dictated by emergency legislation (Domestic Preparedness 2012). The *NCTV* is the primary shareholders of communication in the case of a crisis. If deemed necessary, an *ICMC* is created and chaired by the *National Coordinator for Security and Counterterrorism (NCTV)*. The *ICMC* further consists of the senior advisor of the *Ministry of General Affairs* and the representatives of the responsible or affected ministries, those are usually delegates, who are representing the Minister, as well as the head of the *National Crisis Centre (NCC)*. The *ICMC* can decide to listen to and consult experts or other authorities, if needed, for the decision making. The *ICMC* has two constant members, which are the *Prime Minister*, who is also the *Minister of General Affairs*, as well as the *Minister of Security & Justice*, who also functions as head if not resumed by the *Prime Minister*. The Committee is advised by the *ICMC*. Both the *MCMC*, as well as the *ICMC*, are the crucial institutions of decision making in case of a crisis (Ministry of Security & Justice 2016). The *NCTV* also includes the *National Crisis Centre (NCC)* dedicated to overseeing all national crises and functioning as an information hub and communication centre, as well as the *Departmental Crisis Coordination Centre (DCC)* for each of the twelve ministries (Domestic Preparedness 2012).

The *National Crisis Centre* is divided into two divisions; the *Crisis Coordination Unit (Eenheid Crisiscorördinatie, ECR)* and the *Communications Unit (Eenheid Communicatie, ECO)*. The

Crisis Coordination Unit functions as a contact point for national emergencies as well as a decision-making role in crises. Another assignment is the advisory role in cases of significant events. The *ECO*, on the other hand, is responsible for the development and realization of communication regarding the crisis and general risks. Running 24 hours a day, the *NCC* has become not only a vital crisis center but also the connection to other departments of the *NCTV*, as well as other essential administrations such as the *LOCC* (National Crisis Centre, 2018). The centre also functions as a contact point for international institutions such as the EU, the UN, or NATO (Domestic Preparedness 2012). The tasks and responsibilities of the *NCC* can be segmented in the “cold phase” and the “warmphase”. In the “cold phase,” the *NCC* is mostly responsible for the preparation of a disaster. this includes risk analyses and conducting national crisis plans for possible hazards in the future. It also provides the coordination of main events of national or international dimension, as well as state visits and family events of the royals. In cases of a current crisis, the *NCC* takes over the role of response coordinator and decision-maker. A crucial part of which, is the information management and evaluation to advise on further responses needed (National Crisis Centre 2018). The *Ministry of Interior and Kingdom Relations* also includes the *Dutch General Intelligence and Security Service (Algemene Inlichtingen Veiligheidsdienst, AIVD)* (Ministry of Interior and Kingdom Relation 2019a).

The Institute of Physical Safety is tasked with the organization and support of the 25 security regions on a national level. The management board consists of the general manager, the director of management, as well as the 25 chairpersons from the security regions. The *IFV* is an independent institution required by law and laid down in the Security Region Act of 2013. One of the primary responsibilities is firefighter care which includes training and issuing certificates by their fire department academy, where firefighters learn and excel in their competences in relief and crisis management. Besides courses in specialist training, the academy also researches regards of crisis management. In addition to the academy, the *IFV* also includes the Regional Medical Emergency Preparedness Office (Geneeskundige Hulpverleningsorganisatie in de Regio, *GHOR*) Academy and the Crisis Management Academy, which they are managing in cooperation with the *Police Academy*. It has also professorships in fire prevention, fire fighting, crisis management, as well as energy and transport safety. The institute should form a link among the research, education, and practice of the field of disaster relief and crisis management (Institute of Physical Safety 2019).

After the 2000 firework explosion in Enschede and the closely followed New Year's Fire of Volendam, the government founded the *Dutch Safety Board* in 2005. Five permanent members and supporting staff, including investigators, are tasked with the prevention of disasters as well as limiting their consequences. Should there be found any shortcomings, the *OVV* issues recommendations to the authorities or companies directly involved in the incident. The boards' task, however, is not the establishment of responsibility for the event. The areas of the *Dutch Safety Board* range from issues on transportation services over defence and digital safety to health care issues that can arise (Dutch Safety Board 2019a).

In respect to the 25 *security regions*, every region has a *Regional Medical Emergency Preparedness Office*. The *GGD* (*Gemeentelijke of Gemeenschappelijke Gezondheidsdienst*) is the municipality or *Common Health Service*, which has been legally one association since January 1st, 2014. *GHOR* is a medical aid organization that coordinates health care in the event of disasters and crises, as well as guarantees continuing preparation beforehand. Their goal is to limit the number of victims and adverse effects on public health. *GHOR* also advises governments to prevent disasters and crises as far as possible. *GHOR* coordinates health care in the event of disasters and crises, *GHOR* is responsible for all medical-related issues and ensures that all victims are responsibly cared for under all circumstances by the right emergency services. This is also referred to as the “hot phase.” It is not an emergency service, but an organization tasked service which insures that in the event of an accident or disaster, all medical assistance can work together. These related shareholders include *Regional Ambulances*, *Hospitals*, *Doctors*, and all municipality and *mental health services*. In the “cold phase,” which refers to any situation in which there is no imminent threat of disaster, the *GHOR* handles preparation, education, as well as the aftercare of previous events. Preparations can range from psychological care over post-disaster care to research activities (GHOR 2019).

The Dutch *government* has issued a website *Crisis.nl* on which information regarding crisis and disasters are displayed for the public. During a crisis vital information about extend and ways to get to safety areas can be found on the site. There is also an alert via text message that is sent to citizens in the affected areas (Crisis.nl 2019a). The website is provided by the *NCTV* (Government of the Netherlands 2019b).

3.3.2 Health Care Organizations

The Dutch insurance system was established in 1929 and was widened to compulsory insurance in 2006. While the Dutch system repeatedly ranks exceptional in international comparison, it is with its health care expenditures of nearly 11% of the GDP one of the most expensive ones (Schölkopf and Pressel 2017). The total expenses of this sector are approximately 70 billion Euros (Government of the Netherlands 2016a). In order to provide accessible, affordable, and high-quality health care, the *Dutch Healthcare Authority* (*Nederlandse Zorgautoriteit*, NZa) was established. Its responsibilities range from setting rules, regulating providers and insurers to an advisory role to the *VWS* under their control it falls (Dutch Healthcare Authority 2019). Primary care physicians are functioning as gatekeepers in the Netherlands and are responsible for navigating the care of their patients in the health care system. The consultation of a specialist requires a referral from one of the 7,900 *primary care physicians*. Contrary to many other countries, specialist consultations are organized by the hospitals, and not by individual medical offices (Schölkopf and Pressel 2017). Only in emergencies patients can go directly to the hospital without consultation of their *general practitioner* (Suijkerbuijk et al. 2018).

The *Dutch government* launched a new health care reform under the *Health Insurance Act* (*Zorgverzekeringswet*) to ensure that all citizens are insured for basic medical insurance. While care is given by private competitive health insurers, nearly all the medical providers are non-profit organizations. At the moment, 24 insurers compete in the Dutch health care segment. These insurers, however, have to accept the clients and cannot decline anyone. Premiums are set regardless of the pre-existing medical conditions or age of the people. The Dutch health care system is based on three components.

The first component is the Long-Term Care Act and is directed to citizens with chronic diseases that need constant supervision or around the clock home care (Government of the Netherlands 2018l). It is mostly financed by income-related salary deductions; a small part is contributed by direct payments. In 2006 the amount of taxes paid by employees as well as employers was increased from 10.25% to 12.55% and has been steady since (World Health Organization 2007). The second act falls under the *Health Insurance Act* and covers the basic health insurance package such as visits at general practitioners and short-term hospital stays. The *Social Support Act* and the *Youth Act* cover all other services such as home assistance, wheelchairs, and family support for caring for sick children (Government of the Netherlands 2018l).

Around 93% of the Dutch population has private supplementary health insurance, especially concerning dentist medical care (Suijkerbuijk 2018). As can be seen in figure 4, the primary and secondary medical care is given by GP's as well as the hospitals. As of 2018, there were 89 hospitals, including roughly 23,000 medical specialists throughout the country (Dutch Healthcare Authority 2019).

In 2017, there were 56,886 hospital beds in the country, indicating the lowest level in years. Causes are mergers of *clinics* and *hospitals* and the reorganization of *health care services* by the *safety regions*. This amounts to 4.7 beds per 1,000 inhabitants (Statista 2019a; Indexmundi 2018). The number of curative beds in the Netherlands is 320 beds per 100,000 inhabitants, which is below the European average of around 356 (Eurostat 2016). The 23,000 medical specialists are located in the hospitals and can be consulted after referral by *general practitioners* (Dutch Healthcare Authority 2019). Furthermore, each *security region* has its *Municipalities Health Service* (Suijkerbuijk 2018).

The Netherlands has one of the highest vaccination rates throughout Europe, because the government provides free vaccination against 12 infectious diseases to all children up to twelve years (Kroneman 2016). Listed in the *Public Health Act (Wet Publieke Gezondheid)*, there are currently 43 contagious diseases, which are separated in categories that indicate the number of control measures needed to contain the disease. In cases of epidemic outbreaks, concerning infectious diseases, the national coordination, as well as communication among professionals and the public, lies with the *National Institute for Public Health and Environment*, which was appointed by the *Minister of Health, Welfare, and Sports*. There are eight *academic hospitals* and 80 *peripheral medical institutions* throughout the Netherlands. In addition to that, every *security region* has a *Municipality Health Service (MHS)* (Suijkerbuijk 2018).

The government appointed the first ten *trauma centers* in the country in 1999. At present, there are 11 *trauma* centers in the Netherlands, which are classified as Trauma 1. The implementation of these trauma centers has immensely decreased the mortality rate for polytrauma up to 20% (Dijkink 2017). The number of physicians per 1,000 residents were 3.48 in 2015 which is similar to other European countries (World Health Organization 2019). The Netherlands had a total of 1,996 pharmacies throughout the country in 2018, most of them being franchises and only 160 independent pharmacies (Statista 2018b). Due to the nature of the *Dutch Blood Supply*

Act, only one organization is allowed to be in charge of blood donations and transfers, which is *Sanquin*. The non-profit company was established in 1998, following the merger between the Dutch blood banks and Red Cross Blood Transfusion Service. With its headquarters in Amsterdam, this organization employs about 3,000 people including volunteers to ensure that the almost 350,000 blood donations per year meet the requirements of about 300.000 patients in need of blood transfusion (Sanquin 2019).

3.3.3 Emergency Services

Until the late 1960's *ambulance service*, as well as the *fire brigade*, were run locally. This situation resulted in small divisions and was difficult to organize on a national level and led to a re-organization of the disaster management in the Netherlands. The most imminent change was the decentralization and the postponement of responsibilities for disaster management to the *local authorities* (Sholtens 2008).

Ambulance Services:

As mentioned before, the *Mayor* of each municipality has authority over the *police*, and the *fire brigade* in the case of emergencies. Therefore, he/she also give instructions to the regional *ambulance services*. However, the authority of the *ambulance services* is given by a legal entity through a licence from the *Minister of VWS*. The *Mayor* is allowed to directly give orders to staff responsible for the *ambulances* in the case of disaster management (Ministry of Justice and Security 2013).

The *ambulance service* of the Netherlands is organized under the *Ambulancezorg Nederland (AZN)*, which represents the national *ambulance care organization*. By the division in 25 *security regions*, the *ambulance services* result in 25 *Regional ambulance services*, called *Regionale Ambulancevoorzieningen (RAV)*, and is fused on the temporary care act, the *Tijdelijke Wet Ambulancezorg (Twaz)* (Ambulancezorg 2019a). The *RAV* is under the supervision of the *VWS*, which controls the 25 dispatch centers of the *security regions*. At the beginning of 2018, the total number of ambulance cars in all *RAV* regions was about 790. However, not all of the ambulance cars are in service, some being reserved in case of a large-scale disaster. To provide the necessary number of ambulances, the *RAV* may engage third party providers if the region needs help. The largest one being the *BAS ambulance service*. This applies especially to ordered patient transports and international medical transportation

(Ambulancezorg 2017; BAS Ambulance Service 2018). The *RAV* has established a dynamic preparedness approach, meaning that ambulance cars do not return to a precise location after finishing a call but stay on the road to shorten response time. This approach is usually used during the day when the number of emergency dispatch is higher. *Ambulance services* are located to reach 95% of the population within 15 minutes of the distress call reaching the dispatch center. In 2017, ambulance cars have deployed a total of 1,313,103 times, which showed a slight reduction compared to the year 2016. Every ambulance car has medical personnel, such as nurses or paramedics and a driver, the duties are strictly separated, compared to the practice from many other European countries. The most recent numbers show that there were 5,925 employees in this field in 2017, including the paramedics and non-paramedics working in the control room. The nurse dispatchers are responsible for the control room process (Ambulancezorg 2019b). Their tasks include ensuring a smooth intake, indication, care allocation, and care instructions at every step of emergency dispatch. The microbudget for the *ambulance care* sector in the Netherlands is set each year according to the national budget and amounted to roughly 592 million Euros in 2017. Thus, the ambulance service costs about 34,50 Euros per inhabitant (Ambulancezorg 2017). The *AZN* also monitors the sector and offers the *RAVs* various forms of support. All 25 *Regional Ambulance Facilities* in the Netherlands are affiliated to the *Ambulancezorg Nederland* industry association. During the years 2014 to 2016, the *ambulance care* in the Netherlands supported the *RAVs* on a project-by-project basis in preparing for disasters and crises. Since 2016 onwards, the organization has been working on developing new strategies on the topic of *ambulance service* (Ambulancezorg 2019b).

The dispatch calls are arriving from either *general practitioner's*, *hospitals*, *nursing homes*, or via the 122 emergency calls. All operators have a paramedic background in order to assess the situation and decide whether an ambulance car is needed and in the cases of dispatch with which priority the ambulance car will be sent. Should an ambulance car be sent on the way to a caller of the 122-emergency line, the operator will stay on the line and give instructions to the patient or caller until the ambulance arrives. They also update the staff of the ambulance car about the condition of the patient. There are 230 locations in the Netherlands from where ambulance cars can be sent, not including ambulance cars that are on the road at the moment of dispatch. About every third dispatch has an urgent character, meaning that the situation could be life-threatening. In this situation, the ambulance car has to be at the patient within 15 minutes. In a non-life-threatening case, the *ambulance service* must be on-site within 30 minutes of the emergency call. There are also fast responders, which is an ambulance paramedic driving in a

small car, motorcycle, or bicycle. In some special situations, this might even include small boats and snowmobiles. Only one-fifth of the patients are transferred to hospitals. The other patients are brought to their *general practitioner's* office or can stay home after being assessed and treated by the first responders (Ambulancezorg 2017). By the introduction of a unique App, the *RAV* could provide valuable information such as a crisis plan, if the situation is deemed necessary (Ambulancezorg 2019b). As in many other industrialized countries, one of the main challenges is aging population. By 2040, the number of elderly people in the Netherlands is expected to double. Medical care and *emergency services* must adapt to these changes promptly (Ambulancezorg 2019a).

In the event of major disasters, the *Netherlands Red Cross* also supports the emergency forces. The volunteers who are members of an emergency team takes immediate action in the event of a disaster, accident, or attack. The members of the *emergency teams* receive intensive training and refresh their knowledge in yearly conducted courses. They help the slightly injured so that the *rescue services* can take care of serious injuries (Rode Kruis 2019).

Due to the flat landscape and size of the Dutch country, helicopters are used rarer than in other countries surrounding. However, this does not change the excellent response time which can be attributed to the fact that *helicopter rescues* demand more on scene preparation time (Timm et al. 2018).

As mentioned above, the *Ambulance Care Act* is fused on a temporary law at this moment. The new law is supposed to come into effect on January 1st, 2021. The *Ministry of Health, Social Affairs, and Sport* is responsible for the preparation of the *Ambulance Care Act* (Ambulancezorg 2019a). While there are plans to reorganize the responsibility of the managing control of the *RAV* to the jurisdiction of the national police in 2020, there has been no official confirmation (Ambulancezorg 2019b).

Fire Brigade:

The previous sub-section has already given an idea of the organization of *emergency responders* within the 25 *security regions*. The *Fire Brigade* of the Netherlands (Brandweer Nederland) is organized under the *Security Region Act* and therefore divided into the 25 districts. Every *Security Region* is headed by a *Fire Chief*, who is responsible for all *fire brigades* in that region. The 25 *Fire Chiefs* of the *security regions* make up the *Board of Fire Chiefs* (Raad van

Brandweercommandanten, RBC). The *RBC* further consists of a chairman and five program leaders, which are each in charge for a task area dedicated to the *National Fire Service*. Including for:

- 1) risk management and living safe in a fire environment,
- 2) incident control,
- 3) competence and knowledge,
- 4) crisis management, and
- 5) people and business operations.

About 28,000 *firefighters* are ensuring the safety of the Dutch population around the clock. 21,000 of them are volunteers while, the remainder consists of professional *firefighters*. These firefighters are allocated to 950 stations, responsible for about 219,000 calls reaching the stations every year. About 115,000 of those calls are fire-related. The remaining 104,000 calls for assistance each year, include water related issues, medical help, and animal rescue. The *Dutch fire brigade* has approximately 130,000 turnouts each year, which accounts for one turnout every four minutes (Brandweer 2019).

The *Dutch National Agenda* for the *Fire Service*, for the future of the *Fire Brigade*, was finished in 2010 and focuses on services for strategic goals for them from 2010 to 2040. These include possible future scenarios, as would be in a business model. Four options will be taken into consideration in the coming years. The challenges of the future include reducing the number of false alerts, emending response times, and improving education and prevention measures. One of the main targets of the proposal is the enhanced corporation among *fire brigades*, the *IFV*, and the *Safety Regions*, including *medical responders* and the *police*. This seems to be necessary to keep up with a rapidly changing society and new challenges, by the technological advancement raised. The *Council of Fire Brigade Commanders* advises the *Safety Committee* on everything related to fire and fire protection. Together with the *emergency medical services* in the region, *GHOR*, the *police*, the *municipalities* and colleagues from the *security regions*, the *fire brigade* is one of the critical players of disaster control and crisis management in the Netherlands (Brandweer 2019).

If a fire is particularly severe, the *Royal Netherlands Airforce* could be called to the scene for help. The *Royal Netherlands Airforce* also can use helicopters to fight fires from the air. This will be further illustrated in sub-section 3.5.1 (Royal Netherlands Airforce 2018).

Police

The *police system* in the Netherlands is divided into two groups: 1) the *Dutch national police force* and 2) the *Royal Netherlands Marechaussee* (*Koninklijke Marechaussee*, *KMar*). The *KMar* is a police force with military status and presents one of the four armed forces in the *Military of the Netherlands* (Government of the Netherlands 2019a, Ministry of Defence 2019). Radical changes in the police systems were introduced in January 2013. The former regionalized police system of the Netherlands was transformed into a more national centralized organization and operates now on three levels according to the *Police Act 2012*. Next to the national level, there are ten *police districts* and the *municipality police districts*. Prior to 2013, the *Police* in the Netherlands was organized in 25 *police districts* and the *National Police Service* (*KLPD*), which are now representing the 25 *security regions* (Kwartiermakers Nationale Politie 2012a).

The ten police districts of the Netherlands comprise:

- 1) Noord-Nederland,
- 2) Oost-Nederland,
- 3) Midden-Nederland,
- 4) Noord-Holland,
- 5) Amsterdam,
- 6) Den Haag,
- 7) Rotterdam,
- 8) Zeeland-West-Brabant,
- 9) Oost-Brabant, and
- 10) Limburg.

In additions there is an 11th unit for the nationwide response (Kwartiermakers Nationale Politie 2012a). These are responsible for special tasks that are realized in cooperation with the regional units. The *Special Intervention Division* of the *Central Unit* authorizes and carries out all serious threats regarding violence and terrorism (Government of the Netherlands 2019).

The power to make decisions about resources and the general organizations was transferred to the national level by the *Police Act 2012* (Terpstra and Fyfe 2014). The administration of the *police force* still lies with the *chief constable* of the *national force*. It is under the responsibility of the *Minister of Security & Justice*, who will set the main goals for the *national police force*. This means that every *police officer* is part of one *federal police* and works under one chief (Kwartiermakers Nationale Politie 2012b). Other ministers that are involved in the corporations with the police are: 1) *Minister of the Interior and Kingdom Relations* as well as the 2) *Minister for Immigration, Integration, and Asylum*. Authority over the *police force* for those ministers arise from the *Intelligence and Security Act 2002* and is mostly related to the monitoring and securing the national domain. The power over the police concerning the performance tasks is given to the *mayors* and their *municipalities*, while the local *public prosecutor* makes decisions about criminal investigations. For every 5,000 residents, there should be at least one local officer in the Netherlands (Kwartiermakers Nationale Politie 2012a). With approximately 63.000 employees, the Dutch *police* have about 50,000 officers in the operational field and are therefore, the largest employer of the country. In cases of need, the *police force* is encouraged to work with partners such as the *Royal Netherlands Marechaussee* or the *Police Academy* (Kwartiermakers Nationale Politie 2012b, Government of the Netherlands 2019c). While some powers can be executed by *police officers* independently, far-reaching capabilities such as surveillance or home searches can only be carried out by the permission of the *public prosecutor* (Ministry of Defence 2019a).

One of the four Dutch *armed forces* is represented by the *Royal Netherlands Marechaussee* and is the *police force* with military status. The *military* in the form of the *KMar* is permanently stationed in every safety region and, therefore, a significant part of the disaster management response in the Dutch system. However, compared to other disaster management responders, the *military* has a higher response time and is usually involved in more large-scale disasters (Kalkman and De Waard 2017). The combination of *military* and *police personnel* is given the *KMar* its versatile character. While established in 1814, it was not until 1998 that it became an independent armed force. The *KMar* employees consist of more than six thousand men and women organized in five districts. While the duties of the management lie with the *Minister of Defence* and the corps manager, the *Secretary-general of Defence*. The authority to deploy the *KMar* is vested in several different *ministries* and depends on the specific task. The following *ministries* have the power to use the *military*: 1) the *Ministry of Justice and Security*,

2) the *Ministry of Foreign Affairs*, 3) the *Ministry of Interior and Kingdom Relations*, and 4) the *Ministry of Defence*.

The *KMar* is tasked with three different areas of responsibilities: 1) border control, 2) security and surveillance, and 3) international and military police force (Ministry of Defence 2018a).

There are two units in the *KMar* dedicated to assisting the police in the Netherlands if rendered necessary, the *Mobile Unit* and the *Support Unit*. Especially at demonstrations or significant events, the *Mobile Unit* is tasked with reinforcement of the Dutch *police force*, while the *Support Unit* is charged with maintaining public order if regular forces cannot sufficiently guarantee it. In critical situations, such as hostage situations and riots after disasters, special assistance can be provided too (Ministry of Defence 2018c).

Additional to the *national police* and the *KMar*, the number of *private security officers* have been on the rise in Europe and the Netherlands. In the EU, the trend to increase private security can be found in most member states. It is often former military staff that is taking on jobs in the private security sector. The reasons are, amongst others, the significantly higher pay. The most prominent areas are parking supervision, correctional officers, and security checks on different premises (De Waard 1999). Since the 1980s, the number of *private security employees* has risen from 10,230 to more than 32,000 in 2015. This makes this sector about half as large as the *national police* sector. The largest firm offering *private security* in the Netherlands, is *Group 4 Securicor (G4S)*, with around 6,500 employees (Terpstra and Fyfe 2014, G4S 2019).

Search and Rescue Teams

There are several *Search and Rescue Teams* in the Netherlands, depending on the nature of the situation in which a team is needed. The main Stakeholder of *Search and Rescue (SAR)* is the *Netherlands Coastguard*. They are responsible for all services including *SAR* of the North Sea and inland waters. They are also responsible for coordinating *SAR* missions with other entities of the *government*. While the *Netherlands Coastguard* has no nautical or aeronautical assets themselves, they can request the support of the *Royal Netherlands Sea Rescue Organization*, governmental shipping companies as well as ships, planes, and helicopters from the *Ministry of Defence* and the *Ministry of Justice and Security*. Besides those two *ministries*, the *coastguard* carries out tasks for the *Ministry of Infrastructure and Water Management*, the *Ministry of*

Finance, the Ministry of Economic Affairs, and Climate Policy as well the Ministry of Agriculture, Nature and, Food Quality (Netherlands Coastguard 2019).

There are two institutions responsible for saving lives at sea and inland waters in cooperation with the *coast guard*. The first one is the *Royal Netherlands Sea Rescue Institution (KNRM, Koninklijke Nederlandse Redding Maatschappij)*, which is a voluntary organization working in close corporation with the *coast guard* with regards to *SAR*. While heavily involved with the government, *KNRM* is a charity organization and does not receive any public subsidies from them but is financed on a donation basis. The organization possesses 75 lifeboats and 3,000 volunteers stationed at one of the 45 sites throughout the country. Volunteers are trained and deployed as lifeguards having members on active duty at any time of the day (*KNRM* 2019).

Another Stakeholder responsible for *water rescue* is the *Reddingsbrigade*, in which roughly 23,000 volunteers in 160 brigades are ensuring the safety of citizens on and close to open and inland waters. Around 5,000 *lifeguards* are active every day at the coastlines and lakes throughout the country. Besides saving the lives of those in jeopardy, the *Reddingsbrigade* is heavily involved in the prevention of drowning and accidents concerning water. The organizations also include the *Royal Dutch Association for the Rescue of Drowning (Vereiniging Koninklijke Nederlandse Bond tot het Redden van Drenkelingen, KNBRD)*. Some of these *brigades* can also be called for assistance in the events of flooding or dike breaches. In those cases, they are tasked with the evacuation of affected areas. In the event of a crisis, further support can be required by the *fire brigade* (*Reddingsbrigade* 2019a).

In 2013, the *Urban Search and Rescue (USAR)* was founded, following a series of events such as the Enschede Fire. The organization consists of four *rescue teams*, a command group, as well as a staff and support group. *USAR* includes a wide range of search and rescue staff such as *doctors, paramedics, search dogs, construction engineers, and supporting staff*. Should the deployment of a team become necessary, *USAR* can be ready within four hours in the Netherlands and 24 hours outside of the Netherlands respectively. The organization specializes in deployments for destroyed buildings that can be found after earthquakes and fires. By 2018 *USAR* had a total of 145 employees (*USAR* 2019).

The *SAR Dogs Netherlands*, which was founded in 2013 by rescue dog guides, is training dogs for rescue purposes. There are two different teams, one that is focusing on training dogs to

participate in national and international competitions and exams and an additional group that is training for deployment. The purpose of the exercise is to make teams available to the authorities in the event of a search mission or a disaster (SAR Dogs Netherlands 2019).

The *Royal Netherlands Air Force (Koninklijke Luchtmacht, KLu)* is responsible for all operations that take place in the air. This includes the transport of injured persons as well as the delivery of relief goods and the search missions from the air (Royal Netherlands Airforce 2018). The established *Sea and Rescue Unit* of the *Air Force* was active until January of 2015 when their last rescue mission was flown. While it was initially planned to operate the helicopters from the *Defence Helicopter Demand* for future search and rescue missions, there was a delay due to technical issues. By now, the responsibility still lies with the *airforce*. However, the tasks of *SAR* are carried out by a public company from Belgium (Naviation Nederlande 2019).

The *Defensie CBRN Centrum (Defensie CBRN Centrum, DCBRNC)* is the Dutch competence center to support both *armed forces* and population protection in the fight against chemical, biological, radiological, and nuclear (*CBRN*) threats. The *DCBRNC* represents all organizations that are active in the field of Dutch civil protection. They support training units with regards to preparation and implementation and ensure with their expertise the cooperation among the different aid organizations, which is essential for successfully coping with *CBRN* events. The *DCBRNC* consists of the *Defensie Expertise Centrum CBRN*, the *CBRN School*, the *National Training Centrum CBRN*, and the *CBRN Response Unit*. The *CBRN Response Unit* is an expert team that supports civil security in the fight against *CBRN* threats. It has specialized equipment for the identification and decontamination of *CBRN* hazards. The Ministries involved in the *CBRN* are: 1) *Ministry of Security & Justice*, 2) *the Ministry of Defence*, and 3) *the Ministry of Health, Welfare & Sport* (CBRN Centre 2019).

3.4 Non-core Emergency Responders in the Netherlands

Figures 6, 7, 9, 11, and 12 illustrate the Non-Core Emergency Responders in the Netherlands which are further elaborated in sub-sections 3.4.1. to 3.4.9. The first figure 6 describes an overview of the *government*, the *strategic health authorities* as well as other *health care organizations*. All significant stakeholders in the *Dutch energy sector* are illustrated in figure 7 and further described in sub-section 3.4.4. The two sub-sections 4.5.5 and 4.5.6. detail the *food and beverage providers* as well as *information and communication services* respectively in figure 9. Sub-section 3.4.7. discusses the primary transportations services in more detail and is shown in figure 10. The last sections 4.4.8. and 4.4.9., which are presented in figure 11, describe the Netherlands *waste disposal services* as well as *waste and sewerage undertakers*.

Non-Core Responders of the Netherlands

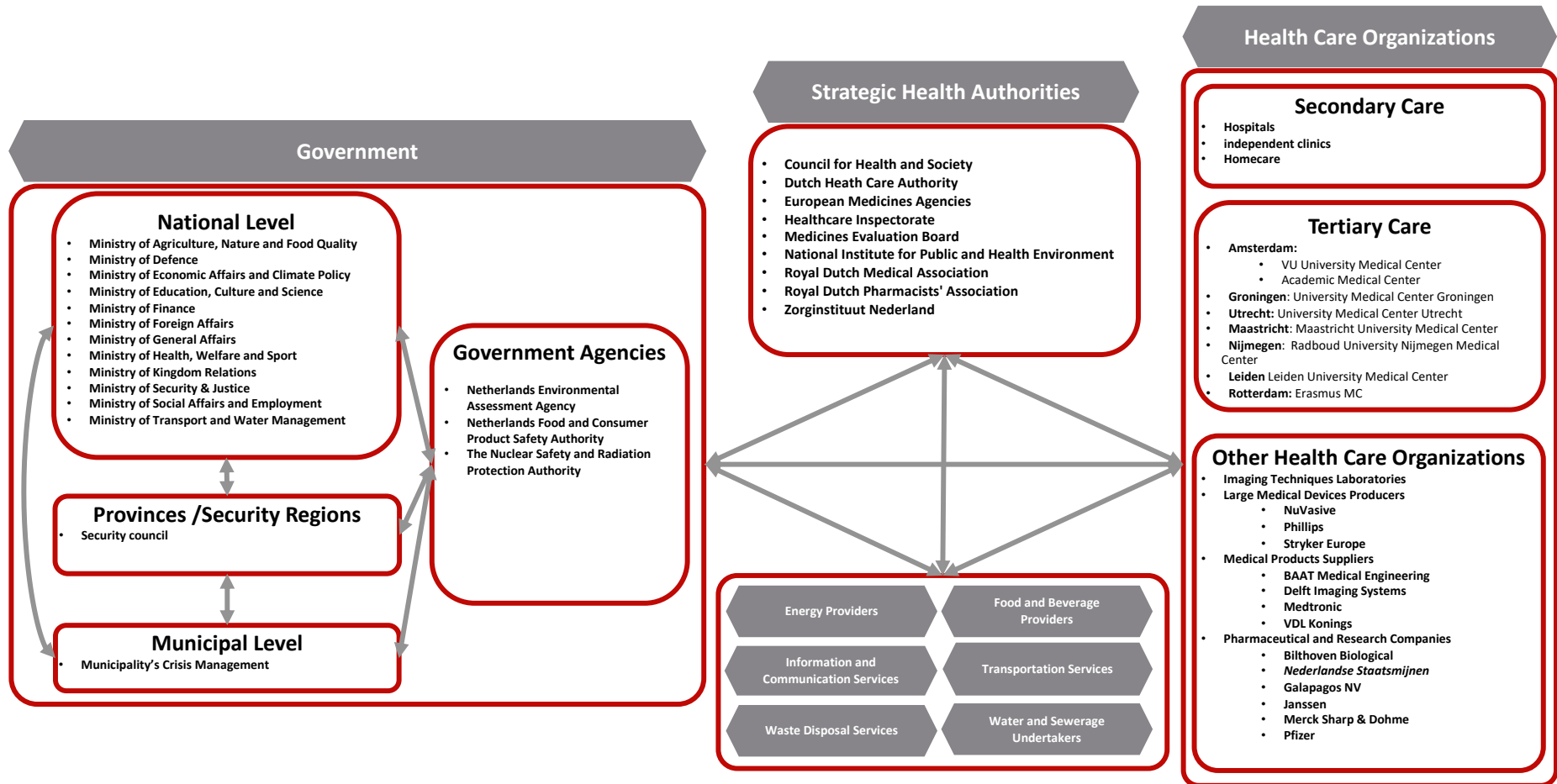


Figure 6: Non-Core Responders of the Netherlands (1/5)

3.4.1 Government

Due to the structure of the *government* in the Netherlands, each *ministry* is responsible for the protection against disasters in the country. The responsibility lies with the ministry concerned with the emergency or crisis. Each ministry must, therefore, draw up its contingency plans to ensure that procedures run smoothly. These related *ministries* are listed in figure 6 and further explained below.

The *Prime Minister (PM)* of the Netherlands is also the *Minister of General Affairs*. This *ministry* is responsible for all government policies which are not explicitly handled by other *ministries*. All policies are under the supervision of this ministry. Next to the *PM* the *Secretary-General* is the most senior *civil servant*, also responsible for the office of the *PM*. One of the most critical tasks is the coordination of *intelligence and security services*. The ministry is also responsible for the *Government Information Service (RVD)*. Among them, there are several departments to secure information among the different ministries. The *Public Information and Communications Service* (Dienst Publiek en Communicatie, *DPC*) is also in charge of informing the public and conducting public opinion polls. There are essential websites provided by the government such as Rijksoverheid.nl, Government.nl, and Rijkshuisstijl.nl which are provided by the *Ministry of General Affairs* (Government of the Netherlands 2018k).

In the event of a crisis the command structure in the Netherlands is structured bottom-up, meaning that *municipalities* are mainly responsible. The bigger the disaster, the higher up the command. The *Ministry of the Interior and Kingdom Relations* is responsible for all public administration, which includes the *central government*, the *provinces*, the *municipalities*, and *water authorities*, ensuring they are acting in accordance with national policies and are equipped and prepared for any crisis. The *BZK* also handles the *Electronic Identification and Trust Services Regulation (eIDAS)*, which is the official portal for Dutch and other European citizens, where they can access and file governmental services. This means that the ministry is responsible for storing, handling, and protecting all personal information of people living or working in the Netherlands. In addition, the *BZK* publishes the findings of the Netherlands Organisation for Applied Scientific Research (*Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek, TNO*) and the *Geological Survey of the Netherlands* (*Geologische Dienst Nederland, GDN*). Both of the agencies are conducting research, which is used by the government to improve future policies (Government of the Netherlands 2018h).

The *Ministry of Health, Welfare, and Sports* is responsible for all issues regarding public health. This includes responsibilities for the *RAV*, organized under the *Security Regions Act* (Ministry of Justice and Security 2013). The *VWS* is responsible for all issues relating to diseases control and disease prevention in the Netherlands (Government of the Netherlands 2018l). There are also other services and institutions under the supervision of the *VWS*. Those include the *Medicines Evaluation Board* (*College ter Beoordeling van Geneesmiddelen, CBG*), which decides about the authorization of any medical products in the Netherlands. The *CBG* is tasked with issuing permits and establishing policies concerning the *health care sector*. They also support the committees and relevant management boards on the government level. One of the most critical institutions under the *VWS* is the *Health Care Inspectorate* (*Inspectie Gezondheidszorg en Jeugd, IGZ*), fulfilling two essential functions. On the one hand, it is responsible for the organization in which *public health services* are offered, and on the other hand, it is also specifically responsible for the quality of the offer. In addition to that, the *VWS* also hosts the *National Institute for Public Health and the Environment* (*Rijksinstituut voor Volksgezondheid en Milieu, RIVM*), which concerns the *Ministry of Economic Affairs, Agriculture, and Innovation* as well as the *Ministry of Infrastructure and the Environment*. Other areas of the bureau are health insurance policies, mental health care, and vaccinations (Government of the Netherlands 2018l).

The *Ministry of Defence* plays a crucial role in disaster management, especially if the country is faced with a natural catastrophe. Compared to most European countries, the *military* is playing a vital role in disaster relief management in the Netherlands. This is mostly due to the military having its own *police* department and also more extensive involvement in home soil. It is one of the three main tasks of the *military*. The *military* is assigned to the *Ministry of Defence*. However, the supreme power over all the *armed forces* of the Netherlands is held by the *government*, as stated in Article 97 (1) in the Constitution of the Kingdom of the Netherlands (Constitution of the Kingdom of the Netherlands 2008). With a workforce of around 58,000, the ministry is one of the biggest employers in the Netherlands (Government of the Netherlands 2018d).

The three core tasks of the *Ministry of Defence* have been identified by the Dutch Government as: 1) defending the homeland of the Netherlands, 2) enforcing the law, national as well as international, as well as 3) the assistance in times of disaster and crises. Roughly one-third of the *armed forces* are positioned in the field of national security, including the Caribbean parts of the Kingdom of Netherlands. Their primary tasks include the supervision of airspaces, the control, and clearance of explosives, as well as coast guard duties (Ministry of Defence 2018b).

The aviation industry in the Netherlands is controlled by the *Ministry of Infrastructure and Water Management*. This is only one part of critical infrastructure in the Netherlands. Others include road safety, public transport, freight transport, and using drones. Another critical issue is bicycle safety. The Netherlands has a comparatively high number of cyclists in the country, which leads to a higher number of hazards and deaths related accidents on the road.

All hazardous substances are under the supervision of this executive branch, including fireworks. The department is responsible for risk assessment, issuing permits, and disaster management in the case of an accident or attack. Besides infrastructure, the ministries' second significant area of expertise is water management, reaching from the supervision of the *provinces* and *municipalities* in the field of water disposal to guaranteeing access to high-quality drinking water. It is furthermore responsible for all bodies of water in and surrounding the country; meaning that water transportation is another area that the ministry is charged (Government of the Netherlands 2019g).

The *Authority for Nuclear Safety and Radiation Protection* (*Autoriteit Nucleaire Veiligheid en Stralingsbescherming, ANVS*) was founded in 2015 and is tasked with ensuring nuclear safety and protecting against radiation. This includes issuing licenses and controlling license holders that are dealing with nuclear or radiation material. They are also laying down the rules of the sector. In 2017, the agency became an independent authority. However, they are still reporting to the *Ministry of Infrastructure and Environment* (Authority for Nuclear Safety and Radiation Protection 2019). Another crucial independent agency that is a part of this ministry is the *PBL*. They are tasked with conducting research, studies, and evaluation on behalf of the *government*. This includes the current environmental status as well as indicating future trends and bringing up critical social issues for discussion in order to help the government in their decision making of environmental policies (PBL 2018).

The *Ministry of Infrastructure and Water Management (Ministerie van Infrastructuur en Waterstaat, I&W)* holds the responsibility for the *Delta Programme*, which was founded in 1953 after the most significant flood in recent history. It serves the purpose of protection against flooding as well as secured access to freshwater (Delta Commissaris 2019). Another issue that this ministry is being in charge of the risk from asbestos usage and all the health-related problems stemming from it (Government of the Netherlands 2019g).

The *Ministry of Economic Affairs and Climate Policy* has a wide range of responsibilities. It is in charge of all climate-related issues and, therefore, is also responsible for the *energy sector* in the country. Thus, this ministry is responsible for all disasters related to the energy sector, as well as for hazards associated with climate warming. Since the Netherlands is especially exposed to the consequences of climate change, they are taking on the task of finding a solution between encouraging economic growth and leading the country towards a sustainable energy-producing and zero-emission goal. The *Geological Survey of the Netherlands* is providing the *Ministry of Economic Affairs and Climate Policy (Ministerie van Economische Zaken, EZK)* with necessary information regarding earthquakes resulting from gas extraction in the country. Together with the *Ministry of Finance*, this ministry oversees all issues related to import and export in the Netherlands. All space-related research is conducted under this ministry, as well as the topic of tourism (Government of the Netherlands 2018j)

All food and drink-related safety measures are under the responsibility of the *Ministry of Agriculture, Nature, and Food Quality*. This applies to ensure the hygienic work environment, as well as the quality and welfare of animals, including infectious diseases prevention of livestock. One of the most critical issues, is the research regarding the rising antibiotic resistance among people and animals (Government of the Netherlands 2018f). While an independent agency, the *Netherlands Food and Consumer Product Safety Authority (Nederlandse Voedsel- en Warenautoriteit, NVWA)*, it is operating under the *Ministry of Agriculture, Nature and Food Quality*, and consulting the VVS. The *NVWA* has three main tasks, which include supervision, risk assessment, and risk communication, but also play a significant role when incidents occur or crisis management with regards if nature or food is needed. The office of risk assessment and research is also an independent part of the *NVWA* (Netherlands Food and Consumer Safety Authority 2019). It also oversees all matters related to biotechnology in the country, from the research to ensuring nature conservation and risk reduction to the environment. This is shared with the *Ministry of*

Infrastructure and Water Management as well as the *Ministry of Health, Welfare, and Sport* (Government of the Netherlands 2019h).

The Ministry of Foreign Affairs is responsible for all matters related to international issues. They have a *Mental Health and Psychosocial Support (MHPSS) Response Team*. It is also partly accountable for soft drugs in the Netherlands, which are those that can be legally sold in the Netherlands. However, since it is not responsible for any disaster on the homeland, it plays a subordinate role for this Master Thesis (Government of the Netherlands 2018g).

Besides the ministries mentioned above, there is also the *Ministry of Education, Culture and Science*, *The Ministry of Social Affairs and Employment*, as well as the *Ministry of Finance*. While they do not perform specific tasks related to disaster management, they are, however, responsible for crisis issues pertaining to their ministry (Ministries of the Netherlands 2018b).

While the *provinces*, the *security regions*, and the *municipalities* are involved heavily in the organization of first responders in a crisis, the role of supervision and planning mostly lies with *central government* and *government agencies*. However, they are still involved and constitute an essential link between the *single municipalities* and the *central government*. The *Management Board* of the *security regions* is routinely visited by *King's Commissioner* and the *Chairman of the Water Board*. Those in addition to other crisis partners are invited to all the meetings. However, none of them have any voting powers (Ministry of Justice and Security 2013). The 25 *Chairman of the Security Regions* form the *security council*, which functions as a consultation body for all regions as well as the link to the *Ministry of Justice and Security*. Besides those responsibilities mentioned, the *Security Council* also served as the board of the *Netherlands Institute for Safety* (Ministry of Justice and Security 2013). Twice a year, the council meets with the *Minister of Security and Justice*, to discuss the priorities in crisis management (Ministry of Justice and Security 2017).

In 1909, the *Maritime Court of the Netherlands* was established as the first independent investigation commission to investigate the causes of disasters and accidents. Many other sectors followed in the coming years, such as the *Aviation Board* and the *Dutch Transport Safety Board*. While some boards hold disciplinary power, there have been no specific rules for the boundaries of their influence. To centralize the independent investigations, the *Dutch government* established the *Dutch Safety Board* in 2005 to replace temporary commissions after

specific accidents or disasters. The main focus is to improve safety in the country by independent, transparent, and professional investigations of events threatening public safety. The *Safety Board* investigates reasons for accidents and disasters to advise future policies to enhance security in the Netherlands (Dutch Safety Board 2019d).

3.4.2 Strategic Health Authorities

The Netherlands introduced the *Health Care Market Regulation Act*. This included the establishment of the *Dutch Healthcare Authority (Nederlandse Zorgautoriteit, NZa)* an independent agency under the supervision of the *Ministry of Health, Welfare, and Sport* (World Health Organization 2007). The goal of the NZa is to ensure the accessibility, affordability, and quality for all citizens in the health care sector. This includes setting regulations for providers and insurers of the industry and also functioning as an advocate to the *Ministry of Health, Welfare, and Sport*. The agency functions as an interface among *consumers, health providers, the health insurers, and the government*. In order to ensure the safe and fair contribution of health care in the Netherlands, the *NZa* is not only responding to recent trends in this sector but also proactively providing a recommendation to the stakeholders in the health care market. One of the tools used by the agency is the *Risk Analysis Model (RAM)*, which indicated which parts of the sector need intense supervision (Dutch Healthcare Authority 2019).

Besides the *NZa* the Dutch Government has another authority responsible for monitoring the quality of health care, which is the *Healthcare Inspectorate*. It is also tasked with youth care in the country. Their goal is to improve transparency and collaboration while giving the residents the most efficient and dedicated attention concerning their health (National Institute for Public Health and the Environment 2019).

Initially, an institution to fight cholera and other diseases, the *Dutch National Institute for Public Health and the Environment* has been existing since the early nineteen hundred. Besides infectious diseases, the research also included studies related to medication, water, and air pollution, as well as the exploration of nutrition. *RIVM* is also involved in the study of disaster management and awareness of new threats. The three departments of the institute consist of: 1) environment and safety, which also focuses on accidents occurring in that field 2) Infectious diseases and vaccinology, and 3) the public health and health services, which researches

regarding food safety. The three domains include thirteen specialist centers throughout the country. The executive board consists of six people and three directors of each of the three departments and is the highest decision-making body of the institute. The research is done on the behalfs of the *Dutch government*. However, this institute is also used and instructed by the *European Union* and the *United Nations* (National Institute for Public Health and the Environment 2019).

In 2015, the former *Council for Public Health and Health Care* and the *Council for Social Development* were merged to form the *Council for Health and Society* (*Raad voor Volksgezindheid en Samenleving, RVS*). Besides issues such as welfare, housing, and the provision of employment, the bureau is responsible for the changing conditions of health care in a society with rapid technological advancements. Due to these changes, the *RVS* is working on the idea of a more personalized health care for the citizens, while guiding policy and work practices. As a joint effort with the *Health Council* of the Netherlands, the *RVS* also includes the *Centre for Ethics and Health* (*Centrum voor Ethiek en Gezondheid, CEG*), which monitors and informs the *government* about developments regarding ethics in the health care sector and give recommendations regarding policies (Council for Health and Society 2019).

The *Zorginstituut Nederland (ZIN)* is an independent organization under the *VWS* responsible for assuring that all citizens of the Netherlands comply with the *Health Insurance Act* and are insured for medical care as well as long term care. It was formerly known as the *Health Care Council of the Netherlands* until 2013. It is also responsible for establishing which medical benefits are included in the primary health insurance package. The *ZIN* is further tasked with the contribution of funds available for the health packages or not and the division among the insurers (Zorginstiut Nederland 2019).

In 1849, the *Royal Dutch Medical Association* (*Koninklijke Nederlandsche Maatschappij tot bevordering der Geneeskunst, KNMG*), an organization for Dutch *doctors*, was founded. Since 1999, smaller organizations have been integrated to form a *Federation of Medical Practitioners' Professional Associations* including: 1) the *National Association of General Practitioners*, 2) the *Association of Public Health Physicians*, 3) the *Dutch Association of Insurance Medicine*, and 4) the *Dutch Association of Medical Specialists*. The *KNMG* offers several services, such as the training and the registration of physicians, as well as assistance with legal and ethical issues that arise. *KNMG* represents more than 59,000 medical doctors

throughout the country as well as the interests of medical students. On an international level, the *KNMG* collaborates with the *Comité Permanent des Médecins Européens (CPME)*, which is the *European Committee of medical Doctors*, ensuring medical training and the high standards of medical practice throughout Europe (Comité Permanent des Médecins Européens 2019; Medicines Evaluation Board 2019).

All new medications in the Netherlands have to be approved by the *Medicines Evaluation Board (College ter Beoordeling van Geneesmiddelen, CBG)*, which also controls the safety of existing medication on the market. Since the beginning of 2019, when the *European Medicines Agency (EMA)* has moved from London to Amsterdam, due to the United Kingdom leaving the European Union, the collaboration on the European level has intensified. This includes ensuring the patient's safe and quick access to newly developed medication on the market in Europe and the Netherlands. This agency promotes the proper use of medical products that already exist to minimize treating errors and encourages the research towards new innovative medication for the future. The board itself consists of a panel of *medical doctors, pharmacists, and scientists* to ensure a balanced representation of interests. Besides this, the board is also responsible for veterinary medicinal products and a *Novel Food Unit* (Medicines Evaluation Board 2019).

In April of 2014, the *Minister of Health*, declared a change regarding the focus of pharmaceutical care, so that the attention is more directed towards the needs of the patients. In order to realize this, the *pharmacists* are more integrated into *primary and secondary health care offers*. This led to a new vision of the *Royal Dutch Pharmacists' Association (Koninklijke Nederlandse Maatschappij ter bevordering der Pharmacie, KNMP)* to focus not only on the medical products but also to establish a patient-centered approach. This should ensure that the products are safe and effective based on the individual needs of patients. While the policymaking lies with *VWS*, which together with the *RIVM* also supervises the sector of *pharmaceutical care*, the authority of dispense and care lies with the *KNMP* (Moltó-Puigmartí et al. 2018).

3.4.3 Health Care Organizations

The *secondary medical care* in the Netherlands is mostly covered by *hospitals, independent health care clinics, and home care facilities*. The system is strictly separated from the *primary health care* and can only be consulted after a referral from a *GP* or in the case of an emergency (Suijkerbuijk et al. 2018). Almost 90% of *hospitals* in the Netherlands are private, usually carried by churches and charitable institutions (Schölkopf und Pressel 2017). The number of hospitals at the moment is 89, including eight *academic hospitals* and eleven *trauma one centers* (NFU 2008; Dutch Healthcare Authority 2019).

The eight *university medical centers (UMC)*, each merged with an academic hospital, are responsible for the *tertiary health care* in the country. Besides that, the *medical centers* are focused on clinical research and innovation. Those medical centers can be inferred from figure 6 and include two in Amsterdam and the other six located in bigger cities throughout the Netherlands (NFU 2008).

With an estimate of 4,7 billion Euros in 2016, the *Medical Technology (TechMed)* market in the Netherlands only accounts for about one percent worldwide, however, it is regarded as one of the most advanced and significant hubs in the European market. The number of *TechMed* companies in the Netherlands is estimated between 500 and 700, the most prominent being *Medtronic*, which is also the largest company worldwide in the provision of medical devices. *Medtronic* is active in 150 countries worldwide and employs roughly 3,000 people in the Netherlands at one of their five locations (Medtronic 2019; KPMG 2017). In the sector of *Large Medical Device Producers*, *Philips* is the biggest producer in the Netherlands, and second largest in Europe after the German company Siemens. In 2016, Philips medical sector had a revenue of 13 billion Euros (Philips Medical 2019; KPMG 2017). Besides *Philips*, *Stryker Europe*, and *NuVasive* also hold a significant share of the medical device market and compete with international companies such as *Siemens Healthcare* (Export.gov 2019). A particular strength of the local medical technology industry lies in the area of research and development (R&D). Many medical technology companies have their origins in a research centre (GTAI 2019).

The Netherlands is one of the leading countries in the sector of life science and research organizations with over 2,500 different companies throughout the country. Annually roughly 2 billion Euros are spent towards research and development in the medical technology sector,

ranking 4th worldwide. Particular emphasis is placed on cooperation between researchers and private companies, as it is the case with the *University Medical Centre Utrecht*. The university houses the *Department of Pharmaceutical Sciences*, which carries out essential studies in the pharmaceutical field (Universiteit Utrecht 2019; Invest in Holland 2016). Many of the leading Dutch pharmaceutical and research companies have been founded by that the *government* and have only been privatized in recent years. This is the case with firms such as *Merck Sharp & Dohme B.V. (MSD)*, *Bilthoven Biologicals*, and *Nederlandse Staatsmijnen (DSM)* (MSD 2019; Bilthoven Biologicals 2019; DSM, 2019). Many other essential companies have located close to Leiden, as it is the case with *Pfizer*, the largest pharmaceutical company in the world (Pfizer 2019). The most significant life science cluster in the Netherlands is located in Leiden, South Holland, between Amsterdam and The Hague. The cluster includes biotech and pharmaceutical companies as well as academic and international research institutions, including the R&D institutes of *Leiden University*. Major pharmaceutical companies such as *Janssen* and *Galapagos* are also located here (Leiden Bio Science Park 2015).

As a result of the United Kingdom's decision to leave the European Union, the *EMA* relocated from London to Amsterdam in March of 2019. This agency is responsible for regulating the European market regarding safety measures for medicine (EMA 2017).

3.4.4 Energy Provider

This section describes the structure of *energy suppliers* in the Netherlands and provides an overview of the different stakeholders involved. Figure 7 provides an overview of the various actors.

Non-Core Responders of the Netherlands

Energy Providers

Electricity Providers

Transmission System Operator	Providers with own Networks	Electricity Producer
TenneT	- Coteq Netbeheer - Enduris B.V. - Enexis B.V. - Liander N.V. - Rendo - Stedin B.V. - Westland Infra Netbeheer B.V.	- Ectrabel - Essent / Rheinisch-Westfälisches Elektrizitätswerk - E.ON Benelux - Nuon / Vattenfall

Fuel Providers

Infrastructure	Resource
- BP Nederland - Esso - Royal Dutch Shell - Total - Tango	- Royal Dutch Shell - SBM Offshore - Vivo Energy

Gas Providers

Transmission System Operator	Distribution Network Operator	Storage Companies
N.V. Nederlandse Gasunie	- Cogas - Enduris - Enexis - Liander - Stedin - Rendo Netwerken - Westland Energy Solutions	- Eneco Gasspeicher - EnergyStock (N.V. Nederlandse Gasunie) - Etzel-Kavernenbetriebsgesellschaft - Gasopslag Bergermeer - Gas Storage OMV Etzel - Innogy Gas Storage NWE

Heating Providers

Infrastructure	Resource
- Cogas - Enduris - Enexis - Liander - Rendo Netwerken - Stedin - Westland energy solutions	- Ectrabel - Eneco - Essent - E.ON Benelux - Nuon/Vattenfall

Government

Strategic Health Authorities

Health Care Organizations

Food and Beverage Providers

Information and Communication Services

Transportation Services

Waste Disposal Services

Water and Sewerage Undertakers

Figure 7: Non-Core Responders of the Netherlands (2/5)

In 2004, the government privatized the energy market in the Netherlands, exposing the market to vigorous competition among the suppliers. The *Netherlands Consumer Agency (Autoriteit Consument & Markt, ACM)*, is responsible for the supervision of all energy suppliers, ensuring fair competition and protecting the consumer (Authority for Consumers & Markets 2019a). The former *Netherlands Competition Authority (Nederlandse Mededingingsautoriteit, NMa)* and the *Netherlands Independent Post and Telecommunications Authority* were joined in 2013 to form the *ACM*, responsible for the rules of the telecommunications, postal services, health care, and energy markets. All staff is made available by the *Ministry of Economic Affairs and Climate Policy*, which also holds the responsibility for the Dutch energy sector (Energieleveranciers 2019).

The electricity consumption of the Netherlands has been relatively stable over the last 15 years and lies around 120 billion kilowatts per hour (kWh). The supply is generated domestically as well as imported from foreign producers. The Netherlands has one of the most significant natural gas reserves in the world. However, due to safety risks, natural gas production has declined sharply in recent years, while coal consumption has simultaneously risen. This included the opening of new coal-fired power stations in 2015. At the moment, there is one nuclear energy plant in use, with an annual output of 4 billion kWh (Export Government 2019; Centraal Bureau voor de Statistiek 2018b).

Compared to other nations in Europe, the Netherlands is lagging behind regarding renewable energy. Only 10% of the energy produced in the Netherlands is renewable, although the country's closeness to the North Sea has the potential to produce more power by wind turbines (Dóci and Gotchev 2016). Due to the discovery of large deposits of natural gas on land and off the coast, the country has evolved from wind to an oil and gas nation. With an expected renewable energy share of 11.9% in 2020, the Netherlands even fails to meet the 12% target of the EU's joint 2020 target. Compared to Germany, renewables account for 13.5% of final energy consumption, targeting 20% in 2020 (Energie Zukunft 2015). However, the new cabinet has agreed to further increase the production of renewable energy to become 100% renewable in 2050. Even though several *energy suppliers* are offering customers the option to choose renewable energy (*groene stroom*), it is mostly imported from Norway, where renewable energy accounts for roughly 98% of the total energy consumption. Only a part of renewable energy is produced on home soil (Energievergelijk 2019). Wind turbines are responsible for more than half, 58% of the renewable energy generated by the Netherlands, followed by 29%

provided by biomass and almost 13% by solar panel in 2017 (Centraal Bureau voor de Statistiek 2018b).

Since 2006, electricity consumption in the Netherlands has been steady at around 120 billion kWh (Centraal Bureau voor de Statistiek 2018a). The Dutch company *TenneT* is the sole operator of the national high-voltage grid in the Netherlands. Some operators are working regionally transmitting low-voltage electricity, which means transmissions of 150kV or less. *TenneT* is also the largest of the four transmission system operators of electricity in Germany. The *Ministry of Finance* is the sole shareholder of the company and therefore controls and operates all high-voltage grids in the country. *TenneT* is the first cross-border network operator in Europe. The high-voltage grid has a length of 11,000 kilometers and employs around 725 people, responsible for 435 sub-stations (Tennet 2019).

There are seven *electricity grid operators* of low voltage electricity in the Netherlands. Those cannot be chosen by the consumer but depend on the region of the country consumers reside in. The *grid operator* is responsible for the construction, maintenance, and management of the energy network. Besides, the operator takes care of the transport of electricity and/or gas to the homes. The place of residence determines the *grid operator* responsible. The seven operators are: 1) *Coteq Netbeheer*, 2) *Enduris besloten vennootschap met beperkte aansprakelijkheid* (*Enduris B.V.*), 3) *Enexis B.V.*, 4) *Liander N.V.*, 5) *Stedin B.V.*, 6) *Westland Infra Netbeheer B.V.*, and 7) *Rendo* (Energieleveranciers 2019). Figure 8 shows the different regions of the country and the *electrical grid operators* responsible for the area.

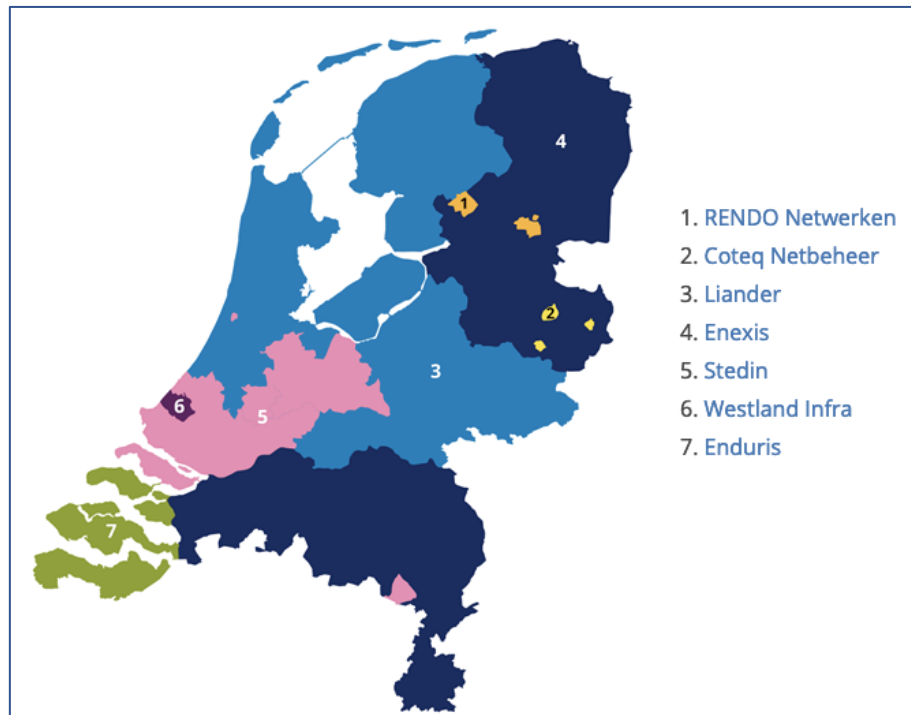


Figure 8: Electric grid operators of the Netherlands
Source: Energieleveranciers (2019)

In the Netherlands, *grid operators* have a connection and transport obligation. The *regional grid operator* is required by law to connect all users to the grid and to provide them with electricity transmission. A *local gas network operator* does not have this same obligation (Energie Overstap Discounter 2019).

The Netherlands has more than 25 *electricity producing companies*, with the leading four players being represented in figure 7. Those include 1) *Nuon*, now owned by *Vattenfall*, 2) *Essent*, now owned by *RWE*, 3) *E.ON*, and 4) *Electrabel/GDF SUEZ*. Those four companies are responsible for 55% of the country's generated electricity (Deloitte, 2019). In the province of Zeeland, the largest energy producer is the nuclear power station, located in Borssele in the Netherlands. It is the only one of previously two stations in the Netherlands, that is still in operation. In July of 2018, it was temporally shut down after a malfunction. The disruption was a non-nuclear failure, and the station went back to operation on August 3rd, 2019, after inspection and reparation. The *Nuclear Safety and Radiation Protection Authority* was informed accordingly and observed the following repairs of the reactor (EPZ 2019). The Dutch electricity grid is connected to Belgium, Germany, England, and Norway. The three markets Netherlands, Belgium, and France have been linked via the *Amsterdam Power Exchange (APX)* since January 2007 (Energieleveranciers 2019).

The Netherlands is the largest natural gas supplier in Europe and one of the largest in the world. Currently, 95% of households in the country are connected to the gas network. Forty percent of the oil fields belong to the *government* who earns billions of Euros in tax revenue every year. However, the production repeatedly caused earthquakes in the country. Most recently, there was an earthquake in January 2018 that reached a magnitude of 3.4, triggering the debate about a sharp reduction in oil production. By 2030, the *government* wants to eliminate oil drilling (ZeitOnline 2018).

There is only one *transmission system operator for gas* in the Netherlands, which is *N.V. Nederlandse Gasunie*. Similar to *TenneT* the Company is also partly responsible for Germany. The network in the Netherlands accounts for about 12,000 km, while there is roughly around 3,000 km of the gas transmission network in Germany. The company also functions as minority stakeholders in the Nord Stream pipeline between Russia and Germany. The state holds 100% of the shares in the company, by the *Ministry of Finance* as is the case with *TenneT* (Gasunie 2019).

The Netherlands has seven *gas distribution network operators* which are 1) *Cogas*, 2) *Enduris*, 3) *Enexis*, 4) *Liander*, 5) *Rendo Netwerken*, 6) *Stedin*, and 7) *Erstland energy solutions* (Gasunie transport services 2019).

Due to the changing seasons, the demand for gas in the Netherlands is distributed unevenly throughout the year and increases with the colder seasons. This is why some companies operate gas storage facilities in the country. The six most important ones are illustrated in figure 7 and are 1) *EnergyStock*, which belongs to *N.V. Nederlandse Gasunie*, 2) *Eneco, Gasspeicher*, 3) *Gasopslag Bergermeer*, 4) *Etzel-Kavernenbetriebsgesellschaft*, 5) *Innogy gas storage NWE*, and 6) *Gas Storage OMV Etzel* (Gas Storage Nederland 2019).

In the last years, the Netherlands' dependency on energy imports from other countries have risen dramatically from 25.7% in 2013 to 51.4% in 2015, since then it has fallen slightly again (Statista 2016b). This is mostly due to the shortened gas extraction since 2013, when safety concerns, following an earthquake in Groningen, put a dent in the gas production (Centraal Bureau voor de Statistiek 2018a).

In 2017, 57.2% of all fuel deliveries were diesel, 40.8% gasoline, and two percent LPG. The most significant providers in the fuel market are: 1) *Royale Dutch Shell*, 2) *BP Nederlands* 3) *Esso* 4) *Total* 5) *Tango*. *Shell* is also the *fuel provider* with most *petrol stations* at 416, followed by *Tinq* and *Texado*, which both reach lower market shares as the *fuel provider* mentioned above. In 2018, the country had 4,142 petrol stations. In 2018 there were 33,607 charging stations for electric cars in the country, 787 of which are fast-charging stations. Since 2014, there have been three stations where hydrogen-powered cars can be topped up (Bovagrai 2019). *Royal Dutch Shell* is by far the largest *fuel producer and supplier* in the Netherlands. It is an English-Dutch company with headquarters in London and administrative headquarters in The Hague (Shell 2019). *Royal Dutch Shell* is the world's largest natural gas and petroleum company and with a revenue of 396,5 billion US dollars in 2019, the third-largest company in the world and the largest in Europe (Fortune 2019). The company generates approximately 3.7 million barrels of oil a day (Shell 2019).

As already mentioned before, for about 93% of the Dutch households, gas is the primary source of heating living space as well as warm water, also referred to as low-temperature heating. Therefore, the *heating providers* are mostly overlapping with the *gas providers* in the Netherlands, as explained above. The remaining households are heated by district heating (Government of Netherlands 2016b). One of the leading players is *Nuon Vattenfall*. However, the company still offers mostly gas heating options. The few options available today for district heating are exclusively offered by the major *gas and electricity suppliers* (Nuon 2019). In addition to the environmental consequences and risks for earthquakes, the prices of heating oil have risen drastically since 2000. One thousand liters of oil cost 1,062 Euros compared to 564.20 Euros in 2000 (BMW 2018).

In January of 2016, the *Ministry of Economic Affairs* published an energy report that outlines the future transitions to sustainable energy solutions. The goal of the Netherlands is to be ultimately Co2 neutral by 2050 to meet the requirements of the *Paris Climate Treaty*. In 2012, the emission of low-temperature heating amounted to 45 million tonnes. This doesn't include high-temperature heating over 100 celsius, used in the industry sector, especially the chemical industry. Currently, in the country, 790 petajoules are needed for low-temperature heating and 670 petajoules for high-temperature heating. In order to make the step towards energy-neutral living feasible, the state has planned several approaches. In addition to hybrid heat pumps and renewable energies, such as the use of heat from industry and power stations and the residual

heat, the government also wants to increase the amount of district heating in the housing sector (Government of Netherlands 2016b).

3.4.5 Food and Beverage Providers

Access to food and drink is vital for all citizens and must be secured in the event of a disaster (Copolla 2015). The following sub-section describes the most abundant food and beverage suppliers in the Netherlands. A graphic overview is shown in figure 9.

Non-Core Responders of the Netherlands

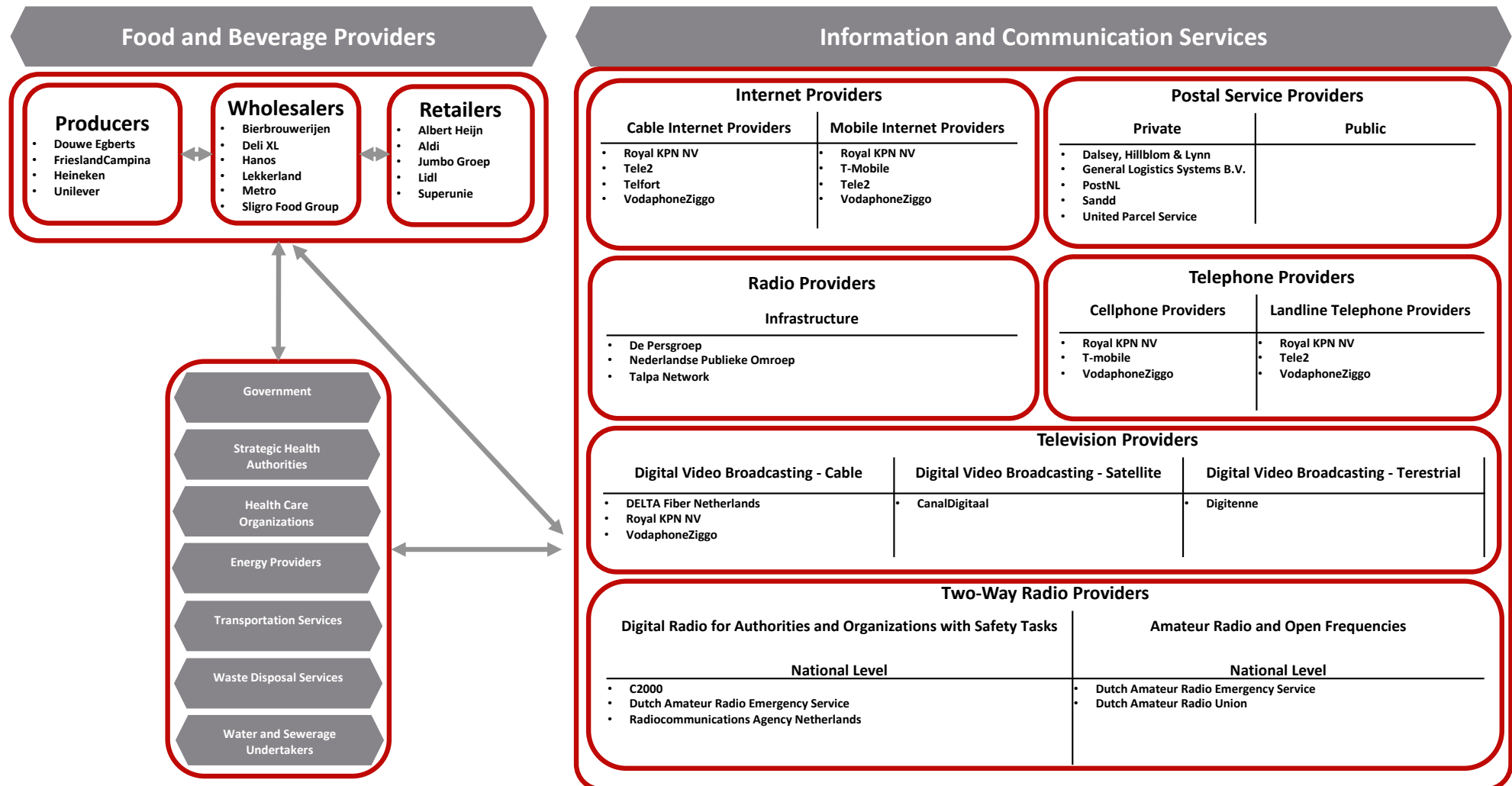


Figure 9: Non-Core Responders of the Netherlands (3/5)

In recent years, the Netherlands has become the second-largest exporter of agriculture products after the US, which has a landmass 270 times as large as the Netherlands. Besides flowers, especially tulips, the country has become known for exporting cheese, vegetables, and beer (Government of the Netherlands 2019d). Out of the 40 *largest food and beverage* companies in the world, 12 of them have research and development centers in the Netherlands (Ministry of Foreign Affairs 2018).

Besides high numbers of food exports, the Netherlands houses some of the leading *food and beverage producers*. *Unilever*, the British-Dutch Company, had the highest revenue, with a turnover of 942 million Euros in 2015. They are followed by *FrislandCampina* and *Heineken*, while the coffee producer *Douwe Egbert* occupies the fourth place (Statista 2015). With over 85,000 employees and productions side in more than 70 countries, *Heineken*, which is based in Amsterdam, is the second-largest brewery in the world (Heineken 2019). With approximately 6,195 food companies and about 140,000 employees, the food processing industry accounts for six percent of the total employment and five percent of the GDP in the Netherlands (Government of the Netherlands 2018).

The largest food wholesaler in the Netherlands is *Sligro*, with a market share of 23% in 2016. *Sligro* is followed by *Biebrouwerijen*, with 14% and *Lekkerland*, with 13% of the market share. *Deli XL*, a Belgium company and the German food wholesaler *Metro* share 11 and 10% in this sector, respectively ahead of *Hanos*, accounting for seven percent of the market in the wholesale food industry (Statista 2016a).

On July 24th of 2016, the former Dutch food retailer *Ahold* and former Belgian retailer *Delhaize* Group merged to form *Ahold Delhaize*, one of the largest retailers in the world (Ahold Delhaize, 2019). With their supermarket chains *Albert Heijn*, they have achieved a market share of 34.7% in 2018. Combined with *Superunie*, which includes amongst other retailers like *Plus Holding*, *Coop Holding*, and *Deen Supermarkten* and has a market share of 28.6%, the two companies control more than 60% of the market. The *Jumbo Group* comes in at the third place with a 19.1% share in the retail food market. The two German discount retailers *Lidl* and *Aldi Holding* account for 10.9% and 6.8% of the market, respectively. The turnover for the market was estimated at 39 billion Euros in 2018 (United States Department of Agriculture 2018). Many international food and drink producers have production sites in the Netherlands, which include *Coca Cola*, *Pepsico*, *Heinz*, *Nestle*, and *Mondelez* (Statista 2015).

In 2000, the country vowed to make its food production and agricultural sector more sustainable with the goal to double the production value while using only half of the resources previously needed. This resulted in the reduction of water dependency by 90% and the near elimination of chemical pesticides. Following this success, the use of antibiotics in livestock has been reduced by 60% since the year 2009. This performance is partly attained through the work at the *Wageningen University & Research*, one of the world's top-ranking research institutions regarding agriculture. Developments that were invented here put the Netherlands on the forefront of the agricultural market and developed some of the most efficient agricultural technologies, like drones and machinery, to check the water management and soil nutrition (National Geographic 2017). It is estimated that sustainable food will be the fastest-growing market in the Dutch food sector in 2019 (United States Department of Agriculture 2018). Many other companies in the Netherlands are specialized in the research of food and health. The Dutch Institute for food research (Nederlands Instituut voor Zuivelonderzoek, NIZO) is located in and specializes in the study of food technologies (NIZO 2019)

3.4.6 Information and Communication Service

In the event of a crisis or catastrophic situation in the country, *information and communication service providers* play an essential role. It can be vital to inform the responsible authorities and rescue forces in an emergency (Coppola 2015). A network failure also demonstrated this in Austria in October 2019, when the backup system failed to work and resulted in the police, fire brigade, and rescue services being unavailable by phone for several hours (ORF 2019). All relevant *information and communication service providers* in the Netherlands can be found in figure 9.

In 2018, 98% of the Dutch households were equipped with *internet access*. In comparison, the number of homes in Austria in the same year was 89% (Statista 2018a). The average in Europe was 87% in 2017, putting the Netherlands at the top of the European Union (Centraal Bureau voor de Statistiek 2018c)

By the densely populated country, the provision of high-speed internet is usually cheaper than in many other countries in Europe. Almost every household is connected to a Digital Subscriber Line (DSL) or cable connection, while a fibre connection is only found in about 30% of Dutch households. The two largest internet providers are *VodafoneZiggo*, who own most of the cable network and *Royal KPN NV (Koninklijke KPN NV, KPN)*, who are operating almost the whole DSL network. While the *KPN* had opened its network to competitors as well, *VodafoneZiggo* used to be closed of cable network not available for the use of competitors (Prijsvergelijken 2019). In October of 2018, the *ACM* ruled that *VodafoneZiggo* also have to open up its cable networks to competitors in order to control the almost unlimited market power of *KPN* and *VodafoneZiggo* (Authority for Consumers & Markets 2018). With an average internet speed of 82 Mbps, Dutch citizens enjoy one of the top 10 fastest internet connections in the world (Centraal Bureau voor de Statistiek 2018c). At the beginning of 2011, *KPN* announced that it would block or price particular applications concerning mobile data use, prompting the *Independent Post and Telecommunication Authority* and the *Authority for Consumers & Markets* to start investigating. This resulted in the Netherlands becoming one of the first nations to implement net neutrality and remains until today one of the few countries that have stricter rules than the European Union demands (Van Eijk 2014).

The Netherlands do not have a public postal service since *PostNL* was privatized in 1989. However, *PostNL* is the largest provider and is tasked by the government to operate the *Universal Postal Service* (PostNL 2019a; The Hague international Centre 2019). Besides the Netherlands, *PostNL* also operates in Belgium, Germany, Italy, and the United Kingdom, where it is known under its previous name of *Thomas Nationwide Transport N.V. (TNT)*. 38,000 employees are currently working for this company (PostNL 2019b). The second-largest postal service in the Netherlands is *Sandd*, with a continually increasing market share and the biggest competitor to *PostNL* (Post and Parcel 2007). There are also some international specialized parcel delivery companies in the Dutch market, such as *United Parcel Service (UPS)*, *Dalsey, Hillblom & Lynn (DHL)*, and *General Logistics Systems B.V. (GLS)* (The Hague international Centre 2019). Responsible for the regulation and competition oversight is the *AMC*, which ruled at the beginning of September of 2019, that an aspired merger of *PostNL* and *Sandd* would be decreasing competition in the market. It, therefore, published its decision not to grant a license for the acquisition of *Sandd* by *PostNL* (Authority for Consumers & Markets 2019b). However, shortly after the *Deputy Minister of Economic Affairs* announced the approval of the merger of the two giant *postal service providers* which is expected to be completed by early 2020 (Post and Parcel 2019; Sandd 2019).

There are hundreds of different radio channels available in the Netherlands. In 2019, it was reported that 59% of people living in the Netherlands listened to the radio daily. The average listening time was 155 minutes per day. On an average day, about 63.1% of the Dutch were reached by radio stations. The age group of 65 years and older has the highest radio listening time (Statista 2019b). There are three leading radio providers 1) *Nederlandse Publieke Omroep (NPO)*, 2) *Talpa Network*, and 3) *De Persgroep*. The *Nederlandse Publieke Omroep* is the public service broadcasting provider of the Netherlands and offers the radio channels *NPO Radio 1*, *NPO Radio 2*, *NPO Radio 3FM*, *NPO Radio 4*, *NPO Radio 5*, *FunX* and *Beste van Vlaanderen en Nederland* which offer different programs (NPO 2019). The *Media Act* states that public service broadcasting providers have provided a varied media selection, including information, culture, and education. Time must be made available for the *government*, the *political parties* as well as *minorities* (Rijksoverheid 2019). The *Talpa Network's* radio station 538 is one of the leading stations in the Netherlands with the highest audience reach in 2018. It is mostly designated to a younger audience. *Qmusic* is the largest commercial radio channel of the *De Persgroep* (Statista 2019b). Should the *government* issue any emergency warning

through the radio, it will be broadcasted through the designated regional broadcast channels (Ministry of Justice and Security 2016).

There are three providers with their own physical mobile telephone network. Besides the two companies that cover most of the landline internet connections, *KPN (Koninglijke KPN N.V.)* and *VodafoneZiggo*, *T-Mobile* is the third provider with its own mobile phone network on the Dutch market. *Tele2* became the fourth provider introducing their network, before being acquired by *T-Mobile* shortly after in 2017. All other providers have to use one of those three networks to offer their services to customers (Prijsvergelijken 2019). In terms of mobile internet, 87% used it in 2017 in the Netherlands. Together with Sweden, the country was therefore ranked first in Europe. Both countries had a very high use of smartphones, with 84% of citizens in possession of one, compared to the European average of 63% (Centraal Bureau voor de Statistiek 2018c). The Netherlands continually shows good results when it comes to fast internet and the availability of 4G. They ranked 2nd in 2018 regarding mobile download speed, with the availability of 89,64% of the country receiving 4G internet (Open Signal 2018). To stay ahead, the Dutch government plans to offer 4G by 2020 initially in Amsterdam and surrounding areas. However, it will most likely not before 2022, for the vast majority of Dutch citizens to be connected to 5G (Nos 2017). Before *KPN* was privatized in 1998, it was the sole operator of all communication networks. It was founded by the Dutch Government in 1893. Due to this history, *KPN* owns all of the *fixed telephone landline networks* in the Netherlands to this day. It is also the largest operator with a market share of more than 50%. It is closely followed by *VodafoneZiggo*, while *Tele2* only reaches a market share of five percent (KPN 2019; Statista 2019c).

By the end of 2012, the Dutch government introduced the *NL-Alert*, a system in which citizens receive a warning on their cell phone, in the case of a life or health-threatening crisis. This includes gas leaks, terror attacks, emergency weather warnings, and extensive fires. Most cellphones sold recently, with the exception of *iPhones*, have the alert pre-installed. The message also gives instructions for further conduct. The system is tested twice a year to ensure high quality and steady functionality (Crisis.nl 2019b).

Most of the households in the Netherlands, with more than 90% receive either *cable* or *satellite television (TV)*, with a wide range of local and international channels. With the exception of children's TV shows, English films, and television shows are seldom synchronized but rather

streamed with Dutch subtitles (CIA 2018). The Netherlands switched from an analog to an all-digital broadcasting system in 2006 (Angloinfo 2019). Besides *cable* and *satellite* connections, the Netherlands also offers *terrestrial* and *IPTV* options for *digital video broadcasting*. The largest cable providers are *VodaphoneZiggo*, *KPN*, and the *Delta Fiber Netherlands*, which provides *cable TV* under the subsidiary *Caiway* (VodaphoneZiggo 2019; KPN 2019, Delta Fiber 2019). Dutch people can receive about 300 digital TV channels via the provider *CanalDigitaal*. It is by far the largest provider of satellite television in the Netherlands. Terrestrial broadcasting can be received by *Digitenne* antenna, which is either connected directly to the TV or a receiver modem. By the signal, amplifier signals can be obtained even across a long distance. The necessary equipment can be purchased from *KPN* (CanalDigitaal 2019; Digitenne 2019).

Since 2004, all emergency service stakeholders, as well as the *Ministry of Defence*, including all *military organizations*, are using the digital communication system *C2000*. This applies to daily operations and significant incidents when communication among the services and especially with the control center becomes necessary. The system can be used by a large number of users simultaneously and cannot be tapped by outside sources. The communication is facilitated by 600 radio masts throughout the Netherlands (Government of the Netherlands 2019f).

The non-profit organization *Dutch Amateur Radio Emergency Service (DARES)*, plays an essential role in the communication process during a crisis. *DARES* is licensed by the central *government* to support professional *emergency services*, *municipality*, and other *civil organizations* in large-scale incidents by providing radio communication. It is headed by expert radio amateurs with the necessary technical resources. The organization is critical in delivering, especially municipalities, with the required means of radio communication if needed (DARES 2019).

One of the providers of digital *Terrestrial Trunked Radio (TETRA)* applicable to *C2000* is *Sepura*. The Dutch Royal *military police* mostly use the company's radios since 2002. The *military police* are, among other things, tasked with securing airports, where communication is crucial (Sepura 2019).

The overall responsibility for radio frequency space lies with the *radiocommunications Agency Netherlands*, established under the *Ministry of Economic Affairs and Climate Policy*. They allocate and monitor all radio frequencies and are tasked with all wired and wireless communication in the Netherlands. Foreign assistance can request access to radiofrequency through the *NCC*. The coordination of all radio frequencies lies by the *LOCC* and the *Radiocommunications Agency Netherlands*. In critical situations, the communication system *C2000171* can be activated for aid services (Agentschap Telecom 2019).

To ensure that all media outlets comply with the *Media Act* the *Commissariaat voor de Media* supervises all radio and television stations, as well as video streaming and on-demand providers (Commissariaat voor de Media 2019).

3.4.7 Transportation Services

Figure 10 shows the Transportation Services of the Netherlands. Those include 1) *Airport Operators* 2) *Railway Operators* 3) *Port Operators* 4) *Road Operators* and 5) *other Transport Operator*

Non-Core Responders of the Netherlands

Transportation Services

Airport Operators

Main Civilian Airports	Operator
- Amsterdam Airport Schiphol - Eindhoven Airport - Groningen Airport Eelde - Maastricht Aachen Airport - Rotterdam The Hague Airport	- Royal Schiphol Group - Eindhoven Airport N.V. - Groningen Airport Eelde NV - Maastricht Aachen Airport BV
Main Military Airports	Operator
- Air Operation Control Station Nieuw-Milligen - Gilze-Rijen Air Base - Leeuwarden Air Base - Volkel Air base - Woensdrecht Air Base	Royal Netherlands Air Force

Port Operators

Body of Water	Main Port	Operator
- IJsselmeer - Maas - Markermeer - North Sea - Rhine - Scheidt	- Port of Amsterdam - Port of Rotterdam - Port of Zeeland - Port of Dordrecht - Port of Moerdijk - Scheveningen Port	- Port of Amsterdam - Havenbedrijf Rotterdam N.V. - Zeeland Seaports - Port of Amsterdam - Moerdijk Port Authority - Port of Scheveningen

Railway Operators

Infrastructure	Resource	
National Level	National Level	Provincial Level
ProRail	- Deutsche Bahn Regio - Nederlandse Spoorwegen - NS International	- Arriva Nederlandse - Connexxion - Keolis Nederlandse - Qbuzz

Road Providers

Road Type	Operator
- Through Roads - Distributor Roads - Access Roads	- Provinces - Rijkswaterstaat - Waterschappen

Other Transport Operators

Private			Public
Bus Services	Patient Transport	Taxi Services	Passenger Transport Executives
- Arriva - Connexxion - Flixbus - Qbuzz - Syntus	- BAS Ambulance Service - Dutch Medical Group - Netherlands Red Cross	- Connexxion - Uber	- Gemeente Vervoerbedrijf Amsterdam - Rotterdamse Elektrische Tram - Haagsche Tramweg Maatschappij Personenvervoer NV - Ferries - Watertaxis

Government

Strategic Health Authorities

Health Care Organizations

Energy Providers

Food and Beverage Providers

Information and Communication Services

Waste Disposal Services

Water and Sewerage Undertakers

Figure 10: Non-Core Responders of the Netherlands (4/5)

As mentioned before, the Netherlands is a rather small country located in western Europe, the two essential points for the movement of public goods are the *Amsterdam Airport Schiphol* and the *Port of Rotterdam*. As the largest Port in Europe and one of the largest in the world, the Port of Rotterdam is a crucial contact point for many other European countries as well (CIA 2018). This section describes the different transportations services and operators in detail.

There are 29 Dutch airports located across the country, which are used for civil aviation (CIA 2018). Some of the smaller airports, such as *Maldens Vlak Glider Field*, are only suitable for glider planes without a concrete landing strip and are therefore not included in the number of official airports. At the moment, there are six *military airports* and 36 *helicopter landing stations*, which are mainly used for medical transports. Nine of these landing stations are heliports, while the rest are stationed at hospitals. There are five *military airports*, as well as the *Eindhoven Airport*, which functions as a commercial and *military airport* (Our Airports 2019). In 2018, 602,097 cross-country and 54,757 local flights have been registered in the Netherlands. The term “domestic flights” refers to flights that took off and landed at the same airport, while cross-country flights have a different origin from the departure airport (CIA 2018). The most important airport in the Netherlands is *Amsterdam Airport Schiphol*. From the 79,606,191 total passengers in 2018, 70,956,594 flew in and out of Amsterdam (Central Bureau voor de Statistiek 2019b).

Amsterdam Airport Schiphol is, measured by total passenger transport, the third busiest airport in Europe and 11th one in the world. *London Heathrow*, while still part of the European Union, has the highest number of passengers in Europe, followed by *Charles de Gaulle* in Paris. This mostly results from the merger of *France Air* and *Royal Aviation Company (Koninklijke Luchtvaart Maatschappij N.V., KLM)* in 2004 (International Airport Review, 2019). Most passengers departing *Amsterdam Airport Schiphol* were transported to and from *Charles de Gaulle* in Paris (Central Bureau voor de Statistiek 2019c). There are 497 flights per day departing and arriving at the *Amsterdam Airport Schiphol*, serving 322 different destinations around the globe (Ministry of Foreign Affairs 2018). Other civilian airports include *Rotterdam The Hague Airport*, *Eindhoven Airport*, *Maastricht Aachen Airport*, and *Groningen Airport Eelde* (Central Bureau voor de Statistiek 2019b). With *Amsterdam Airport Schiphol*, *Rotterdam The Hague Airport* and the majority shares in Eindhoven, the *Schiphol Group* is the largest operator of Airports in the Netherlands (Schiphol Group 2019). The *Groningen Airport Eelde* and *Maastricht Aachen Airport* are operated locally (Groningen Airport 2019) (Maastricht

Aachen Airport 2019). Headquartered at *Amsterdam Schiphol Airport*, the *air traffic control of the Netherlands (Luchtverkeersleiding Nederland, LVNL)* is responsible for the management of all Dutch civil airspace (Luchtverkeersleiding Nederland 2019).

KLM, including the regional airline *KLM Cityhopper*, is the largest airline in the Netherlands. Since the merger with *Air France* in 2004, it has operated under *Air France-KLM*, resulting in the privatization of *Air France*. *Transavia*, a charter airline, is the second-largest operator and a subsidiary of *Air France-KLM*. In 2008 the largest cargo airline in the Netherlands, *Martinair*, became another subsidiary of *Air France-KLM* (Air France-KLM, 2019). Additional dutch charter Airlines include *AIS Airline Netherlands*, *Dutch Dakota Association (DDA)*, *Touristik Union International Airlines (TUI)*, and *CHC Airways* (Airline History 2019). In 2018 the 1,832,808 tons of cargo in the Netherlands were shipped almost exclusively through *Amsterdam Airport Schiphol*, including all air mail, which accounted for an additional 21,486 tons in 2018 (Central Bureau voor de Statistiek 2019a).

The *Royal Netherlands Air Force* operates all *military airports* by the military air traffic control, the *Air Operations Control Station in Nieuw Milligen (Air Operations Control Station te Nieuw Milligen, AOCS NM)*. The *AOCS NM* is also heavily involved in the overall supervision of air space above the Netherlands and cooperates closely with the *LVNL*. They monitor and secure the Dutch part of the NATO airspace and alternate with Belgium to supervise the airspace of the Benelux countries. Since 2018, the *LVNL* and the *AOCS NM* have shared the task of controlling the airspace of *Schiphol-East*. Further steps to integrating the military air traffic control into the civilian air control are planned in the future. In the event of extensive fires or other disasters, the *Royal Netherlands air force* is tasked with the operation of helicopters to extinguish fire or transport casualties. In cooperation with the police and the *Public Prosecution Service*, it lends combat helicopter support to the police force, in cases of criminal investigations (Ministry of Defence 2018d; 2019e). All transport aircrafts of the *Royal Netherlands Air Force* are stationed at the *Eindhoven Air Base*, from where all military air transport is provided. Therefore, serving as the departure and arrival point for all military personnel deployed to missions abroad. Aircrafts stationed in Eindhoven include two McDonnell Douglas DC-10, a tanker aircraft, four *C-130* aircraft, and the *Gulfstream IV*, which is used for senior officials and coordination. The air force personnel also support the *Eindhoven civil airport* with the around the clock protection of security measures.

There are two major international military air transport cooperations located at Eindhoven, the *Movement Coordination Centre Europe (MCCE)*, and the *European Air Transport Command (EATC)*. The *MCCE* is tasked with the coordination of strategic military transports of the 27 NATO countries as well as the EU members of the *MCCE*. Besides the Netherlands, the *EATC* include the member countries of Belgium, Germany, France, Luxembourg, and Spain and is designated for all military air transport. The *Royal Netherlands Air Force Military School*, as well as the Logistic centre, are both located at the *Woensdrecht Air Base*. There are 13 *Pilatus PC-7 Turbo Trainer* Aircraft in use for training purposes. The Netherlands have 67 helicopters, which are located at the *Gilze-Rijen Air Base*, if not used on international missions. Some of those helicopters can be utilized for firefighting in extreme situations. The 213 multi-functional fighters F-16 are stationed at the *Leeuwarden Air Base* as well as the *Volker Air Base*. The *Coast Guard* has two Dornier 228-212 stationed at the *Schiphol Airport*. As a replacement for the F-16, the Netherlands plan to obtain 27 F-35 multimission fighters. They have already bought two, which are currently stationed in the USA and used for extensive testing and training (Ministry of Defence 2019e; Ministry of Defence 2019f).

The *Dutch railway system* is operated by *ProRail B.V.*, which is responsible for the construction, maintenance and management of the railroads throughout the country. Therefore, the safety of all operations, passenger travel, as well as cargo safety, is maintained under their care (ProRail 2019). With a Railway System of 3,058 km, three-quarters of which has been electrified, it has a well-developed network (CIA 2018). The three leading players in the rail network are *ProRail*, the government, and the other carriers. Every year *ProRail* commits to present a management plan, which has to be approved by the *Ministry of Infrastructure and Water Management* and also determines the providers allowed to operate on the leading railway network. The Government of the Netherlands is the sole shareholder of *ProRail BV*. The legal framework for the management of the railroads is laid down in the *Railway Act of 2003* (ProRail 2019). The *Railway Act* states the different roles and therefore distinguishes between the management of the rail network, which *ProRail* provides, and the rail transport activities.

The largest provider of train services in the Netherlands is the state-owned company *Dutch Railways (Nederlandse Spoorwegen, NS)*. It transports more than one million passengers every day and owns approximately 3,000 railway cars. The company also operates in other European countries such as Great Britain and Germany, under the *NS* subsidiary *Abellio* (NS 2019). *Keolis Nederland*, originally named *Syntus*, was set up by *NS*, *Connexxion*, and *Keolis* and is

now wholly owned by the French organization *Keolis*. They have 20 trains and are operating 136 km of the railroad in the Netherlands, specifically in the west of the country around the city of Zwolle (Keolis 2019). Over 30 different cargo companies use the Dutch railway system for cargo transport. The largest organization is the German *Deutsche Bahn* subsidiary *Railion*. Others include *Rail4Chem*, *Cargo*, and *Husa Transportation Group (HGK)* (NS 2019).

The safety of all rail and road transport is supervised by the inspectorate of the government, specifically by the *Ministry of Infrastructure and Water Management* (NS 2019). Due to the dense rail infrastructure and stable prices, the Netherlands do not have a high need for long-distance bus operators. There are some international companies such as *Flixbus* operating long-distance bus routes throughout the country (Ministry of Infrastructure and Water Management 2019).

Of the 41,543 square km of the Dutch country, 7,650 square km are water, accounting for almost 18,5% of the total area. The Netherlands has a coastline of 451 km and is situated at the *North Sea* (CIA 2018). The most significant two lakes are the *Ijsselmeer* and the *Markermeer*. The *Ijsselmeer* came into being when the Netherlands constructed the 29 km long closing dike between De Oever and Makkum. In the middle of the former *Zuidersee* a second dike was built between Enkhuizen and Lelystad, which now forms the border to the *Markermeer*. The country has several rivers and canals which lead through the country and are partly used for transporting goods, while some are for recreational boat trips only. The Netherlands is, therefore, easily accessible by water in the event of a disaster and you can also reach inland areas via the main rivers (Water ways 2019). The three most important rivers are the *Rhine*, *Maas* or *Meuse*, and the *Scheldt*. 6,237 km of the waterways are navigable by ships, which can carry cargo up to 50 tons (CIA 2018).

The Netherlands has a total of 24 ports, including the 3rd largest port in the world and most important one in Europe, the *Port of Rotterdam*. It is not only an essential location for Dutch trade but also crucial for the import and export of many other European countries, especially the neighbouring country Germany. Other countries in Europe can be reached by the *Meuse* and the *Rhine*. The *Port of Rotterdam* and the *Amsterdam Airport Schiphol* are only roughly an hour's drive apart from each other. Those are connecting the two most important points of trade. In 2016, there were 461.2 million tons of shipment in approximately 12.4 million containers going through the *Port of Rotterdam*, which amounted to 3.1% of the Dutch GDP (Ministry of

Foreign Affairs 2018; World Port Source 2019). Other principal harbours include the *Port of Amsterdam* and the *Port of Zeeland*, which consist of the two former independent ports, the *Port of Terneuzen* and the *Port of Vlissingen*. The second-largest port in the Netherlands, the *Port of Amsterdam*, handles approximately 390,000 twenty-foot Equivalent units (TEU) of cargo every year, while there are about 62 million tons of cargo going through the *Zeeland Seaport*. Besides, there are several smaller ports, the *Port of Moerdijk*, *Port Dordrecht*, and the *Scheveningen Port*, which are partly connected to major rivers or the *North Sea* (World Port Sources 2019).

The *Havenbedrijf Rotterdam N.V.* is a public company that manages and operates the *Port of Rotterdam*. The main shareholder of the company is the *municipality of Rotterdam*, while the Dutch State also holds some shares. The *Harbour Master's Division* is responsible for all safety issues at the port, including inspections, port security, the port health authority, and controls all shipments by their International Ship and Port Facility Security Code (ISPS) code (Port of Rotterdam 2019). Like all other ports, the *Port of Amsterdam* is managed by a company headed by the harbour master, which is wholly owned by the *City of Amsterdam* (Port of Amsterdam 2019). The *Zeeland Port* is operated by the *Zeeland Seaport*, a government public company with its shareholder being the Province of Zeeland and three municipalities that are connected to the port (Zeeland Seaport 2019). More than half of all freight is transported through the country by ships passing through the ports in the Netherlands, making the country dependable on seagoing vessels. The responsible ministry in the Dutch government is the *Ministry of Infrastructure and Water Management* (Government of the Netherlands 2019g).

The Netherlands have the fifth-highest road density in the world, much higher than any other European neighbour except Belgium (Knoema, 2019). The total amount of roadway equals 138.124 km, of which 3.654 km exist are expressways (CIA 2018). Roads are classified into three different categories, the 1) *through roads*, 2) *distributor roads*, and 3) *access roads*. The *through roads* are located outside urban areas and are streets with a constant flow, including *trunk roads* (*Autoweg*) and *motorways* (*Autosnelweg*). *Distributor roads* are set up for continuous traffic flow with occasional intersections and can be found in urban and rural areas, including all provincial and municipalities roads. Residential areas are usually connected to *access roads* (Institute for Road Safety Research 2019). All national roads are under the supervision of the *Directorate-General for Public Works and Water Management* (*Rijkswaterstaat*) within the *Ministry of Infrastructure and Water Management* while the other

roads are managed by either the provinces or by one of the 21 *Water Boards (Waterschappen)* (Government of the Netherlands 2019i). The Netherlands have the third-lowest death toll from traffic accidents worldwide (Ministry of Foreign Affairs 2018). All main roads, as well as the main waterways, are under the supervision of the *Ministry of Infrastructure and Water Management*. Besides the management, they are in control of maintenance and the necessary inspections (Government of the Netherlands 2019i). In November 2019, the Dutch government decided to introduce a general speed limit of 100km/h on motorways. However, this only applies from 6.00 am to 7.00 pm. At night, the upper limit of 130km/h is valid (SpiegelOnline 2019).

The largest private rail operator is the UK company *Arriva*, which has 146 trains as well as 1,230 busses operating throughout the country (Arriva 2019). *Connexxions* has 1,662 buses in use for public transportation. Furthermore, the company has almost 200 electric buses, 43 trolleybuses, and six autonomous shuttles, at some of the locations under the name of *Breng* or *Hermes* (Connexxions 2019). The company *Keolis* operates around 800 public buses and 25 trains. The lines of the buses are attached to the main rail transport route. *Keolis* is providing their services under the name *Syntas*. This company is additionally active in *Gelderland*, *Overijssel*, *Utrecht*, and *Twente*, as well as operates under the name *allGo* and *KeolisBlauwnet* (Keolis 2019). *Qbuzz*, which was wholly acquired by *Nederlandse Spoorwegen* and operates buses and trams (Qbuzz 2019).

The ambulance service is strictly organized under the *Regionale Ambulancevoorzieningen (RAV)*, as described in sub-section 3.4.3. However, the government uses private ambulance providers if needed. The largest private organization in the Netherlands under the *RAV* is *BAS ambulance service* (Ambulancezorg 2019b; BAS ambulance services 2018). The second important ambulance service for private services is the *Netherlands Red Cross (Rode Kruis)* (2019). Specialized in various forms of medical transport, the *Dutch Medical Group* operates under five different service organizations. They have taxis for medical transport under *Medic Taxi*, as well as air ambulance services under the *Dutch air ambulance*. The organization *Broeder de Vries* is specialized in international repatriation either back to the Netherlands or for foreign visitors to their home country. They additionally offer medical support for significant events or company activities (Dutch Medical Group 2019).

There are *several taxi* providers in the Netherlands. One of the largest is *Connexxions*, with almost 2,500 taxis throughout the country (Connexxions 2019). Most cities have their own *taxi providers*. Prices are set to a limit but can still vary depending on the route and the distance of the pickup. The largest number of taxis can be found in Amsterdam, with multiple taxi ranks around the city, the number has increased after the market was deregulated in 2000. Before that, there was a limited number of licences issued for each town (Holland 2019b). The service provider *Uber* is operating in all of the five major Dutch cities - 1) Amsterdam, 2) Rotterdam, 3) The Hague, 4) Eindhoven, and 5) Utrecht. *Amsterdam Schiphol Airport* is also connected to the *Uber* network, connecting the third largest airport in Europe with the largest city in the country. In 2018, the Uber App was downloaded more than 500,000 times in the Netherlands, more than in any year before (Statista 2019d). The ride-hailing services are mostly requested by the age group of 20 to 39, with a distribution of 59 percent, while 31% of the users are between 40 and 64. Seven percent are older, and only three percent are under ten years old (Statista 2019e). *Taxi drivers* in the Netherlands are required to obtain a license, which has to be placed, visible for the passengers to see as well as a taxi driver's diploma. The permit can be obtained from *Keuringsinstituut voor Waterleiding Artikelen*, which processes applications for formal permits in the transportation sector on the behalf of the *Minister of Infrastructure and Water Management*. A diploma for *taxi drivers* requires several exams and is issued by the *Central Office for Motor Vehicle Driver Testing (Centraal Bureau Rijvaardigheidsbewijzen)* (Government information for entrepreneurs 2019).

Every major city in the Netherlands has its own *public transportation system*. Due to the densely populated country, almost all Dutch citizens live in a two kilometres radius of a public transport stop (Ministry of Foreign Affairs 2018). There are five main private *regional bus and rail public transport concessions* operating throughout the countries. Those companies include: 1) *Connexxions*, 2) *Arriva*, 3) *Syntus*, 4) *Veolia*, and 5) *QBuzz*. They are competing for public transportation throughout the state with the exceptions of Amsterdam, Rotterdam, and The Hague, where *Amsterdam Municipal Transport Company (Gemeente Vervoerbedrijf Amsterdam, GVB)*, *Rotterdam Electric Tram (Rotterdamse Elektrische Tram, RET)*, and *Haagsche Tramweg Maatschappij Personenvervoer NV (HTM)* provide the local transport. Those three cities have their own public providers, which is run by the government and are the only cities that operate a metro system. The largest one is found in The Hague. While the central government is responsible for providing the infrastructure and sets a fixed budget, responsibilities lie with the regional public transport authorities. The public transport policy is

outlined in the Mobiliteitsaanpak from 2008 by the *Ministry of Infrastructure and Water Management* (Ministry of Infrastructure and Water Management 2010). There are several ferry and *water taxi companies* in the Netherlands. In Amsterdam, the use of the *ferries* is free of charge and is operated by the local *GVB*. Water taxis are available in Rotterdam and Amsterdam (Holland 2019b; GVB 2019).

The Dutch people have been known for their extensive *cycling*. While there are 4.5 million trips by bus, tram, and metro and 1 million by train, Dutch citizens make about 14.5 million trips by bicycle every day (Ministry of Infrastructure and Water Management 2019). On average, residents' cycle about 1,000 kilometres a year. There are up to 35,000 kilometres of cycling infrastructure and an additional 55,000 kilometres of shared road space (Ministry of Foreign Affairs 2018).

3.4.8 Waste Disposal Service

The following sub-section outlines the *Waste Disposal Services* in the Netherlands and their related service provider. Figure 11 gives an overview of the main players.

Non-Core Responders of the Netherlands

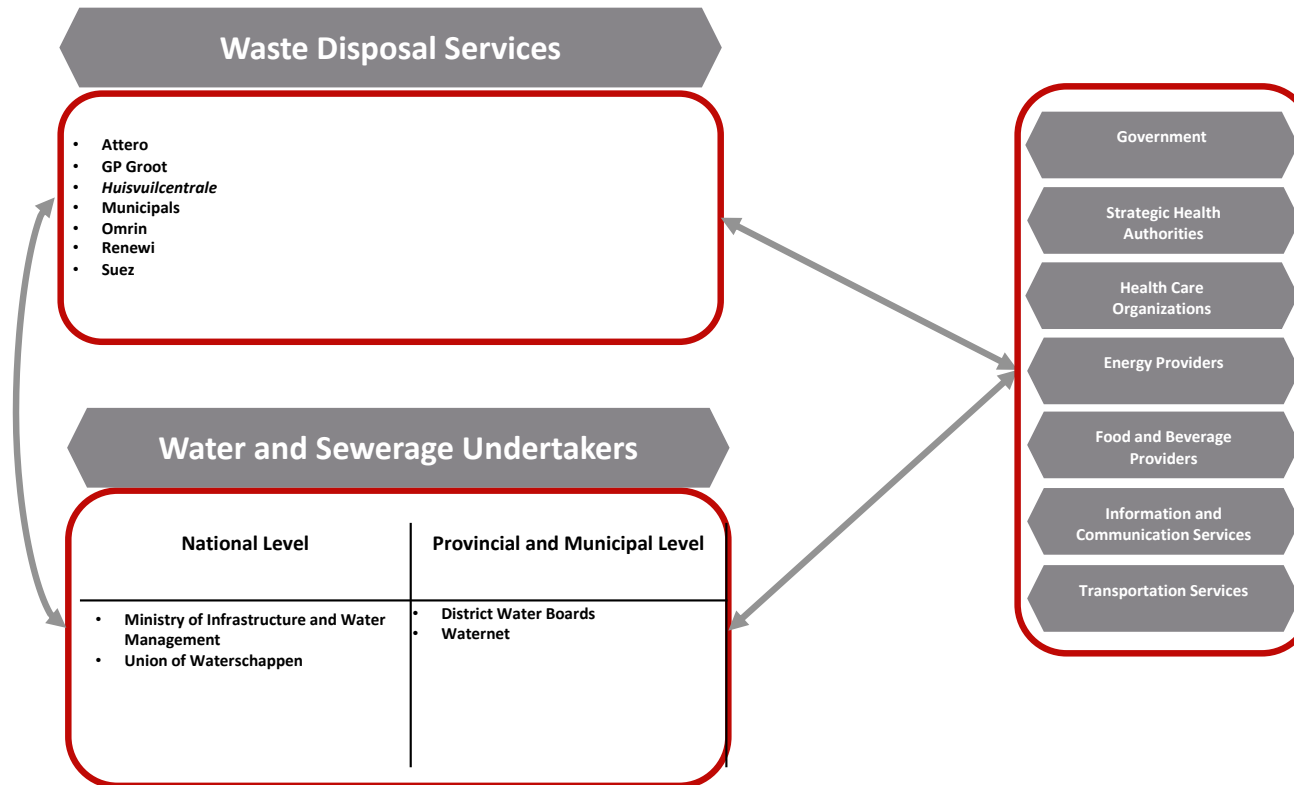


Figure 11: Non-Core Responders of the Netherlands (5/5)

The Netherlands annually produce around 60 million tonnes of waste 8.5% of those consists of household waste, while the rest stems from the industries (Centraal Bureau voor de Statistiek 2019e).

Due to insufficient landfill capacity, at the end of the 1980s, the Dutch Government took drastic measures towards improving the country's waste management. In order to achieve this goal, the *Waste Management Council* was established in 1990 and resolved in 2006 when the targets of the waste management reform were met. The council was established as a link between the different levels of government. The *national*, *provincial*, and *local tiers* were connected to enhance the coordination and execution a joint approach. This resulted in a sharp decline in landfilled waste, from 35% in 1985 to only 2,2% in recent years. The rate of recovery from waste, including the energy obtained by burning waste, rose from formerly 50% to 93% (Rijkswaterstaat 2019). On average, the overall waste produced by a single inhabitant in the Netherlands was 4.3 tonnes in 2016 and therefore lies below the EU average of 4.8 tonnes (Centraal Bureau voor de Statistiek 2019d). With 42%, the most substantial part of the waste is produced by the building industry by construction and demolition, while 24% stems from manufacturing, followed by 14% of consumer waste (OECD 2015). In many European countries, large quantities of the municipalities' waste are stored in landfills, while the Netherlands only dispose 2.2% of the household waste in landfills. Around 54% are either recycled or composted, and roughly 43.5% is used to generate power through combustion. By major electronic achievements of recent years, the share of electronic waste is also rising considerably. Among the European countries, Sweden leads in terms of reuse, separate collection, and recycling of electronic waste with 16.4 kilograms per inhabitant. The Netherlands with 9,1 kilograms is slightly above the European average of 8.9 kilograms (Rijkswaterstaat 2019; Centraal Bureau voor de Statistiek 2019d; Centraal Bureau voor de Statistiek 2019e). By the decline of landfill treatment in the waste sector, the greenhouse gas emissions were reduced by more than 60% since 2000, even though they only account for roughly two percent of overall greenhouse gas emissions in the Netherlands (OECD 2015).

Approvals and monitoring of compliance of the waste management policies, are under the responsibility of the individual provinces. They must comply with the *National Waste Management Plan*. In addition, they are responsible for the long-term closure of landfills. To fulfill these functions, they have the opportunity to put a levy on landfilled waste. The collection of garbage from single households is assigned to the individual *municipalities*. The collection

of waste can either be organized by the *municipalities* themselves or outsourced to *private companies*. Residual waste and compost have to be picked up at the curb by law (OECD 2015). They are also free to choose to either collect recyclable waste at the houses or have designated facilities, where paper, glass, textiles, and plastics have to be separated and dropped off (Dijkgraaf and Gradus 2014). About 39% of *municipalities* are collecting plastic waste at the curb, while the others have collection points for drop-off. Large cities such as Amsterdam, The Hague, and Rotterdam perform below the nationwide average in separating waste (Gradus et al 2016).

There are several options for *municipalities* to charge for *waste collection*. They can either charge for a fixed amount or price on the size of the household, or “pay-as-you-through,” meaning that the service charge depending on the amount of waste collected. The unit-based approach has been on the rise in recent years (Dijkgraaf and Gradus 2014). In 2015, there were 242 enterprises collecting non-hazardous waste and nine enterprises in charge of hazardous waste in the Netherlands (Statista 2017a). Industrial waste has to be disposed by the companies themselves, forcing them to hire their own staff for collecting hazardous waste (Wang 2015). Private citizens can bring their bulky and recyclable waste, as well as small chemical waste, to one of the waste disposals points, which are set up all over the country. Companies are charged a certain fee. The closest disposal site and opening hours can be found on the website of their local *municipalities*. Amsterdam has six different sites in the city. In some cities, chemical or specific waste can be dropped off at supermarkets or pharmacies (Gemeente Amsterdam 2019; Dutch Review 2019).

The *Dutch Waste Management Association (DWMA)* unites over 50 companies responsible for all steps in the *waste processing chain* in the Netherlands. They are involved with the government on all levels, as well as other organizations, national and international (Vereniging Afvalbedrijven 2019). With 36 sites throughout the country, *Suez Recycling and Recovering Netherlands* is one of the largest *waste collecting and recycling firm* in the Netherlands. Others include *GP Groot*, which operates mainly in the north and west of the country and has around 200 vehicles for collecting residential and company waste. *Huisvuilcentrale (HVC)* is mostly located in the west of the country and responsible for 44 *municipalities*. In the north of the country, *Omrin* is an essential partner of the *municipalities*. (Suez 2019; GP Groot 2019; HVC 2019; Omrin 2019). *Renewi* leads the market in the sector of waste-to-product recycling, by processing 14 million tonnes of waste each year (Renewi 2019).

On a national level, the *Rijkswaterstaat*, the executive body of the *Ministry of Infrastructure and Water Management*, is responsible for waste management. The department is in charge of policies, reporting to the EU, and conducting research. The legal basis of the waste management is fused in the *Environmental Management Act of 2002*. The act also forms the basis of the foundation of the *National Waste Management Plan*, which is the policy framework for waste in the recycling sector in the Netherlands. In addition to the framework conditions for traditional waste activities, it also contains topics such as evaluation, monitoring, and permits for various waste treatment standards. The current plan covers the years from 2017 to 2023 and takes into consideration the years until 2029. Since the *National Waste Management Plan* often proceed EU legislation it has served as model for European wide (OECD 2015; Rijkswaterstaat 2019)

3.4.9 Water and Sewerage Undertakers

In addition to the *Waste Disposal Services*, figure 11 contains the main *Dutch Water and Sewerage Undertaker*, which this sub-section details further.

The *Dutch water management* forms next to the *central Government*, the *provinces*, and the *municipalities*, the fourth tier in the public administration of the country, which is coordinated under the *Ministry of Interior and Kingdom Relation* (Government of the Netherlands 2018e). On a national level, all water-related matters in the Netherlands are managed by the *Water Act* and under the control of the *Ministry of Infrastructure and Water Management* (Eijgenraam et al. 2016). There are more than 140,000 km of sewage pipes in the Netherlands that transport wastewater from households and industry. More than 95% of those are gravity flow sewerage, while 4.1% are operated as mechanical sewerages, mostly when transport over long distances is needed. Similar to *waste disposal companies*, the individual *municipalities* have responsibility for the wastewater management. A large part of wastewater from the industrial sector is discharged through these sewers but it is often already treated in advance by the individual companies. Almost 99.5% of households in the Netherlands are connected to the sewage network, 0.4% have their own purifying system. Especially citizens living in remote areas where installing sewage lines would not be cost-efficient, use their own system of waste management (Government of the Netherlands 2019e; Geudens and van Grootveld 2017).

The wastewater is transported to one of the treatment plants, which are managed by the 21 *district water boards* in the country. Those are represented by the *Association of Regional Water Authorities (Unie van Waterschappen)* (Unie van Waterschappen 2019). The different *district water boards* can choose to outsource the *wastewater treatment* to private companies or other institutions. In 2015, the country had a total of 334 public and 432 private sewage treatment plants. The individual treatment plants are usually from the biological and physico-chemical industries, most of the wastewater stemming from the dairy industry. Amsterdam and the surroundings areas are serviced by *Waternet*, which is not only in charge of the wastewater but also supplies the area with drinking water (Geudens and van Grootveld 2017).

There are ten additional companies in the Netherlands that supply clean drinking water. Except for *Waternet*, they are independent of the wastewater undertaker. The two most significant sources of drinking water are the *Rhine* and *Meuse*. Some municipalities have separate *sewers*

for the relatively clean rainwater, which can be transported through the so-called *rainfall system*. In other areas, rainwater is directly led to lakes or the groundwater. The separate system ensures that the sewage system is not be flooded by heavy rainfall, and the sewage treatment plants do not have the extra work of purifying the clean rainwater (Government of the Netherlands 2019e; Geudens and van Grootveld 2017).

Since 1981, the number of urban wastewater treatment plants has been deducted from 505 to 327 in 2016. While the number of mechanical treatments and trickling filters has been reduced drastically, in the case of mechanical treatment even to zero, the number of aeration and oxidation tanks has risen (Central Bureau voor de Statistiek 2019a).

3.5 Co-operating Bodies in the Netherlands

The following sub-sections 3.5.1, 3.5.2, 3.5.3, 3.5.4, 3.5.5. and 4.5.6 explain in detail the area of the Dutch co-operating bodies. In concrete terms these are: 1) *Military*, 2) *Communities*, 3) *Environmental Authorities*, 4) *Media*, 5) *Voluntary Sector*, and 6) *Cyber Security*. Figures 12 and 13 provide a graphical overview.

Co-operating Bodies of the Netherlands

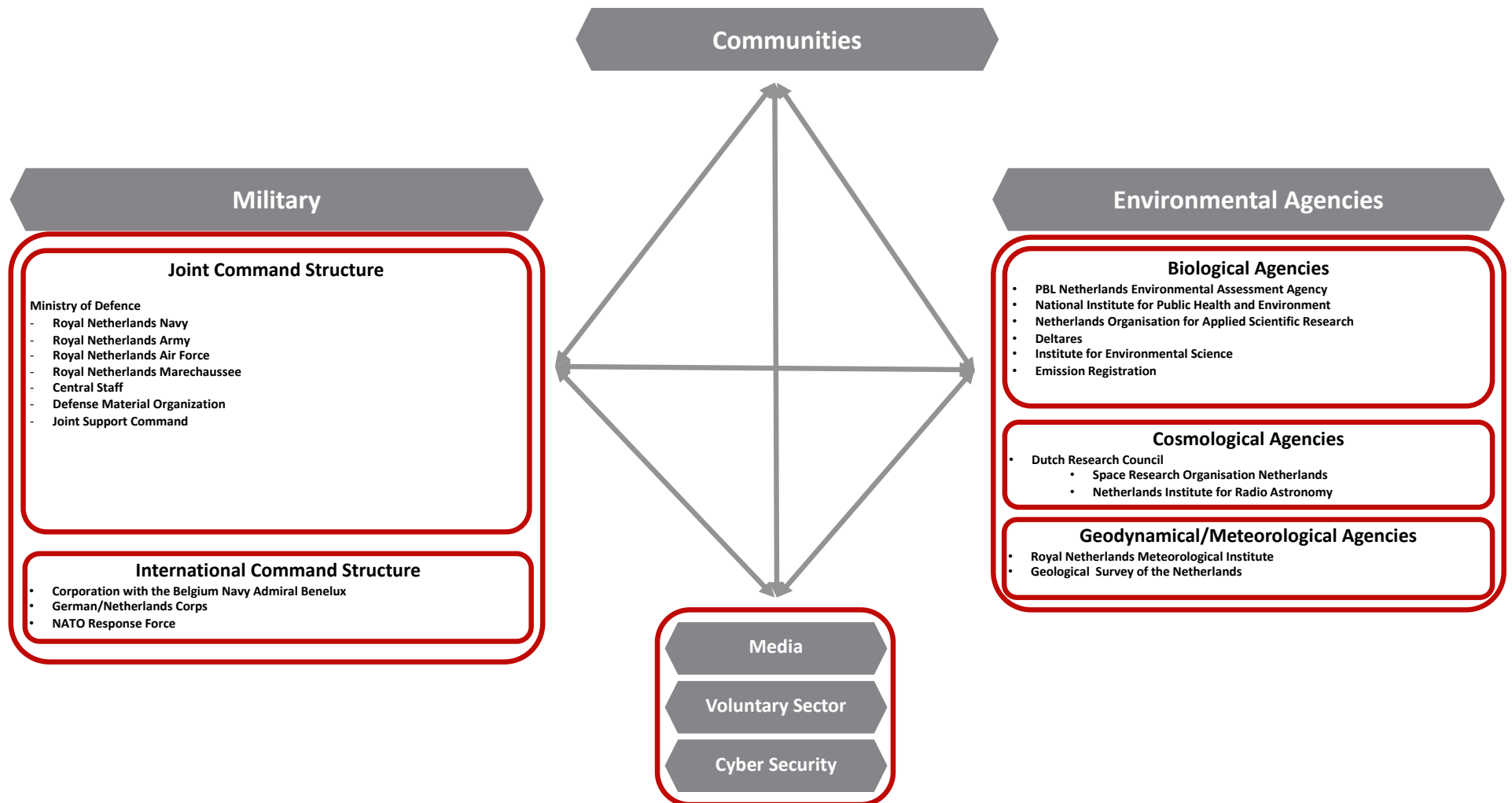


Figure 12: Co-operating Bodies of the Netherlands (1/2)

3.5.1 Military

As already described in the sub-section 4.5.1., the *Dutch military* consists of seven subdivisions, which are subject to the *Ministry of Defence*. Those include 1) *Royal Netherlands Navy*, 2) *Royal Netherlands Army*, 3) *Royal Netherlands Air Force*, 4) *Royal Netherlands Marechaussee*, 5) *The Joint Support Command*, 6) *Defence Material Organization*, and 7) *Central Staff* (Ministry of Defence 2019).

The *Ministry of Defence* employs more than 60,000 people, most of them through one of the four armed forces of the military. About 55,000 employees are working in either the *armed forces*, the *Central Staff* or the *Defence Material Organization (DMO)* (Ministry of Defence 2019h). With more than 5,000 soldiers the *Royal Netherlands Army (Koninklijke Landmacht, KL)* is the largest of the units. The *National Reserve Corps* of the *Royal Netherlands Army* consists of 3,000 reservists, that can be called into service if necessary (Ministry of Defence 2018a).

The oldest armed service is the *Royal Netherlands Navy (Koninklijke Marine, KM)* which is tasked with ensuring security at sea and on bodies of water. On home soil, the work of the *KM* is supportive of all *coastguard* activities, especially with regards to search-and-rescue missions as well as threats in and above the water and the joint responsibility for harbours and seaports. This ranges from threats such as bombs, unexploded mines or terrorist threats to using diving expertise and medical assistance at sea to support *civil authorities* in cases of natural disasters. The *commander* of the *Royal Netherlands Navy* reports directly to the *Chief of Defence (Commandant der Strijdkrachten, CHOD)*, who can instruct the commander to help the authorities of the Netherlands and abroad in disaster relief, which can also include clearing explosives, the support of firefighters and search and rescue missions in or above water. The *commander of the Royal Netherlands Army* is also the *Admiral Benelux* and, therefore, in charge of the close joint efforts with the Belgian navy. Luxembourg only contributes financially to the federation of the armed forces (Ministry of Defence 2018a).

An extensive part of their area of responsibilities is humanitarian assistance and disaster relief, both in the Netherlands and other parts of the world. The *KM* is charged with protecting the hubs at sea as well as shipping routes. This includes securing trade and energy transport unreservedly. The responsibilities at sea are, for example, gathering intelligence with

submarines and play an essential part in the fight against terrorism. In order to react swiftly in the case of emergencies, the *Royal Netherlands Navy* has set up numerous sea bases, which are self-sufficient and fully stocked with personnel and technical support. Deployment of troops at sea can be carried out at any point and is most likely in cases of transporting troops, food, and water or ammunition. In case of a national or international crisis, medical or humanitarian assistance or the provision of fire assistance, support can be deployed in a timely matter. Another field of expertise in the Netherlands are hydrographic services, which includes the compiling and managing of shipping routes, the seabed, and underwater hazards. They are closely linked to the *International Hydrographic Organization (IHO)* and have complemented the international standards with their own national standards as well (Ministry of Defence 2019d).

All land operations are conducted by the *Royal Netherlands Army* which is headed by the *Commander*. He is also the head of the *Dutch Defence Academy (Nederlands Defence Academy, NLDA)*, which is among other tasks responsible for scientific research with regards to defence and answers to the *CHOD*. One of the significant responsibilities of the army is obviously the defence of Dutch territory, including the protection of the country against any kind of attack. Examples of threats include attacks on power stations, water companies, or cyber-attacks on computer systems. Besides the task of defending the territory of the Netherlands, the *Royal Army* is also directly in charge of offering assistance in times of disaster. The most obvious situation in the Netherlands would be floods but can also include medical outbreaks such as the cattle-plague (Ministry of Defence 2018b).

Another area is the *Expertise Centre for Identity Fraud and Documents (Expertisecentrum Identiteitsfraude en Documenten, ECID)* dedicated to the fight against and prevention of identity fraud. As their role of police for all armed forces, they are located in the Netherlands as well as overseas posts such as *military bases*. Beyond those duties, the *KMar* is entrusted with the protection of the Royal Family and important Dutch institutions such as the National Bank. In 2016 the *National Tactical Command (NTC)* was established to respond to evolving threats like terrorism, cross-border crime, and illegal migration in connection to the migrant crisis of recent years. Its core responsibility is the gathering of information concerning all areas of the *KMar*. If necessary, their expertise can also be lent to other sections of the *Ministry of Defence* or general Dutch *police forces*. While every service is able to carry out independent

operations, joint operations between two, three, or all of the four services are possible (Ministry of Defence 2018a).

One of the main tasks of the *KMar* is to secure the borders, especially at airports related to European external entry points but also along the coast and at seaports. Further participation contains the protection of the *European Border and Coast Guard Agency* (Frontières extérieures, *Frontex*). Even internal borders towards other countries in the Schengen area concerning *Mobile Surveillance Safety* (*Mobiel Toezicht Veiligheid*, *MTV*) are included in the responsibilities of the *KMar*. Cross-border crimes and terrorist threats are an important part of the responsibilities this division holds. Inspections in trains, on water, in air traffic, and on the road are part of the *MTV* (Ministry of Defence 2019b). All air-related operations are carried out by the *Royal Netherlands Air Force* under the supervision of the *Commander of the Royal Netherlands Air Force*. Additional to their role in international conflict resolution, their focus lies on the issue of disaster relief. This applies to natural as well as human-made disasters. The security contribution in the Netherlands includes the protection of the Dutch airspace and stand-by fighter aircrafts that can be launched at any time if deemed necessary (Ministry of Defence 2018c).

The matter of the defence of the country is under the control of the *Minister of Defence* and supported by the *State Secretary of Defence*, who make up the political leadership of this ministry. The *Minister of Defence* is in charge of the overall defence policy and its implementation, while the *State Secretary for Defence* is accountable for personnel, the security and business operations, and the *Royal Netherlands Marechaussee* (Ministry of Defence 2018a). The *Central Staff* is in charge of all defence policies and is supported by four *armed forces*, services for military personal and critical mission response. The *Defence Material Organization* and the *Joint Support Command* assist armed forces through services and products. Based in The Hague, the *Central Staff* is responsible for the development of the defence police, which represents one section of the national security police of the Netherlands. The highest military position in the Netherlands is the *CHOD*. While being assigned to the *Minister of Defence*, the *CHOD* is responsible for conducting and executing all operations carried out by the *military* of the Netherlands. He/She oversees the activity of the *Navy*, *Army* as well as the *Air Force* and is therefore in charge of three of the four-armed forces divisions (Ministry of Defence 2018a).

3.5.2 Communities

In the Netherlands, as in other European countries, the civilian population is actively involved in voluntary social projects and aid organizations. The most critical Dutch communities are analyzed below. The voluntary sector is discussed in detail in sub-section 3.5.5. Communities can be mainly divided into religious groups, sports clubs, and other leisure clubs.

The occurrence of a disaster is often connected with the necessity of protection and help for a large number of people. In addition to provision of food and drinks, their help also includes emergency shelter and psychological support. Schools, churches, and sports facilities can be converted into emergency shelters in the event of a disaster. Churches, in particular, also play an important role in counselling and psychological support (Drückers et al 2017).

The Netherlands are considered the most secular nation in the world and the only country in which more than half the population, 52%, has no religious affiliation. However, the number was even higher, that is 60% in the 1990s. Most religious citizens identify themselves with the *Roman Catholic Church*, with 24% being followed by members of the *protestant churches* with 15%. *Protestant churches* can be divided into the *Dutch Reformed Church* and the *Protestant Church Netherland*, at six percent each, and other *reformed churches* with three percent. Islam is the religious affiliation of five percent of Dutch residents. The remaining six percent are classified as other religions, which includes *Judaism* and *Buddhism*. Only about 22% of the Dutch population attends church regularly, and only one-third state they believe in god (Centraal Bureau voor de Statistiek 2018d). However, the *Christian religion* is still deeply embedded in the Dutch culture and *Islam* seems to be on the rise in recent years, in addition to evangelical groups (Eurotopics 2019). Women are more likely to believe in God and attend church services than men (Kregting 2019).

It is notable that in the age group between 18 and 24 only 38.2% of Dutch citizens hold religious views, while of those aged 75 years and older, 71.5% call themselves religious. This shows a trend towards an even more secular society in the coming years (Centraal Bureau voor de Statistiek 2018d). Nevertheless, churches in the Netherlands are still heavily involved in disaster relief at home and abroad and are prepared to offer aid and shelter in the event of a disaster (Tear Netherlands 2019). They used to also play a crucial role in sports since most of the sports clubs came from religious institutions. This, however, has changed drastically in recent years (Tiessen-Raaphorst and Breedveld 2007).

There are many other clubs and associations across the Netherlands, such as *music clubs*, but the most significant number can be found in the sports sector. More than half of the population, that is 52%, do sport in their leisure time, while the European average lies at 38%. There are approximately 27,000 different clubs throughout the country which offer sports activities. The number of clubs has decreased throughout the years; however, the number of memberships has risen. With 55%, the amount of men is slightly higher than that of women in a sports club, which lies at 51%. Judging by memberships, football is the most popular sports activity in the Netherlands (Tiessen-Raaphorst and Breedveld 2007).

The national *scouting organization* of the Netherlands has roughly 100,000 members and is the largest youth organization in the Netherlands. Every fifth child has been or still is a member of one of the more than 1,000 scouting groups in the country, which are active in 80% of the Dutch communities (Scouting 2019).

Due to the extensive number of expatriates living in the Netherlands, there are numerous international clubs as well, while most of them are English speaking, there is also a range of French, German and Spanish speaking clubs that offer different social activities (Expatriates Netherlands 2019).

Other relevant non-profit organizations include the *Victim Support Netherlands* and the organization for *Social Work (Maatschappelijk werk)* (Drückers et al. 2017).

3.5.3 Environmental Agencies

The environmental agencies in the Netherlands are divided into *biological*, *cosmological*, and *geodynamic/meteorological* facilities, as shown in Figure 11.

The Netherlands have several environmental authorities that are subordinate to or cooperate with different ministries. The most important body is the *PBL Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving, PBL)*, which was established as an independent research institute in 2008. It emerged from the two former authorities the *Netherlands Institute for Spatial Research* and the *Netherlands Environmental Assessment Agency*. *PBL* carries out studies in the fields of environment, nature, and spatial planning with

the aim of strategic policy analysis. The agency reports to the *Ministry of Infrastructure and Water Management* but also researches requests of some other ministries, such as the *Ministry of Economic Affairs and Climate Policy*. The core tasks of *PBL* include the research and documentation of current ecological and environmental quality to record the politically required consequences. Not only is it intended to identify and analyze future trends quickly, but *PBL* also determines the options for achieving government goals in the areas of the environment, nature, and spatial planning. The institute collaborates with many national and international organizations and institutes, as well as a number of universities (PBL 2018).

As mentioned in sub-chapter 3.5.2. the *National Institute for Public Health and Environment* has three main domains, which include environment and safety. This institute is an independent organization that mostly conducts Research for the *Ministry of Health, Welfare and Sport*, *The Ministry of Infrastructure and Water Management*, and the *Ministry of Economic Affairs and Climate Policy*. It is also commissioned by international organizations such as the European Union and the United Nations. The *RIVM* is tasked with inspecting the quality of air, water, and soil and assesses potential health risks as well as environmental consequences. In the event of an accident or disaster, in which dangerous substances are released into the atmosphere, the concentration is measured and evaluated by *RIVM*. The tasks of the institute include includes monitoring radioactive materials, high voltage powerlines, and any other wireless devices such as mobile phones. A new threat that has arisen in recent years is the pharmaceutical residue due to drugs in the wastewater, which is also researched by the institute (RIVM 2019).

In 1932, the *Netherlands Organisation for Applied Scientific Research* was established and regulated by public law, as an independent research organization to help companies and the government utilize knowledge. *TNO* focuses on nine social topics, which also include the circular economy and environment (TNO 2019a).

As another institute for applied research, *Deltares* focuses on water and subsurface. The particular focus lies on deltas, coastal regions, and river basins. Flooding is a significant topic in the Netherlands and, therefore, also represents a large part of the research of *Deltares*. Future risks, but also the increasing population and the economy in connection with possible disasters, are examined. Their goal is to prepare the government better for future floods and assist agencies to act more efficiently during an emergency. Another critical topic is the water system

and underground resources, especially in a circular economy. In addition, this institute deals with the Delta infrastructure. *Deltares* also monitors and models the dynamics of the ecosystems and environmental quality and researches solutions for impacted environments (Deltares 2019).

The Faculty of Science of the Leiden University houses the *Institute of Environmental Science (Centrum voor Milieuwetenschappen, CML)*, which focuses on researching sustainable use of resources in nature as well as biodiversity. The two research areas of this institute include environmental biology and industrial ecology (Universiteit Leiden 2019).

The *Emission Register* stores all data related to the pollution of air, soil, and water. Each year over 350 results are added to the register. The *Emission Register* collects, processes, and reports the relevant data of all sources of emissions in the Netherlands. The efforts are coordinated by the *RIVM* and are therefore subject to the *Ministry of Infrastructure and Environment*. *RIVM* works closely with many other institutions, especially the *Statistics Netherlands*, *TNO*, and *Deltas*. There are six different compartments in which emissions are conducted 1) emissions to the air, 2) emissions to the air, that have to be reported to the *Intergovernmental Panel on Climate Change (IPCC)* from international shipping or air traffic, 3) emission to soil, 4) discharge load to surface, 5) load to sewers and surface water, and 6) load to sewer (Emissie Registratie 2019).

The *Netherlands Space Office (NSO)* was founded at the beginning of 2009 in The Hague to bundle the individual institutes for space travel in the Netherlands, forming into one organization. The *Space Agency of the Dutch* government has an advisory function to the government and is responsible for implementing the space policy. The *NSO* Steering Committee consists of the *Ministry of Economic Affairs and Climate*, which also functions as coordinator, the *Ministry of Education, Culture and Science*, the *Ministry of Infrastructure and Water Management*, and the *Dutch Research Council*. However, all ministries can apply for support by the *NSO*. The organization operates closely with the *European Space Agency* in the fields of satellite applications, technology, and science. Other international partners outside of the European Union include the *United States National Aeronautics and Space Administration* and the *Japan Aerospace Exploration Agency* (NSO 2019).

Focusing on a variety of different scientific disciplines, the *Dutch Research Council (Nederlandse Organisatie voor Wetenschappelijk Onderzoek, NWO)* funds thousands of researchers and various topics like the national research council at public research facilities with the main focus on universities. Through the full range of every scientific discipline, the *NWO* strongly influences innovation policy as well as the national science consent. The *NWO* is an independent body operating under the *Ministry of Education, Culture and Science* and also has strong connections to the *Ministry of Economic Affairs and Climate*. It runs and manages multiple research institutions across the Netherlands. Those include the *Space Research Organisation Netherlands (SRON)*, which conducts research on all matters of astrophysics, earth science, and planets and is also involved in the development of satellite technology. Another research institution managed by the *NWO* is the *Netherlands Institute for Radio Astronomy (Astronomisch Onderzoek in Nederland, ASTRON Netherlands Institute for Radio Astronomy (NWO 2019))*.

The Netherlands are a densely populated country with a large water proportion and many dikes. Due to global warming in recent years, sea levels have risen considerably, and with them, the number of extreme weather events and floods. All weather-related forecasting and monitoring are conducted by the *Royal Netherlands Meteorological Institute (Koninklijk Nederlands Meteorologisch Instituut, KNMI)*. The Institute, which was established in 1854, is also in charge of observing the climate, air quality, and seismic activity in the Netherlands. *KNMI* operates 48 measuring stations located in the country and the North Sea to provide this institute with the latest data at all times. The information provided by *KNMI* is an essential basis for major political and social decisions for national security. Especially in the context of the Delta Programme, valuable insights are gained for further investments. Climate models are used to create and investigate future trends and weather situations. The forecasting office is open around the clock any day of the year to warn the population in the event of extreme weather or imminent earthquakes. In addition, specifically adapted weather information is created and made available for all transportation sectors such as aviation and shipping, as well as for rail transport and road transport. *KNMI* closely cooperates with other essential authorities such as *Rijkswaterstaat, Water management Nederland* and *RIVM*, and with many international bodies. This institute reports to the *Ministry of Infrastructure and Environment (KNMI 2019)*.

As part of the *TNO*, the *Geological Survey of the Netherlands (Geologische Dienst Nederland, GDN)* is studying the subsurface of the country. This involves acquiring information for

constructions of tunnels and buildings but also drilling for oil and the most abundant natural resource of the Netherlands, gas. The information conducted by the *GDN* is used by the government for future legislative decisions. An example for the research was the connection between recent earthquakes and gas extractions in the country. Private businesses also profit from the findings and research of the *GDN* (TNO 2019b).

3.5.4 Media

One of the most effective tools of communication with the public are the *media*. Especially during a disaster or a crisis they are an important channel to warn and inform the citizens in a certain area or the whole country. *Social Media*, including *blogs*, *podcasts* and *networking sites* have increased in recent years and led to higher social media use during the event of a crisis (Jin et al. 2014). *Social Media* outlets have passed traditional media such as newspaper, radio and even television as the primary source of obtaining details of ongoing events. However, there are often credibility issues related to popular sites such as *Twitter* and *Facebook* (Collins et al. 2016). It can be concluded that the media as a whole should be considered as a valuable source of information in a situation of disaster or crisis, but their role should also be seen critically because fake news can mislead the public or even cause hysteria in the event of a disaster. Figure 13 shows an overview of the most important media outlets in the Netherlands

Co-operating Bodies of the Netherlands

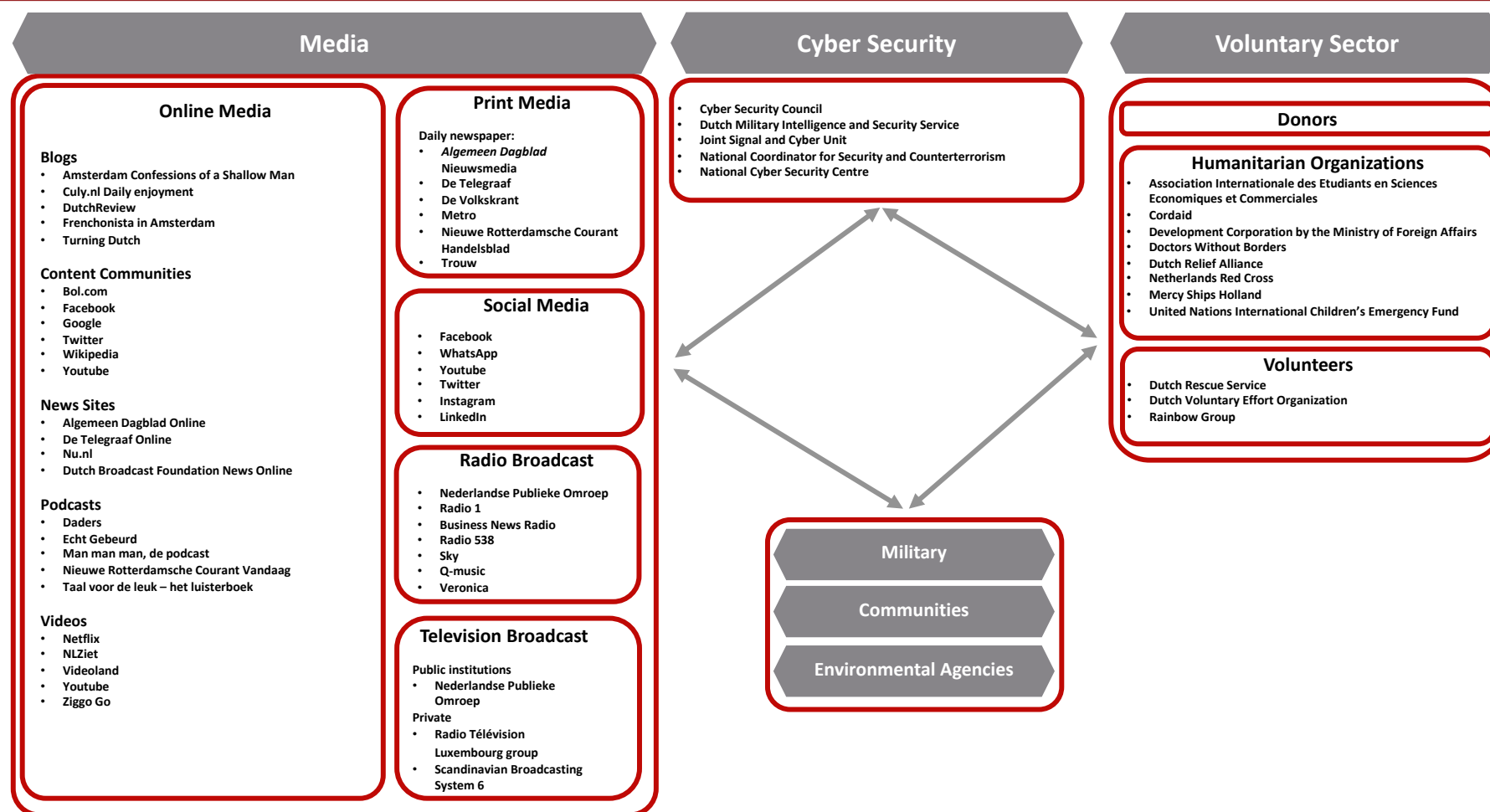


Figure 13: Co-operating Bodies of the Netherlands (2/2)

The most frequently used medium in 2019 was television, which was used daily by 79% of the population, followed by social media with daily usage of 69%. 60% of received their news on the Internet or cellphone applications, while 47% pulled them straight from the newspapers. The radio, which is the most used audio media, is used by 59% on a daily basis (Peters and van Strien 2019).

Blogs have become very popular in recent years. The most visited blog in the Netherlands is the ex-pat magazine *DutchReview*, followed by the blog *Amsterdam Confessions of a Shallow Man*, written by an ex-pat living in Amsterdam. The following two blogs *Frenchonista in Amsterdam* and *Turning Dutch*, are also personal blogs from ex-pats living in the Netherlands. *Culy.nl Daily enjoyments* is a blog surrounding the theme of food, ranging from recipes to food photography (Feedspot 2019).

Similar to most other European countries, the most popular websites in the Netherlands include *Google*, *Youtube*, and *Facebook*. Other accessible content communities are the buy and sell platform *bol.com* and the real estate site *funda.nl*. Further well received sites include *Wikipedia* and *Twitter* (Similiar Web 2019).

More and more people receive their news from digital sources. In the Netherlands, the figure of 60% online news users is significantly higher than the 47% who read printed newspaper every day (Peters and van Strien 2019). The most popular online *news site* is *Nu.nl*, which is used by one quarter of Dutch citizens at least three times a week. The *Dutch Broadcast Foundation* (*Nederlandse Omroep Stichting*, NOS) *News online*, the *Algemeen Dagblad* online and the *De Telegraaf* online are other frequently visited news online portals (Digital News Report 2018).

The most listened to *Podcasts* in the Netherlands include *Taa voor de leuk – het luisterboek*, which covers art topics, and the true-crime podcast *Daders*. The news outlet *Nieuwe Rotterdamsche Courant* (NRC) publishes the third most popular podcast in the country the *NRC Vandaag* is the, followed by *Echt Gebeurd* and the comedy channel *Man man man, de podcast* (Podtail 2019). Most Dutch citizens listen to podcasts on *Apple podcasts*, followed by *Spotify* and the websites of the podcasts themselves (Statista 2019f).

YouTube is the most viewed Internet portal for *videos* and one of the most visited internet sites in general (Similiar Web 2019). The online streaming service *Netflix* has around 2.2 million subscriptions, while the two smaller providers *Videoland* of the from the media group *Radio Télévision Luxembourg (RTL)* and *NLZiet* record 200,000 and 100,000 subscribers each (Media Landscapes 2019). The television provider *VodaphoneZiggo* recently started its own video-on-demand streaming service *Ziggo Go* (VodaphoneZiggo 2019).

There are currently eight different *newspaper publishers*, that account for the 28 daily and 40 non-daily newspapers in the Netherlands. *De Persgroep* is the largest publisher group in the country and owner of the papers *Algemeen Dagblad (AD)* *Nieuwsmedia* and *De Volkskrant*. The market share of the *De Persgroep* amounted to 52% in 2015. With a market share of 24%, *Telegraaf Mediagroep (TMG)* is the second-largest media conglomerate in the country and publisher of the boulevard newspaper *De Telegraaf* as well as the only free daily newspaper *Metro*. In terms of copies sold, *De Telegraaf* ranks first, followed by *AD Nieuwsmedia*, and *De Volkskrant*. The fourth place is taken by *NRC Handelsblad*, which is released by *Mediahuis*, followed by the *Trouwer* (Media Landscapes 2019; Statista 2017b).

59% of the Dutch trust news in general, while only 22% trust news on social media channels. Nonetheless, the use of *social media* increased rapidly in the last years, especially younger generations show an increase in usage. *WhatsApp* is the most popular social media tool but comes only second with regards to receiving news. *Facebook* is still the top social media news channel and the second popular social media medium overall. 14% of all news are obtained from *YouTube* and seven percent from *Twitter*. Other popular social media platforms are *Instagram* and *LinkedIn* (Digital News Report 2019).

There are three main providers in the *television market*. The public broadcasting station *NPO* offers the three stations *NPO 1*, *NPO 2*, and *NPO 3*. The *RTL group* offers five different channels: *RTL1*, *RTL2*, *RTL3*, *RTL4*, and *RTL5*, while *Scandinavian Broadcasting System (SBS)* offers *SBS6*, *Net5*, *Veronica*, and *SBS9*. Those three groups account for roughly 80% of the total market share in the Netherlands (Media Landscape 2019). With 42% *NPO 1* is the television channel with the largest market share, followed by *RTL4* with 30.7%. Other popular television channels are in order of viewers *NPO 2*, *SBS6*, *NPO 3*, *RTL7*, and *Veronica* (Statista 2018c). The most popular TV events are sports. In 2006, the European Championship was the most-watched program even though the Netherlands did not qualify and

therefore not compete. This followed by reality programs, the Eurovision Song Contest, and Kings Day. The eight o'clock news only makes it into the top ten most-watched shows when sports are excluded (Media Landscapes 2019).

Radio is the most trusted source of information in the Netherlands (Media Landscapes 2019). There are two main national stations for news, the public broadcasting *Radio 1* and *Business News Radio* (*Business Nieuws Radio, BNR*), which is a commercial broadcasting station. There are additional 13 regional stations broadcasting news in the Netherlands. The most popular stations, however, are mostly commercial music stations such as *Radio 538* with the highest audience in the country, this is followed by *Sky*, *Q-music*, and *Veronica*. With regards to the public radio broadcaster, the most popular are the *NPO* channels, followed by *Radio 1* (Media Landscapes 2019).

According to a report by *Reporters Without Borders* from 2019, the Netherlands currently comes in fourth, after Norway, Finland, and Sweden, concerning freedom of information and press. The previous year the Netherlands occupied the third place (Reporter ohne Grenzen 2019).

3.5.5 Voluntary Sector

The Netherlands has a long-standing tradition of government non-profit partnerships. The two have been heavily interwound, and no other country has such a high percentage of employment in the *non-profit sector*. Primarily, the social housing sector has been dominated mainly by non-profit organizations (Brandsen and Pape 2015). The Dutch Government relies heavily on the voluntary sector in the event of a crisis, especially with regards to the fire department (Wijkhuijs and Duin 2012). The voluntary sector consists of *humanitarian organizations*, *volunteers*, and *donors* and is further portrayed in figure 13.

In 2018, almost 49% of Dutch citizens volunteered on a regular basis. The most popular sector, especially for men, are sports clubs. 14% of all volunteers are working in sports clubs, in which a total of 85% staff members work voluntarily, this amounts to two million hours per week. Women are more likely to volunteer in schools or care facilities (Centraal Bureau voor de Statistiek 2018e; Tiessen-Raaphorst and Breedveld 2007).

The Dutch Government cooperates closely with volunteers and non-governmental organizations in the field of crisis management. Between 70% and 80% of the fire brigade in the Netherlands are employed on a voluntary basis, this number has declined from approximately 90% in the last thirty years. The police force mostly consists of professional employees but has a share of volunteers that account for roughly four percent (Wijkuijs and Duin 2012).

An essential collaboration between the government and the volunteer sector is the work with the *Rescue Brigade*. The volunteers work as lifeguards, whether on the coast, lakes, rivers, or public pools. They are also increasingly involved in events such as the New Year's dive. It is a recognized rescue service, which means that the municipality or security region can request a service contract with the brigade (Reddingsbrigade 2019b). They are also equipped with official emergency stripes as well as radio transmitters by the government. *The Ministry of Justice and Security* has provided the unit with 88 lifeboats that can be used in the event of floods to help evacuate citizens. There are 90 fleets of roughly 1,700 volunteers that are ready 24 hours a day to assist in the event of a crisis. Together with the *Ministry of Justice and Security*, the *IVF*, and the *Fire Department*, they form the *National Rescue Fleet (National Reddingsvloot, NRV)*. The *NRV* is under the coordination of the individual security regions in the event of a water-related crisis or significant events. There is also a close corporation with the *National Coastguard* with regards to emergencies on the sea (Reddingsbrigade 2019a).

The *Netherlands Red Cross* is one of the most prominent non-profit organizations regarding crisis management in the Netherlands. If necessary, the *Dutch Red Cross* can deploy specially trained volunteers of the *Rapid Deployable Medical Assistance Group (Snel Inzetbare Groep ter Medische Assistentie, SIGMA)*. Those volunteers assist the medical professionals with the treatment and transportation of victims. The *Dutch Red Cross* has 20,000 volunteers working in more than 200 different departments. 798 of them are on the emergency teams, which in the event of a crisis can be prepared for action within an hour. Those first responders are intensively trained in emergency care and receive regular trainings. Their main task is to support rescue services such as *ambulances*, *police* and *fire brigades* and to take care of the lightly injured. At least four times a year, volunteers have to help out at events as first responders to guarantee that all members are regularly trained and experienced. The *Dutch Red Cross* has specially trained volunteers, who also provide counseling services for people who have been involved in a disaster, in addition to helping communities gather family information on missing people. In

the case of a breach of a dyke, a network of 40,000 people can be activated in order to distribute sandbags. The *Dutch Red Cross* also plays a central role in international aid missions. In 2018, the organization was active in 51 countries, spending around 23 million Euros on almost 150 emergency aid programs. The aid ranges from the distribution of drinking water and food to medical care and the provision of accommodation (Rode Kruis 2019; Wijkhuijs and Duin 2012).

On a national level, the *Ministry of Foreign Affairs* oversees the development corporation of the *Dutch government*. Approximately 290 million Euros are spent on medical and emergency aid around the world yearly. Other areas are vocational training and the fight against climate change. In 2018, the government spent about 5.6 billion Euros on development assistance around the world, making the Netherlands the seventh-largest donor country worldwide (Enterprise Development 2019; Donor Tracker 2019).

The *Ministry of Foreign Affairs* established a partnership with the *Dutch Relief Alliance*, which unites 16 Dutch aid organizations. The Alliance helps to coordinate help and relief efforts when an international crisis that needs international efforts, occurs. Major global corporations include *Save the Children*, *SOS Children's Villages*, *Terre de Hommes*, and *Cooperative for Assistance and Relief Everywhere (CARE) Netherlands* (Dutch Relief 2019). The aid organization of the catholic church *Caritas International* operates under the name *Cordaid* in the Netherlands and has 270.000 members. It is one of the largest aid organizations in the country (Cordaid 2019). The international organizations *Doctors Without Borders* and *Mercy Ships Holland* are active in the field of health care. Other relief organizations are the *United Nations Children's Fund (UNICEF)* and the youth leadership program *Association Internationale des Etudiants en Sciences (AIESEC)* (I am Expat 2019).

In Amsterdam, the *Rainbow group* is an organization for locals as well as expatriates who want to volunteer. It connects people with other citizens that need help in their daily lives. Reasons range from poverty, homelessness, reintegration to addiction, and psychological problems (De Regenboog 2019). Organizations of the voluntary sector in the Netherlands are represented by the *Association of Dutch Voluntary Effort Organizations (Vereniging Nederlandse Organisaties Vrijwilligerswerk, NOV)*. There are more than 360 organizations active under the *NOV*. The sectors cover a broad spectrum of different social domains such as sports, youth, politics, churches, and culture. *NOV* acts as an interface to the government and plays a vital role in future political decisions toward the voluntary sector. There is close cooperation with

Movisie, the national knowledge institute for social issues. As part of the *International Association for Volunteer Efforts*, they are also effective on an international level (NOV 2019).

3.5.6 Cyber Security

Cyber Security has become an essential issue concerning national security in recent years. Due to the changing technological landscape of the Netherlands and the world surrounding it, the importance will become even more pressing in the future (NCTV 2019a). The society relies on a smooth and functioning infrastructure provided by modern technology. Those services are known as critical infrastructures or, in many cases, essential infrastructures of information. If those services are unavailable in large regions, the impact can be highly disruptive to the whole country (Lopez et al. 2012).

After the terrorist attacks in the USA on September 11th, 2001, the Netherlands, amongst other European countries, reevaluated their security approach. After discovering problematic areas in their defence system for a natural disaster as well as human-made threats to the country's security, an interdepartmental group started the *National Security Project* in 2004. The goal was to analyse and assess the current national security, resulting in the first *National Security Strategy (NSS)* of the Netherlands (Caudle, 2010).

Due to this date, cyber-attacks are the most imminent threat to the security of the Netherlands. There are different objectives for the attack of the Dutch technological network. This can range from strategic espionage to influencing democratic processes or public opinion. Attacking a country through a cyber-attack comes with relatively low costs and is simplified by inadequate measures against attacks by most states. By the anonymity of the attackers, it poses rather low risks for the perpetrator. The most inherent threats are often caused by espionage and information manipulation by nation-states. Other threats are disruption and information theft by criminals as well as sabotage by potential terrorists. However, the *NSA (National Security Agency)* scandal in the USA has also shown that information theft can happen through insiders, and threats might not always be external. Unintentional threats can include failure or breakdowns of systems or leaks that are not realized in a timely matter (NCTV 2019b). A study from *TNO* in 2010 found that the financial loss due to cybercrime is estimated to be above 10 million Euros (Hathaway and Spidalieri 2017).

The *National Coordinator for Security and Counterterrorism (NCTV)* under the *Ministry of Justice and Security* holds the overall responsibility for security and terrorism in the Netherlands, which also include cyber security (Government of the Netherlands, 2019b). This consists of the sub-organizations such as the *Cyber Security Department (DCS)*, the *National Cyber Security Centre (NCSC)* and the *Cyber Security Council* (NCTV 2019c).

In May 2018, the *NCTV* established a framework of objectives towards a secure cyber community called the *Dutch Cyber Security Agenda*: 1) An organized digital cloud, 2) Contributing to international peace and security in the digital domain, 3) Getting to the forefront of promoting digitally secure hardware and software, 4) Successfully erecting barriers against cybercrime, 5) Leading the field of cyber security knowledge development, and 6) Establishing an integrated approach to cyber security that includes the public and private organizations.

The *Minister of Justice and Security* is responsible for implementation, as well as the coordinating *Minister for Cyber Security* in general. The agenda also names the launch of the *Cyber Security Alliance*, a platform providing the exchange between private and public bodies working together for a secure digital structure in the country. Another *NCTV* initiative is *Alert online*, which aims to facilitate a high level of cyber security for government, academia, business, education, and consumers. *Alert online* also conducts an annual survey to investigate how sensitive the country is to cyber security (NCTV 2019c).

The *National Cyber Security Centre (NCSC)* was established in 2012 under the *NCTV*. However, it did not become an independent executive arm of the *Ministry of Justice and Security* until January of 2019. It serves as the information center and competence centre for *cyber security*, where knowledge from both the private and public sectors is bundled and analyzed. This ensures that developments are identified at an early stage in order to react appropriately to emerging threats. Incidents involving the central government and vital sectors are supervised by the centre as well. Furthermore, the *NCSC* is responsible for the coordination of events that affect Dutch society and serves as a point of contact in such situations. All consultations with multi-national organizations are managed here. By regular training, the *NCSC* is prepared to act swiftly in the event of a crisis (NCSC 2019). Every year the *NCSC* in cooperation with other agencies and the Dutch intelligence publishes the *Cyber Security Assessment Netherlands (CSAN)*. The publication assesses the extension and severity of the threats the Dutch population and government face with regards to the digital sector. The report

is written by public and private representatives as well as the research community (NCTV 2019a).

In June of 2011, the *Cyber Security Council (Cyber Security Raad, CSR)* was established. One of the main goals is the advisory functions for the government and the private sector with regards to cyber threats and defences. It is also overseeing the implementation of strategies regarding national cyber security. The *CSR* entails representatives from the government as well as business enterprises. The management of *CSR* is headed by the *NCTV* and the Chief Executive Officer (CEO) of *KPN*, who represents the private sector (Hathaway and Spidalieri 2017).

The *Military Intelligence and Security Service (Militaire Inlichtingen- en Veiligheidsdienst, MIVD)* provides intelligence and security information to the four branches of the armed forces and senior departments. The *Military Intelligence Service* is responsible for the security of the armed forces on missions and reports directly to the *Secretary General*. Essential areas for which the *MIVD* is responsible are: 1) peacekeeping operations and 2) the fight against international terrorism. Military counterintelligence is one of the most important tasks of the *MIVD*, which monitors information about intentions and activities of individuals, organizations, and networks. In the name of national security, the *MIVD* is authorized to intercept telephone and internet connections. In 2018, 309 devices were tapped, which shows a slight decrease, compared to 2016 when 382 devices were tapped. The *MIVD* also verifies the security of companies that have contracts with the government where sensitive data is involved. Only after approval by the *MIVD* can those companies conclude agreements with the government or their authorities. An important international contact is the *NATO* but regular exchanges are also sought with the *EU* and the *UN* (Ministry of Defense 2019d).

In 2015, the *AIVD* and the *MIVD* established the *Joint Signal and Cyber Unit (JSCU)* in which both of their cyber capabilities were joint (Hathaway and Spidalieri 2017). The *JSCU* is dedicated to this issue and operates under the *AIVD*. Core tasks of the *JSCU* are the surveillance and monitoring of communication as well as the supervision of the Dutch internet and the alignment with national law for cyber security. It also supports the *Armed Forces* during assignments at home soil and abroad (Ministry of the Interior and Kingdom Relations, 2019a).

4. Critical Comparison with Other Countries and Conclusion

After the previous section have identified and described in detail the stakeholders involved in national disaster management in the Netherlands, this section compares those with other selected countries. In addition to the neighbouring country Germany (Kirchpfening 2017), the following countries also included in the comparison are; Austria (Golovescu 2016), France (Gazarek 2018), Sweden (Bubeck 2018), and Norway (Holubar 2018). Figures 4, 6, 7, 9, 10, 11, 12. and 13 establish an important foundation on which the comparison is based. Sub-section 4.1 compares the Core Emergency Responders of the Netherlands to those countries mentioned above. 4.2 and 4.3 follows with the comparison of the Non-Core Emergency Responders and the Co-operating Bodies, respectively. A brief summary of the most important aspects of this Master Thesis is provided in the last sub-chapter 4.4.

4.1 Core Emergency Responders

Similar structures at the level of core emergency responders can be found in all comparable countries. In all the countries analyzed, the primary responsibility for disaster management rests with the local or regional level and can usually directly be attributed to the *municipalities*. If the crisis extends to several municipalities, the regional levels will be activated. In addition to the municipalities and provinces, the Netherlands was specifically divided into 25 security regions for disaster management. With the exception of France, which is divided into seven defence zones, this approach can only be found in the Netherlands. Particular similarities can be found in Norway and Sweden, where the *Ministry of Justice* holds the overall responsibility for disaster management on a national level. As in Sweden and Germany, the responsibility for disaster management in the Netherlands lies with the particular ministries effected, therefore involving a large number of ministries (Ministry of Justice and Security 2017; Golovescu 2016; Kirchpfening 2017; Gazarek 2019; Holubar 2018; Bubeck 2019).

All the countries mentioned, with the exception of Austria, maintain their own disaster and civil protection authorities. In Austria, this task is directly assigned to the *Ministry of the Interior*. The responsible body in the Netherlands is the *National Coordinator for Security and Counterterrorism*, which includes the *National Crisis Centre* and the *Department Crisis Centre*. While most of the other countries form a crisis team in the event of a disaster, the Netherlands have permanent teams on the national, the local, and the regional levels (NCTV 2019a; Golovescu 2016; Kirchpfening 2017; Gazarek 2019; Holubar 2018; Bubeck 2019).

With regards to Health care, the division into primary, secondary, and tertiary care is standard in all European countries. With the exception of Sweden, the practice of GPs as the gatekeepers to the health care system seems to be in alignment with findings in other countries. The Netherlands differentiates itself in terms of specialists, who are mostly located in hospitals and do not have their own medical practices. In some cases, joint practices are available for specialist consultation, however, most Dutch citizens go to the hospital to see a specialist. This deviates from the practice in most other countries, in which hospitals are mainly responsible for emergency care, severe illnesses and accidents. While located in hospitals, specialists are usually separated from emergency care and inpatients. With 4.7 beds per 1,000 inhabitants, the Netherlands is rather ill-positioned compared to countries such as Germany and Austria, where the number of beds is as high as 8.2 and 7.6 per 1,000 inhabitants, respectively. The situation is, however, still better than in Norway and Sweden, where only 3.85 and 2.54 beds are available for the same number of citizens. It should also be noted that the Netherlands is a rather small and densely populated country with excellent connections to Germany and Belgium, where patients can be evacuated in the event of a large-scale disaster. The primary and secondary health care in the Netherlands is mostly organized through the security regions on behalf of the *Community Health Service* and *Regional Medical Emergency Preparedness Office*. This is similar to the provision of service in Sweden and differs from other countries in which the care is administrated on a national level (Schölkopf 2017; Indexmundi 2018; Bubeck 2019).

The *rescue services* are structured very similar by the findings in the compared countries. However, *emergency services* in the Netherlands are all under the control of the public sector. While the government can hire private ambulances, they have to operate under the national ambulance service *RAV*. The *fire brigade* in the Netherlands and other European countries is very much alike and also contains a high proportion of volunteers. A distinctive characteristic can be found in the police force, which is strongly supported by the *Royal Netherlands Marachaussee*, the police unit of the *military*. The only country with a similar structure is France, where the *military gendarmerie* is also firmly integrated into the national police structure. All the countries with the exception of Austria are bordering on the seashore, making water rescue teams a high priority. The water rescue sector in the Netherlands is highly dominated by volunteers, which can be compared to Germany, where the *German Red Cross* plays a significant role. Due to the flat landscape and dense population, air rescue is not as

typical in the Netherlands as in countries such as Norway and Sweden, where rural areas can be difficult to reach otherwise (Ministry of Defence 2019).

4.2 Non-Core Emergency Responders

The national level of the *Non-Core Emergency Responders* can best be compared to the countries of Norway and Sweden, where all ministries can be classified as stakeholders. However, the primary responsibility in Sweden lies with the *Ministry of Justice and Security*. The high number of actors involved may lead to delayed acting and cooperation difficulties (Holubar 2018; Bubeck 2019).

With regards to the *strategic health care authorities*, the Netherlands show only slight differences compared to the other countries. With eight university hospitals, the rather small country of the Netherlands is very well positioned and surpasses all other countries, considering the size and population of the country.

The Life science sector in the Netherlands is one of the leading markets in the world and includes pharmaceutical companies, academic and international research institutions as well as biotech companies. It is also one of the major European hubs when it comes to TechMed companies (Leiden Bio Science Park 2015; Invest in Holland 2016)

Just as in Norway, the Netherlands have only one single state-owned transmission system operator for electricity and gas. This is unique compared to other countries. The two companies *TenneT* for electricity and *Gasunie* for gas are also operating in Germany. The neighbouring country also shows the most overlaps as far as network providers and producers are concerned. As possessing one of the largest natural gas reserves, the Netherlands have a very privileged position in this regard. Home of the largest fuel producer, the *Royal Dutch Shell*, the Dutch households are heavily dependent on gas, with it being the primary source of heating in 93% of all households (Kirchpfening 2017; Holubar 2018; Shell 2019; Government of Netherlands 2016).

Following the USA, the Netherlands are the second-largest *agricultural product exporter* in the world and houses *Unilever*, one of the leading foods and beverage producers worldwide. Other than that, the food market in the Netherlands does not show any significant differences to other

countries (Government of the Netherlands 2019d; United States Department of Agriculture 2018).

Out of all the countries used for comparison, the Netherlands have the highest usage of the internet, of all Dutch households being connected to it. 98% of all citizens have access to a private internet connection. Norway and Sweden show similar usage with 96% and 95%. Like most the other countries, the Dutch *telecommunication sector* is dominated by a few providers, such as *KPN*, which plays an essential role in the Netherlands. While privatized in 1998, it still owns all fixed telephone lines in the country and co-chairs the *Cyber Security Council (CSR)*. With regards to the *emergency communication services*, the *Dutch Amateur Radio Emergency Service* plays a vital role for the municipalities. While the governmental organizations have their own *communications system*, the municipalities are often not prepared and resort to the help of this *NGO*. Another difference to other countries is the fact that the Netherlands do not own a public postal service, since *PostNL* was privatized in 1989 (Statista 2018a; PostNL 2019a; KPN 2019; DARES 2019; Holubar 2018; Bubeck 2019).

The *transportation service sector* in the Netherlands is quite extensive and allows access to *public transport* for all residents. With the *Amsterdam Airport Schiphol*, the country operates the third busiest airport in Europe. Transport by *air, rail, bus* and *road transport* as well as the number of military airports is very similar to other countries. The Netherlands have one of the highest road densities and is compared to their size with 138,124 km of the road network at the forefront, compared to others. The road density can best be compared to Germany (Ministry of Foreign Affairs 2018; Kirchpfening 2017).

The Netherlands have an extensive coast to the North Sea and functions as a significant import and export hub. Besides the 23 other ports, they also operate the *Port of Rotterdam*. This is the largest Port in Europe and 3rd largest in the world. The port is also vital for many other European countries and has an especially crucial influence on Germany's trade and supply channels. All ports are operated by state-owned public companies, with municipalities and provinces as the majority stakeholders (Ministry of Foreign Affairs 2018).

In the case of *waste and sewage disposal* companies, the Dutch water management is of particular importance. It is one of the tiers of the public administration of the country and is responsible for all water-related matters. The country is further divided into 21 district water

boards. Due to the low altitude of the country, water management is a crucial topic and one of the core abilities. The waste disposal services can be compared to Sweden, where waste is used to produce energy, and high relevance is placed on the subject of recycling (Government of the Netherlands 2018e; Bubeck 2019).

4.3 Co-operating Bodies

The structure of the *Dutch military* can best be compared to France where besides the national defence the military police has a high national representation. The military is an important stakeholder in the disaster management and is especially important for flood and dyke related issues. Similar to the Swedish and Norwegian military it is divided into the army, the navy, the air force and the home defence, however in contrast to the Netherlands, Sweden and Norway only deploy their military nationally when all other resources have been exhausted (Gazarek 2018; Bubeck 2019).

Communities are very similar to the other countries with sport clubs playing a major role in the case of evacuation scenarios. One of the special features in the Netherlands is the fact that more than half of the citizens are not associated with any religious institution. Nonetheless, religious organizations offer aid relief as well as social support in the event of a crisis. The Netherlands record a high percentage of expatriates in the country, which is also visible in the communities.

As in most other countries that have been chosen for comparison, the *environmental authorities* are strongly interlinked with the government and universities. The ones listed and examined in the Netherlands do not pose any significant difference.

The same can be said with regards to the *media landscape*. While the use of internet and social media is increasing, *traditional media* is still important for the population. *Radio* is the most trusted media in Netherlands and is still used extensively by Dutch citizens. Most of the foreign *television* shows and movies are not synchronized to Dutch but streamed in English. The high percentage of expatriates living in the Netherlands also shows in the media supply such as TV programme, selection of movies, radio and podcasts (Media Landscapes 2019).

The *voluntary sector* of the Netherlands can best be compared to Sweden and Norway where the willingness to volunteer shows similar results. Like in Sweden the voluntary sector has strong

ties to the military and the government in general. Especially the water rescue sector is highly dependable on the voluntary work (Reddingsbrigade 2019b; Bubeck 2019).

Even though it is still expandable, *cyber security* in the Netherlands has improved considerably and has established itself as an important part of security. This trend can also be detected in the Scandinavian countries and in France. Germany seems to be lagging behind in this area. Since 2012 the *National Cyber Security Centre* has been an independent executive arm of the *Ministry of Justice and Security*. Cyber security is also one of the five directorates of the *Ministry of Justice and Security*, giving the issue therefore a high relevance (Ministry of Justice and Security 2013).

4.4 Conclusion

In summary, the Netherlands have a comprehensive disaster management structure. The *National Coordinator for Security and Counterterrorism* plays a vital role in guaranteeing safety, with some smaller teams also being subdivided into the *NCTV*. In an emergency, further crisis teams can be formed. Although the centralistic structure in the Netherlands represents a multitude of levels in civil protection, the introduced security regions are intended to avoid undefined areas of responsibility.

An essential role in the Netherlands is also held by the military, which is strongly represented or solely responsible for police, border protection, and water rescue. The intensive cooperation between the military and the civilian population is also evident here. Dutch society is firmly integrated into disaster control by the strongly developed voluntary sector.

The water management holds a prominent role in the Netherlands in general as well as for disaster management. Besides the central government, the province and the municipalities, the Dutch water management presents the fourth tier of the public administration. This is mostly the result of the countries vulnerability to floods, which are expected to rise with increasing global warming. Even though the Netherlands show extensive knowledge and capabilities in this field, the risk of floods remains their most significant risk, since one-third of the country lies below sea level.

Every year, a national risk-assessment is carried out on the basis of which financial and structural decisions are taken on at a governmental level. Those findings are not only presented to the government but are also accessible to the population. This should identify risk areas at an early stage in order to be prepared for emergencies.

The Netherlands have also established themselves in the area of Cyber Security. They have, in addition to their own authority, the *National Cyber Security Centre*, which has committed itself to the protection against attacks and failures in the telecommunications sector.

All in all, it can be said, that the Netherlands have an extensive civil protection system. Especially in the field of water rescue and cyber security they are one of the pioneers.

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Abstract (English)

Disasters are a constant threat to the world. Climate change, digitalization, and other trends highly impact disasters and unforeseeable events. It is, therefore, important for both individual countries and multinational associations to be prepared in the most efficient way to deal with impending crises and disasters. In emergencies, immediate assistance is essential, which requires a well-positioned and organized crisis management structure. This work focuses on the analysis of stakeholders involved in the national civil protection of the Netherlands. A distinction is made among Core Responders, Non-Core Responders, and Co-Operating Bodies. The Core Emergency Responders are the first point of contact in the event of a disaster and take over important tasks in an emergency. They include the government, health organizations and emergency services. Non-Core Emergency Responders include those civil protection organisations that have only indirect contact with disaster management, such as government units as well as strategic health organisations and secondary and tertiary care health organisations. They also include energy service providers, communication service providers, transport service providers and food and beverage providers. Co-operating bodies that have a supporting role include the military, communities, environmental organizations, the media, the voluntary sector and cyber security.

The EU project Securing.Health.Emergency.Learning.Planning (S-HELP), initiated by the University of Cork, Ireland and developed between 2014 and 2017, served as the basis for this analysis. This research related to main national stakeholders in disaster management was carried out under the direction of Prof. Dr. Marion S. Rauner with the participation of the University of Vienna. The Decision Support System S-Help was specially developed to support decision-makers involved in crisis situations. The project examined the involved stakeholders and disaster control structures of the countries 1) England 2) Ireland 3) Israel 4) Northern Ireland and 5) Austria, whereby a uniform structure was developed. After this project, subsequent master theses analyzed countries such as 6) the Czech Republic, 7) Slovakia, 8) Germany, 9) Switzerland, 10) Romania, 11) Bosnia and Herzegovina, 12) Serbia, 13) Croatia, 14) France, 15) Norway, 16) Poland, 17) Sweden, and 18) Italy

Abstract (German)

Katastrophen sind eine ständige Gefahr, denen die Welt ausgesetzt. Auch in Zukunft werden durch Klimawandel, Digitalisierung und andere Veränderungen, unvorhersehbare Ereignisse nicht verhindern lassen. Aus diesem Grund ist es sowohl für einzelne Länder als auch multinationale Vereinigungen wichtig, für drohende Ereignisse bestmöglich vorbereitet zu sein. In Krisensituation ist unverzügliche Hilfeleistung unumgänglich, welches eine gut aufgestellte und organisierte Struktur der Krisenbewältigung erfordert. Diese Masterarbeit fokussiert sich auf die Analyse Stakeholder, die am nationalen Katastrophenschutz des Königreich Niederlandes beteiligt sind. Dabei wird zwischen Core-Responders, Non-Core Responders und Co-Operating Bodies unterschieden. Die Core Emergency Responders bilden die erste Anlaufstelle im Katastrophenfall und übernehmen im Notfall wichtige Aufgaben. Zu ihnen zählen Regierung, Gesundheitsorganisationen und Rettungsdienste. Unter die Non-Core Emergency Responders fallen jene Katastrophenschutzorganisationen, die lediglich indirektem Kontakt mit den Katastrophenbewältigung haben, wie Regierungseinheiten sowie strategische Gesundheitsorganisationen und Gesundheitsorganisationen der sekundären und tertiären Versorgung. Zusätzlich zählen hier auch Energiedienstleister, Kommunikationsdienstleister, Transportdienstleister oder Lebensmittel- und Getränkeanbieter hinzu. Zu den Co-operating bodies, welche eine unterstützende Aufgabe einnehmen, fallen hingegen zum Beispiel Militär, Communities, Umweltorganisationen, die Medien, der Freiwilligensektor und Cyber Security.

Als Grundlage dieser Analyse diente das in den Jahren 2014 bis 2017 von der Universität von Cork, Irland EU-Projekt entwickelte Securing.Health.Emergency.Learning.Planning (S-HELP). Dieses wurde unter der Leitung von Univ.-Prof. Dr. Marion S. Rauner mit der Beteiligung der Universität Wien durchgeführt. Dabei wurde ein Decision Support System S-Help, das speziell zur Unterstützung von Entscheidungsträgern entwickelt wurde, die in Krisensituationen tätig sind. Das Projekt untersuchte dabei die beteiligten Stakeholder und Katastrophenschutzstrukturen der Länder 1) England 2) Irland 3) Israel 4) Nordirland und 5) Österreich, wodurch eine einheitliche Struktur entwickelt wurde. Darauf folgende Masterarbeiten analysierten in Folge Länder wie 6) die Tschechische Republik, 7) die Slowakei, 8) Deutschland, 9) die Schweiz, 10) Rumänien, 11) Bosnien und Herzegowina, 12) Serbien, 13) Kroatien, 14) Frankreich, 15) Norwegen, 16) Polen, 17) Schweden und 18) Italien