Chapter I

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“The greatest glory in living lies not in never falling, but in rising every time we fall”
~ Nelson Mandela

Falling and rising coincides with the growing up of a child. Every time they fall, they rise a bit stronger and know better how to avoid falling. As a child, I grew up on an island; the island of Ameland in the north of the Netherlands. Here we could enjoy the beautiful things nature had to offer, such as the beach, dunes and forest in our backyard. However, every year we also faced several storms. I remember the high tides and the sea splashing onto the dunes and dikes. Apart from some damage to the dunes and beach restaurants, the threats of nature to our island never became too severe during my childhood. They did, nevertheless, make me aware of the interrelationships between people and nature.

In many places in the world, the interrelationships between people and nature do lead to disasters. Disasters disrupt societies and cause a lot of damage, often loss of lives, and pose many challenges for recovery. Despite this destructive character of disasters, the aftermath of a disaster provides societies as well with an opportunity. Paraphrasing Nelson Mandela, the rise after the fall of a society due to a disaster offers an opportunity for glory; to develop towards a more resilient and sustainable society.

In this PhD research, I have investigated the processes of falling and rising of societies in the context of disasters. The ideas for starting this PhD research on disasters are born by my interest in planning and cultural, social and economic geography. When I first became engaged in this topic for an analysis of the recovery process of post-earthquake L’Aquila in Italy, I realized that disaster cases bring all these wide-ranging societal, natural, institutional, technical and economic issues together. In particular, in the cases studied in this PhD research, I have focused on governance processes underlying and influencing post-disaster societal development. Where solely technical or short-term approaches have proved to be insufficient for dealing with the social-environmental challenges that societies currently face, this PhD research explores in an in-depth way the social and governance underpinnings of disasters. By doing so, it sheds light on governance for triggering transitions towards enhanced resilience and sustainability.
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1.1 Shaky societies in a world full of threats

In current-day societies, people are increasingly confronted with disasters. These disasters manifest in different kinds. First, disasters occur when extreme natural hazards grow into disasters, such as hurricanes and earthquakes. These disasters are expected to increase in frequency and duration, mainly because of climate change (Perry, 2007). Second, human-induced disasters, such as technological disasters and negative ecological harms produced by an unsustainable use and extraction of natural resources, directly result from human action (Pritchard, 2012). Furthermore, war, terrorism and economic crises of different types are repeatedly threatening societies. Although these different kinds of disasters seem rather distinct, a shared characteristic of the majority of them is that they result from the interrelationships and interactions between people and their natural environment. To illustrate, natural disasters, such as hurricanes and earthquakes, are directly caused by the forces of nature. Yet, climate change that the planet is currently facing and concomitant extreme weather events, are for a large share the result of human action. Moreover, other human or social factors, such as the socio-economic vulnerability of communities and governance of disasters, can also be blamed for influencing and exacerbating the impact of disasters. This PhD research is focused on those disasters that occur within and manifest the interface between human actions and natural processes (Alexander, 2016; Wisner et al., 2004). The research uses a systems perspective to grasp in an integral manner the different ways, rhythms, realities and relevant scales of interaction between natural and social processes shaping societies (Davoudi, 2012). In particular, it builds on social-ecological systems scholarship to both better understand, and to improve governance systems for dealing with the dynamics and complexities posed by nature and humans that global societies are confronted with (Parra and Moulaert, 2016).

Many countries, cities and villages around the world are repeatedly overwhelmed by disasters. For instance, Bangladesh is impacted by cyclones, central Europe by floods and countries on the Pacific Rim by earthquakes. This can lead to the assumption that societies do not learn from – or rebuild stronger – after disaster events. We can ask ourselves the question why this learning and building-back better does not occur. And, more specifically, which processes lie underneath this difficulty or impossibility to learn from disasters, adapt to new situations and transform into more resilient and sustainable societies? Building on the works by Rebecca Solnit ‘A Paradise Built in Hell’ (2000) and Naomi Klein ‘The Shock Doctrine’ (2008) and ‘Disaster Capitalism’ (2015), it can be argued that disasters can be and are actually used to transform societies, reinforce social capital in communities, and rebuild towards more socially inclusive, resilient and sustainable societies. This PhD research investigates what and how transitions are triggered by disasters, how learning from disasters unfolds and how this societal learning can inform
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the creation of improved governance systems. It explores governance processes in three cases in the face of disasters:

1. Christchurch, New Zealand, after the earthquakes of 2010 and 2011;
2. Chiloé, Chile, after the disaster created by the salmon virus Infectious Salmon Anemia (ISA) in 2007;
3. Groningen, the Netherlands, in the context of the earthquakes caused by gas extraction since 2012.

In international disaster practice, societies struck by a disaster used to focus on technical solutions for mitigating, preparing for and dealing with a disaster. In the last decades, roughly until the 2000s, there was a dominant discourse on the short-term and technical elements of disasters. For instance, societies mitigated and prepared for the impacts of earthquakes by installing building codes to which new constructions needed to comply (Alexander, 2016). However, from the beginning of the 2000s, social elements and a longer-term perspective gained centrality besides the technical. This change in perspective coincides with the introduction of concepts such as (social) resilience and (social) sustainability in post-disaster redevelopment aims. Nevertheless, although there is an increasing attention in disaster scholarship and practice to both the technical and social components, these two realms tend to remain away from each other and are mainly studied from their own disciplinary perspectives. In a similar fashion, the domains of the natural and human side in disaster studies remain two distinctive worlds. This PhD research aims to further the social side of disasters by taking both domains – human and natural – into consideration. The social side is studied by focusing on governance dynamics and processes, and with particular attention to disasters. This PhD thesis observes that governance is what can lead to and/or exacerbates a disaster, and it is also the process that provides societies a chance to recover better after a disaster. Consequently, governance is shaped by the socio-institutional basis and related politics, and is in dynamic interaction with the forces of nature. By using a social-ecological systems perspective, this PhD research contributes to the academic understanding and practice of disaster governance through an analysis of the role of governance in the social (re)production of disasters, on the one hand, and on how governance can also be an enabler for a more sustainable transition, on the other.
1.2 Understanding disaster governance

1.2.1 Positioning disasters
Disasters are studied in many disciplines and from many perspectives. For a long time, disasters were regarded as acts of God. In the last decades, however, the understanding grew that the extreme events are caused by nature (Furedi, 2007). The understanding of disasters as acts of nature comes in parallel with the positivist dominance of natural and technical sciences in studying disasters. Consequently, the focus in geosciences lies primarily on predicting and modeling climate change and future hazards (Shove, 2010). Architectural and engineering studies, subsequently, are centered on preventing, preparing for, and mitigating the effects of disasters in construction and vulnerability assessments. From the angle of natural sciences, ecologists also study shock events such as disasters. Here, the focus lies mainly on the effects of shocks on ecosystems (Folke et al., 2010). Moreover, the concept of resilience with regard to disasters was first introduced in ecology, referring to the recovery time of an ecosystem to get back to the pre-disturbance situation (Holling, 1973).

In response to a perspective regarding disasters as natural events, the understanding matured in the 2000s that the events are caused – or at least enhanced – by humans. Disaster scholars agreed increasingly on the social creation of disasters, because, in reality, an extreme natural event develops into a disaster through the effects it has on societies (Homan, 2003; Wisner et al., 2004). In this regard, academic contributions on disasters broadened from the natural and technical sciences towards among others the economy, law and medical fields. The scope of the issues studied, consequently, also expanded towards, among others, the effects of disasters on the economy. For instance, economists define (economic) resilience as the recovery time of economic development paths back to the pre-shock state (Fingleton et al., 2012). Issues such as environmental and social (in)justice and inequality with regard to vulnerability were brought to disaster research by, among others, sociology, critical geography and urban studies (Perry, 2007; Powers, 2006). At the same time, medical scientists increasingly focus on mental and physical health problematics after disasters (Alexander, 2016).

Social sciences and humanities form the largest group of studies that contribute to the understanding of disasters as socially created events – as opposed to acts of God or nature. Sociologists, geographers, political scientists, anthropologists and spatial planners brought the focus towards disasters management, vulnerability indicators such as socio-economic vulnerability and gender, and more recently towards disaster risk reduction and climate change adaptation (Becker, 2017; Gaillard and Mercer, 2012). In addition, the importance of disaster governance became more widely known. Disaster governance acknowledges the need for social engagement and participation of different state and
non-state actors in post-disaster recovery processes, as well as the focus on disaster politics and organizations (Tierney, 2012). A more recent development in disaster studies is the attention to technological disasters and extractive industries, cyber security, war and terrorism (Kieffer, 2013).

This list of different foci in disaster studies is non-exhaustive and should be seen as a general overview of various approaches addressing the *problematique* of disasters. Acknowledging the character of disasters as being socially created, this PhD research follows the understanding that disasters are the result of the dynamic interrelationships between human action and natural processes. A disaster grows through the combination of an extreme natural event – hazard – and a vulnerable society (Gill and Ritchie, 2018; Hyndman and Hyndman, 2017). In this regard, this research builds on a social-ecological systems perspective to disasters and their governance. It examines disasters as entangled social-natural events that lead to the widespread disruption of societies and their natural environment, in an abrupt or rather gradual manner.

Consequently, this PhD thesis brings a social-ecological approach to resilience on board (Folke, 2005). Applying this approach to the analysis of disasters results in the understanding of resilience as the ability of societies to learn from, adapt to and transform in response to a disaster. Enhancing resilience in the context of disasters takes place in dynamic processes of constant interaction between societies, the natural environment and their governance (Blackburn, 2018; Davoudi, 2012). Resilience is increasingly added to sustainability aims since roughly 2010 and both concepts are used as compasses for recovery processes and their governance. Whereas sustainability refers to a way of development that does not comprise the ability of future generations to develop, resilience encourages recovery that is able to absorb and recover better from shocks (Davoudi, 2012; Lockie, 2016). Although the concepts of resilience and sustainability increasingly resonate linguistically in international policies on disasters and post-disaster recovery, their real meaning and potential for implementation are often still unclear (Restemeyer, 2018). From a critical point of view, moreover, resilience is also sometimes blamed for posing a neoliberal alibi to camouflage the devolving of public responsibilities to actors other than the state (Chandler, 2014; Davoudi, 2018). Therefore, this PhD research aims to grasp how resilience and sustainability are interpreted and implemented by various actors in post-disaster transitions (Manyena, 2006).

### 1.2.2 The double-edged sword of governance

Disasters thus occur at the crossroads of nature and society: if there were only natural elements, disasters would be limited to hazards without causing disruptions (of a large extent) to societies (Hartman and Squires, 2006). This research consequently posits that disasters are – either or both – caused and exacerbated by human processes. The
understanding that human action causes and/or exacerbates disasters implies that governance is central to disasters. Governance is conceptualized by different disciplines and in a variety of ways. A rather narrow and static understanding of governance refers to governance arrangements that can be set-up, such as laws, regulations and policies (Bulkeley and Betsill, 2005). Central in governance debates, moreover, is the shift from government to governance. This shift has been interpreted in terms of decentralization of responsibilities to sub-national state institutions, as well as regarding the involvement of a plurality of actors in decision-making process; e.g. a plurality of government levels, private sector institutions and the civil society (Bakema et al., 2017; Parra and Moulaert, 2016; Sywngedouw, 2005). In this research, governance refers to the full and evolving spectrum of governance structures, arrangements, interaction, collaboration, conflict, negotiation and decision-making processes between a plurality of actors on different levels and their hybrid configurations. These social processes of governance are shaped by cultural, historical, emotional, political, economic and power dynamics and path-dependencies. The social elements to disasters, in interaction with the biophysical world, are consequently grasped in this thesis by deeply studying governance dynamics and processes underlying and influencing the interactions between humans and their natural environment, as shown in figure 1.1.

![Figure 1.1: Governance as a central element of social-ecological systems (source: author)](image-url)
A variety of actors are part, and thus the engine of, (disaster) governance processes. This plurality of actors involves public, private and civil society actors, and the hybrids between them, operating at various levels from the local to the global (Swyngedouw, 2005; Parra and Moolaert, 2016). Public actors are state actors, such as central, regional and local governments, and government authorities directed to specific domains. Private actors are small and big companies and entrepreneurs, mainly oriented towards socio-economic development. Civil society actors encompass a wide variety of organized citizens and other organized groups striving for shared interests, such as NGOs, resident associations and lobby groups. Important to note is that sometimes actors cannot be positioned in any of these three groups, but are rather mixes or hybrids between them. Equally, actors often operate and interact at multiple spatial levels.

Building on this plurality of actors, governance refers to the question ‘who’ takes part in governance processes, as well as the ‘how’, the ‘what’ and the ‘for whom’ questions. When zooming in into governance, this PhD research analyzes the roles of different institutions in shaping, creating and influencing governance processes. Institutions are understood as dynamic systems of social rules that structure social interactions. They refer to the formal and informal rules, laws and policies, as well as the groups of (mixes of) public, private and civil society actors (Hodgson, 2006; Ostrom, 2010). As such, institutions are dynamic parts of governance processes. In the literature, the distinction is often made between formal and informal institutions, referring to respectively legal rules, regulations, public and private actors, and common norms, values and civil society actors operating outside legally defined rules and regulations (Hodgson, 2006). However, in reality, these formal and informal institutions become increasingly mixed and their differentiation more and more blurred. Actors and institutions may have different roles when they act in different contexts and situations. Particularly in disaster governance processes, the distinction between formal and informal leads to an unrealistic and incomplete understanding of institutions. For instance, responsibilities that are subscribed to the state in ‘normal times’ might be fulfilled by the civil society and/or market in times of disaster, and vice versa.

From the perspective of disasters, societies can prevent, mitigate and prepare for, and cope with and recover stronger after disasters through governance. Governance can therefore be regarded as a double-edged sword: it can influence the cause and exacerbation of a disaster, on the one hand, and it can be the engine of post-disaster transitions that enhance resilience and sustainability, on the other hand (Davoudi, 2012; Lockie, 2016).

1.2.3 Governance of social-ecological systems in the face of disasters
This PhD research uses a social-ecological systems approach to fully grasp the dynamic and entangled social-natural processes leading to disasters. The governance of social-ecological systems in the face of disasters brings an extra layer – a layer of stress – to
the governance of social-ecological systems, as depicted in figure 1.2. A social-ecological systems approach highlights the dynamic nature of societies and the interdependencies between different actors, political processes and their natural environment. Moreover, it emphasizes the multi-scalarity of social-ecological processes (Adger et al., 2003; Ostrom, 2010). As such, this approach enables the study of multi-level governance processes influencing disasters. The concept of multi-level governance acknowledges that governance is shaped by the dynamic interactions between actors and institutions at different levels. The multiple levels refer to multiple spatial scales, temporal phases and various actors. Multi-level governance lenses are subsequently applied in this research to further understand the hybrid character of disaster governance. Moreover, multi-level governance acknowledges the importance of multi-actor participation and the inclusion of the local level in post-disaster contexts (Aldrich, 2012). The methodology applied in this research also mirrors multi-level governance, as in-depth interviews with actors on different levels are conducted, which will be further discussed in section 1.5.4.

Figure 1.2: The layer of stress that disasters bring to the governance of social-ecological systems (source: author)

A fundamental aspect of disasters that largely shapes their governance is the uneven way in which they impact societies. This non-homogeneous impact refers first and foremost to the dispersed geographical impact of disasters: disasters affect some places harder than others. This is mainly due to the vulnerability of the people that live in certain areas. Second, this geographical variety in impact is exacerbated by the trend that people of
a lower socio-economic standing, and belonging to more vulnerable social groups, live in locations that are more susceptible to hazards (Becker, 2017; Maes et al., 2018; Perry, 2007; Wisner et al., 2004). This is usually driven by real estate market prices. Third, disasters are perceived differently by different people, depending on the extent to which they are physically impacted, but also on their own psychosocial or emotional perception of the impacts of a disaster. These factors, among others, lead to the varied impact of disasters. The uneven impact of disasters asks for a governance approach that is suited to the specific needs and wishes of different people in different geographical areas and time phases after a disaster. A governance approach that is able to be flexible and take on hybrid forms might be appropriate for this (Bakema et al., 2017; Bakema et al., 2018a).

A social-ecological systems approach is highly valuable for an in-depth analysis of socio-natural disasters, hybrids of multi-level governance and post-disaster transitions, since it regards social and natural components of a system in an integral way. However, there has been a bigger emphasis in social-ecological systems studies on the ecological than on the social side (Berkes and Folke, 2002). One of the reasons for this is that the approach was first introduced by ecologists. This group of scientists recognized the important relationships between natural and social elements, but did not dig deeper into the social dynamics. This led to the prevailing vacuum in the understanding of the social side (Kaika, 2017; Tierney, 2012). Taking the natural elements into close consideration, this PhD research focuses on the social side of the analysis of social-ecological systems. It highlights the social side by focusing on governance and institutions inherent in social-ecological systems under stress caused by a disaster.

1.2.4 International practice on disasters
Together with the shift observed in disaster scholarship towards an enlarged focus on the social side of disasters, similar developments can be observed in disaster practice. Internationally, there is a growing number of institutions implementing programs on disaster management, disaster risk reduction and lately also disaster governance. First and foremost, the United Nations (UN) has been engaged with hazards and disasters since the 1960s. Over the last decades, the UN moved from a narrow focus on the technical side of disasters towards positioning disasters within a wider sustainable development perspective (UNISDR, 2018). In 1965, the UN launched the United Nations Development Program (UNDP) and placed the themes climate change and disaster risk high on its agenda. As part of the Sustainable Development Goals (SDGs), the UN advocates for the prevention of disasters by stimulating resilient community building and enabling sustainable economic development (UNDP, 2018).
Due to climate change, disasters are expected to increase in frequency and duration (Steward and Donovan, 2008). In response to this knowledge, the UN installed the Office for the Co-ordination of Humanitarian Affairs (OCHA) in 1991, after designating the 1990s as ‘The International Decade for Disaster Risk Reduction’. The goals of OCHA were centered on strengthening the response to emergency situations and disasters, and the integration of humanitarian response and policy development (OCHA, 2018). A milestone in this international decade was the creation of the ‘Yokohama Strategy for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness and Mitigation’ in 1994. As its name suggests, the acknowledgement grew that there should be an enlarged understanding of preventing disasters rather than just responding to them. From 2000 onwards, the focus on social aspects of disasters developed further, as reflected by the installment of the United Nations Office for Disaster Risk Reduction (UNISDR) in 1999. In particular, studies were conducted on indicators for measuring vulnerability of communities and on disaster reduction, following from the 1999 ‘International Strategy for Disaster Reduction’.

The earthquake and tsunami in the Indian Ocean in 2005 triggered international awareness on the need for more knowledge and action within the field of disaster risk reduction and response. Consequently, as of 2005, the ‘Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters’ (HFA) was widely adopted by many countries around the world. The HFA introduced the concept of resilience building and was aimed at reducing disaster losses and preventing future disasters. It has the following five priorities: 1) prioritizing disaster risk reduction in countries, 2) identifying disaster risks and creating early warning systems, 3) building safety and resilience through knowledge, education and innovation, 4) reducing risk, and 5) strengthening disaster preparedness to allow for effective response (UN/ISDR, 2005). Building on the HFA, the UNISDR created the international ‘Sendai Framework for Disaster Risk Reduction 2015-2030’ in 2015 to steer nations and disaster risk reduction strategies. This framework aims to ensure the continuation of the developments of the HFA, and, based on consultation about the previous program, introduces some new directions. In particular, a transition between the two frameworks can be observed from disaster management towards disaster risk management, and a broadening of focus on both natural and human-induced hazards and disasters (UN/ISDR, 2015).

Besides these frameworks and developments led by the UNISDR, many other international organizations and NGOs are engaged in the merits of disaster governance and disaster risk reduction. To just mention a few, the Intergovernmental Panel on Climate Change (IPCC), set up in 1988, conducts scientific research on climate change and advises international policy makers on disaster risk and policy actions (IPCC, 2018). Furthermore, the Rockefeller Foundation launched the 100 Resilient Cities network in 2013, with the aim to help cities...
around the world in their resilience building strategies. The 100 Resilient Cities network follows the international developments in not just incorporating processes to strengthen resilience for natural hazards, but also social stresses and shocks, such as violence and social problems (100 Resilient Cities, 2017). For instance, the city of Christchurch in New Zealand, studied in this PhD research, has become part of this 100 Resilient Cities network. After being hit by several devastating earthquakes, it promotes resilient recovery of the city and wider region. Finally, many international NGOs, such as the International Confederation of Red Cross, Oxfam Novib and UNICEF, focus on limiting the impacts of natural disasters, but also of war, food and water shortage, inequality and injustice. In a world that is becoming more and more interconnected and globalized, disasters are also likely to become more complex (Lechner et al., 2016; Kirschke and Newig, 2017). Whereas the scope of disasters did in the early years not reach further than natural events, it is very important and necessary that the scope extends towards technological, human-made disasters and disasters that occur because of a confluence of causes.

1.3 Scope of this research

Building on these international developments in disaster academia and practice, the following, non-exhaustive shifts in the focus in disaster governance can be observed:

- From disaster management to disaster risk reduction, implying a shift from a focus on the aftermath of disasters to the pre-disaster, disaster prevention phase;
- From disaster risk management to disaster risk governance, entailing a growing understanding that the roles and actions to prevent and deal with disasters should be shared between a plurality of state and non-state actors rather than solely (national) states;
- From natural hazards and disasters to broader risks and disasters, which implies the acknowledgement that disasters are not limited to natural events, but become more complex as they can be the result of a mix of factors;
- Acknowledgement of a mix of sudden and gradual disasters, reflecting how disasters are not just sudden events, but can also have a more gradual character, a slow-onset and/or an undefined end;
- From technical disaster preparedness to social disaster mitigation, enhancement and resilience, referring to the increasing focus on assessing vulnerability, measuring resilience and reducing disaster risk, besides construction standards and early warning systems.
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Although these developments have taken place over the last decades, disaster studies and practice remain primarily focused on minimizing the impacts of disasters and, in particular, on providing assistance in the emergency management phases after a disaster. Furthermore, international communities working on disaster-related issues, the UNISDR and other practitioners, are mainly tailored towards distinguishing indicators for resilience and vulnerability, and subsequently, for measuring and evaluating resilience. Moreover, despite international programs, such as the Sendai Framework, that promote the inclusion of all state and non-state actors, still mostly central governments in countries are involved in disaster governance and disaster risk reduction. In this PhD research, disaster governance is, therefore, studied from a systems perspective to allow an integral analysis of all factors and actors that influence the creation, growth, exacerbation and contraction of disasters. The main theoretical concepts that structure this PhD research – disasters, governance, institutions, social-ecological systems, resilience and sustainability – aid in furthering the understanding of disaster governance. As such, this research contributes to six domains in the literature on disaster governance, which are introduced below.

1) Nature- and human-induced disasters

Disaster research focuses mainly on either nature- or human-induced disasters. The influence of natural disasters on industries, such as the impact of an earthquake on a nuclear power plant, is more and more subject of study, also inspired by recent disasters in the world (Kieffer, 2013). For instance, Gill and Ritchie (2018) coined the term ‘natech disasters’ to describe the potential disruptive outcomes of the impact of natural disasters on human technology and vice versa. However, disasters that occur because of a mix of natural and human causes remain understudied. In a world that is increasingly interconnected and in which humans depend on nature for development, the black-white distinction between nature- and human-induced disasters becomes increasingly blurred and less relevant. Moreover, due to the influence of human actions on climate change, extreme weather events such as hurricanes and droughts will occur more frequently. The very nature of these disasters proves the inseparability of natural and human causes of disasters. In this research, therefore, both nature- and human-induced disasters are studied.

2) Technical and social side of disasters

Disaster research tends to focus either on technical or on social aspects. The technical side is covered by, among others, investigating and designing construction standards to resist hazards, and developing early warning systems. When social elements are studied, they usually focus on indicators to explain the vulnerability and resilience of communities to disasters, on the importance of participation and social engagement, and on analyses of how disasters occur. So, the social creation of disasters is acknowledged and widely
analyzed in disaster studies that focus on social elements, such as vulnerability, that lead to the construction of a disaster. Yet, studies reaching to, for instance, a deeper understanding of the governance of disasters are still small in number. Taking into account the importance of technical elements to prevent and mitigate the consequences of disasters, this research shows how an understanding and knowledge about the social elements is needed to better design the governance response to disasters.

3) Disaster governance

Governance studies in the realm of disasters have developed from the shift from government to governance. Hence, disaster governance generally looks at the socio-political interactions between actors and institutions on multiple levels among whom governance roles and responsibilities are negotiated and shared. Although the field of disaster governance is growing, there is still a lot to be learnt regarding governance ‘for whom’, ‘how’, ‘why’, ‘when’ and ‘where’. This research aims to get a better understanding of the governance of disasters. It is an in-depth study of governance dynamics and processes that can trigger transitions to more resilient and sustainable societies. In fact, it deals with the question: how, and when, should who, have what role in the face of disasters? Consequently, this research investigates what governance is, how disasters both shape and are shaped by governance dynamics, and what the role is of various institutions within governance processes.

4) Social-ecological systems

A social-ecological systems perspective regards human and natural systems in full interaction with each other. These interactions shape societies and their natural environment. When the perspective was first introduced by ecologists, governance was regarded as a subsystem of social-ecological systems. In this research, however, governance is regarded as an integral part of a social-ecological system, as it both shapes and is shaped by the interactions between societies and nature. Disasters are clear examples of how the natural and social worlds come together. This is even more so in the case of human-induced disasters, as reflected in the large number of negative consequences caused by extractive industries. Acknowledging that natural elements are interrelated with the social, this research deepens the social side of social-ecological system research on disasters. The importance of the social side is explored through a focus on governance, yet with close attention to the ecological side.
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5) Geography of disasters

A disaster often has a different impact on different areas. Disaster scholarship nowadays widely acknowledges that the vulnerability of local communities is higher in some geographical areas than in others. This is due to, among others, socio-economic and demographic factors, but also geophysical aspects such as proximity to the coast or to a fault line. These socio-economic vulnerabilities and geographical aspects are related to each other in terms of environmental justice, as socio-economically disadvantaged groups often live in areas with higher exposure to hazards. Besides this different geographical impact of a disaster, the location of a disaster can also influence the ways in which a disaster is recognized as such. For instance, a disaster can get less recognition of its scope when it occurs in a peripheral region than in a core region of a country. This PhD research grasps the relationship between the geography of a disaster and its impact by exploring three cases that are located in rather peripheral regions in the respective countries, as will be further discussed in section 1.5.3.

6) Resilience and sustainability

Social-ecological system studies brought the concept of resilience to disaster research. There are three main elements of social-ecological resilience, which are the ability to cope with and absorb the disturbance that a disaster poses, the ability of a system to self-organize and the ability to build capacity for learning, adaptation and transformation (Folke et al., 2010). Resilience in the context of disasters can be strengthened through enhancing these three abilities. Many disaster studies focus on the ability to cope with and adapt to disasters. However, there is less knowledge about how and what learning takes place among whom after disasters, nor about what is needed for post-disaster transformation. Since learning is one of the main components of resilience, this study focuses on how a post-disaster society can learn from a disaster to trigger transformation of societies. Moreover, sustainability and resilience aims often go hand in hand. However, due to different interests of different actors involved in disaster recovery, the three P’s of sustainability – people, planet and profit – hardly go in parallel. Instead, the one goes rather at the expense of the other. Finally, this research contributes to furthering the understanding about sustainable and inclusive social, environmental and economic development in post-disaster societies.
1.4 Framework on the PhD research

Figure 1.3 presents a schematic and simplified theoretical framework of this PhD research. The oval in the left side of the figure shows the concepts inherent to the multi-level governance of social-ecological systems in the face of disasters. The circles on the rights side visualize the social-lead up to a disaster and possible post-disaster transitions to enhance resilience and sustainability through governance triggered by disasters.

1.5 Research approach

1.5.1 Research aims

The aim of this PhD research is threefold. First, the research applies a social-ecological systems approach with the aim to enrich the understanding of disasters. A social-ecological systems perspective highlights the interrelatedness of nature and societies through which disasters occur, as well as the dynamic character of these systems. Through an in-depth analysis of the social side of social-ecological systems threatened by disasters, this PhD research contributes to disaster studies and furthers social-ecological systems thinking.

Second, this research aims to provide insights in the role of governance and its interaction with natural and socio-institutional processes. Shock events such as disasters put societies under pressure and add an additional layer, a layer of stress, to governance systems.
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These stressful and often chaotic situations influence the roles and behaviors of different public, private and civil society institutions. This research contributes to governance debates by investigating post-disaster governance processes in three cases, and provides a more extensive understanding of the roles and responsibilities of different actors and institutions involved in disaster governance.

Disasters often account for (a lot of) damage and casualties. Yet, these events and their underlying shock effects also have the capacity to trigger transitions in societies. Post-disaster societies often express the wish to use the window of opportunity that a disaster context offers to redevelop in a stronger and better way. The third aim of this research is, therefore, to obtain an in-depth insight in the ways in which governance can stimulate and enable post-disaster transitions towards enhanced resilience and sustainability.

1.5.2 Research questions
This PhD research aims at answering the following research question:

What is the role of governance in steering transitions towards more resilient and sustainable social-ecological systems in the face of disasters?

Five sub-questions build to the main research question:

• What is a disaster and how do its characteristics influence disaster governance?
• What is the role of governance and collective social action in post-disaster recovery processes?
• How do post-disaster societies learn from, adapt to and transform in response to disasters?
• Which types of transitions can disasters and their underlying shock events trigger?
• How do these transitions bring enhanced resilience and sustainability to societies?

1.5.3 A qualitative case-study approach
For investigating governance systems in places affected by disasters, this PhD research adopted a qualitative research approach. A qualitative approach “strongly argues the value of depth over quantity and works at delving into social complexities in order to truly explore and understand the interactions, processes, lived experiences, and belief systems that are part of individuals, institutions, cultural groups and even the everyday” (O’Leary, 2010, p. 113-114). This research includes three case-studies of places affected by a disaster that are analyzed as “in-depth examinations of a single instance of some social phenomenon” (Babbie, 2010, p. 309). Case-studies are particularly suitable for conducting research
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about the interactions between people and their (natural) environment, since they enable the capturing of all contextual conditions and not just a single phenomenon of study (Swanborn, 2010; Yin, 1993). In all three cases, complex social phenomena, such as governance, perceptions and real life experiences, are studied. The aim of analyzing these realities in a case-study is to get a complete and profound understanding of the details and ambiguities of the disaster situation.

Case selection

The empirical research comprised fieldwork in three regions in New Zealand, Chile and the Netherlands that have been hit by a disaster. These cases are introduced below.

Case 1: Christchurch, New Zealand

New Zealand, shown on the map in figure 1.4, has approximately 4.7 million inhabitants (Stats NZ, 2018). Located on the south island, the city of Christchurch is the capital of the Canterbury region and is the second biggest city of the country with a population number of 375.000 (Christchurch City Center, 2017). In September 2010, the first earthquake with a magnitude of 7.1 on the Richter scale struck Christchurch. Despite this high magnitude, there was only physical damage and no human loss of life. Nevertheless, half a year later, a second big earthquake occurred with a magnitude of 6.3. Although this earthquake was smaller in magnitude, it caused more physical damage as well as 183 casualties. This bigger impact was mainly due to the close proximity of the epicenter to the city center, the shallow depth and timing of the earthquakes. After these two earthquakes, many smaller earthquakes and an ongoing seismic activity determined the lives of many people in the wider Christchurch area for almost five years (Bakema et al., 2017; Hayward, 2013). Although natural hazards, such as earthquakes and volcano eruptions, occur frequently in New Zealand, the earthquakes in Christchurch were unexpected. The local levels of government in Canterbury were able to deal with the devastations caused by the first earthquake, yet, the impact of the second earthquake, worsened by the ongoing seismic activity, outreached the governance capacity of the local state actors to deal with the recovery. In response, institutional changes took place, including the set-up of a special-purpose state authority to lead the recovery process (Bakema et al., 2017). At the same time, there was a big role for ‘other actors than the state’ in the post-earthquake recovery process, represented by a high number of civil society initiatives, public participation activities and co-creation of recovery plans.

The case of Christchurch shows the multi-layered governance response to a disaster in a country that is social-institutionally well-prepared and has (technical) expertise for hazards, among others in the form of transparent institutions and earthquake-resistant
building standards. However, the country was not expecting an earthquake of this magnitude in this specific location. Post-earthquake Christchurch shows how a society is impacted in a non-homogenous way by a disaster. The consequent different realities and experiences of affected people ask for a tailored and hybrid governance response. Moreover, Christchurch is an interesting case to investigate the roles and responsibilities of different public, private and civil society institutions operating at different spatial and temporal scales.

Figure 1.4: Map of Christchurch, New Zealand (source: created by author based on ESRI data, 2017)

Case 2: Chiloé, Chile

The archipelago of Chiloé in the south of Chile, shown on the map in figure 1.5, is known for several reasons. The churches of Chiloé are part of UNESCO’s World Heritage, it exhibits one of the endpoints of the Pan-American highway, and it is nationally and internationally known for its production of wood, wool and salmon. Stimulated by a market-driven regulation from the 1970s onwards, the Chilean economy diversified from copper mining and forestry towards the production of salmon. The salmon industry was able to grow very rapidly under a political-economic regime with almost inexistent environmental and social regulations, and formed the biggest industry on the island of Chiloé. The blooming
industry, in which salmon became the second export product of the country, transformed the island from a traditional society into a world leading industrial commodity producer.

Between roughly 2007 and 2010, Chiloé was the scene of the Infectious Salmon Anemia (ISA) in the salmon industry. The ISA virus spread at a very high speed to a big geographical area due to, among others, high fish density in the cages and the close proximity between the cages. These economic reasons for a high production influenced the overexploitation of the natural environmental by the salmon industry (Bustos, 2014). The virus caused a drop in the production of salmon, which led to a huge loss of local jobs and a socio-economic crisis on the island. In addition, it also had repercussions at the national level, given the importance of the salmon industry within Chile's economic export basket.

The case of Chiloé presents a situation in which an extractive industry and its governance account for a human-induced disaster. Chiloé is the perfect example of a disaster that occurred in a country that has a lot of experience and (technical) expertise with different kinds of nature-induced hazards, such as earthquakes, volcano eruptions and tsunamis. However, the prevalent governance systems were not suited to prevent and deal with this untypical (human-induced) disaster. Even more so, the governance system made it possible that this kind of disaster could be generated. After the outbreak of the ISA disaster, the state and private sector wanted to introduce changes to enhance environmental standards for controlling the production of salmon in Chiloé. However, attempts to deal with and learn from the ISA disaster were mainly centered on biotechnological approaches to the detriment of urgent regulatory, socio-political and governance aspects. This resulted in a higher use of antibiotics and other chemicals to control the outbreak of diseases in the salmon population. The case of Chiloé contributes to this PhD research by illustrating how resilience of certain elements of a system (biotechnological resilience) can hinder resilience of other components (social resilience), compromising more systemic sustainability and resilience goals.
Figure 1.5: Map of Chiloé, Chile (source: created by author based on ESRI data, 2017)

Case 3: Groningen, the Netherlands

The extraction of gas from the soil in the province of Groningen in the north of the Netherlands, shown in figure 1.6, has led to earthquakes since approximately 1990. The pressure of the earth layers is slowly decreasing due to the gas extraction, which increasingly poses a threat to Groningen. Compared to earthquakes in other parts of the world, such as New Zealand and Chile, the earthquakes in Groningen are of a low magnitude. The biggest registered earthquake so far had a magnitude of 3.6 on the Richter scale. Nevertheless, earthquakes do not occur naturally in the north of the Netherlands. Moreover, they occur at a small depth. Combined with the different soil composition in the region compared with other earthquake-prone regions in the world, the earthquakes in Groningen can produce considerable damage to the built environment.

Besides this physical damage, many people are psychosocially impacted by the earthquakes. Almost in every disaster case in the world, people are psychosocially affected, in addition to the harm that disasters produce to the built environment. This psychosocial impact can especially be prominent and harmful in cases where disasters are directly man-made, since an actor can (often) be held responsible. In Groningen, the
gas extraction is conducted by the Dutch company Nederlandse Aardolie Maatschappij (NAM); the Dutch Oil Company. After the gas was discovered in the 1960s, the NAM obtained a contract from the Dutch state to extract the gas and sell a percentage of the revenues to the Dutch state. Moreover, the NAM is a joint venture of the oil companies Shell and Exxon Mobil. Although the first signs of ground movement were measured in the 1990s, for a long time the relationship between the gas extraction and earthquakes was denied. After the biggest earthquake in 2012, the affected people argued that the (central) government still insufficiently recognized the scope of the earthquake problems. Since 2015, several institutional changes in the domains of the government and private sector have occurred. Nevertheless, local people and other actors still perceive a lack of recognition of their problems. They are confronted with uncertainty about their future and with the troublesome damage assessment, reclaim and strengthening procedures. This creates a situation of growing distrust between the state, the private sector and the people in Groningen (Bakema et al., 2018b).

In this PhD research, the case of Groningen is studied as a gradually unfolding human-induced disaster. Although the Netherlands is generally known for having highly advanced (socio-political) institutions and water defense and protection infrastructure due to its location below sea level, it does not have expertise for dealing with this ‘untypical’ disaster. Moreover, the case illustrates the chain of human factors and socio-economic decisions that are acting as drivers for the actual triggering of the earthquakes. Also, the entangled public-private institutions cause a complex institutional situation, as the state is both responsible for the safety of the population and also has a big interest in the company that extracts the gas. The case of Groningen, therefore, provides insights in the socio-natural processes through which a disaster can unfold.
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Figure 1.6: Map of Groningen, the Netherlands (source: created by author based on ESRI data, 2017)

Contribution of the cases

The case-selection discussed above introduced several societal elements that influenced the unfolding of a disaster in all three cases. In this PhD research, these elements reflect the core characteristics of the creation and governance of a disaster, and, moreover, they form the basis for the triangulation of the three cases. The elements, also explained in table 1.1, are:

- Type of the disaster;
- Quality of (socio-political) institutions;
- Development of (technical) expertise;
- Place of the disaster.

Following from the definitions of disasters, governance and institutions as discussed in section 1.2, the elements presented here are inclusive to issues of power, economics, politics, culture, vulnerability, et cetera.
Building on the insights from the case-studies of this research, the analyzed countries have in general well-developed (socio-political) institutions and (technical) expertise for certain types of disasters. The ingredients to prevent, prepare for, and – if necessary – cope with and learn from disasters are consequently present in all three cases. However, all four elements are needed for preventing that a disaster will be created and for consequent appropriate disaster governance: if one element of a hazard in a society is different than what is expected or planned for, a disaster is likely to unfold when the hazard meets a vulnerable social group. As such, the lack or insufficient capacity of one element can lead to the malfunctioning of the whole (governance) system. This leads to the argument studied in this PhD research that having well-developed (socio-political) institutions and (technical) expertise is not necessarily enough for preventing the creation of disasters, nor for appropriate disaster governance. More concretely, institutions that are said to be well-developed might not be the right ones for a specific situation and might not do justice to all actor groups in society.

For instance, the countries analyzed in this research did have well-developed (socio-political) institutions – by international development standards\(^1\) – and had the (technical) expertise to prevent disasters, yet they were either prepared for different kinds of disasters, or were prepared in different places than the ones that were actually hit. Table 1.2 shows a simplified characterization of the triangulation of the three cases studied in this research. This overview enlightens the understanding of the different institutional characteristics in a society that play a role in disaster governance.

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\(^1\) International institutional development standards from for instance the UN Development Index, the OECD, Social Development Indicators and the Food and Agriculture Organization (FAO).
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<table>
<thead>
<tr>
<th>Earthquakes in Christchurch (New Zealand)</th>
<th>Salmon industry in Chiloé (Chile)</th>
<th>Earthquakes and gas extraction in Groningen (the Netherlands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well-developed (socio-political) institutions</td>
<td>Developed (socio-political) institutions</td>
<td>Well-developed (socio-political) institutions</td>
</tr>
<tr>
<td>Great (technical) expertise</td>
<td>Great (technical) expertise</td>
<td>Great (technical) expertise</td>
</tr>
<tr>
<td>Untypical place</td>
<td>Untypical disaster</td>
<td>Untypical place &amp; disaster</td>
</tr>
<tr>
<td>Prepared for earthquakes in other parts of the country, not in this place</td>
<td>Expertise in nature-induced disasters, not in human-induced</td>
<td>Expertise in water-related disasters, not in seismic disasters and not prepared in this place</td>
</tr>
</tbody>
</table>

Table 1.2: The elements in the three case-studies that influenced the creation of the disasters (source: author)

1.5.4 Methodology

In this PhD research, theoretical concepts and empirical investigation are combined to explore the relationships between governance and disasters. The methodology was centered on gathering and analyzing primary and secondary data for three in-depth case-studies. Triangulation, referring to building the research on multiple perspectives and sources, is applied with the aim to reduce bias and validate information (Flowerdew and Martin, 2005). This research applied methodological triangulation (Verschuren, 2003) in the case-studies as well as in the forms of data collection.

In particular, a multi-method approach was used to meet the main goal of finding in-depth insights into the underlying mechanisms, experiences and realities of different actors affected by a disaster. These methods comprised document analysis, participant observation and in-depth interviews. Moreover, a variety of sources and different perspectives was used in all three cases to validate research findings. These qualitative methods helped to enrich the understanding of the social relations between institutions, governance approaches and challenges in the places affected by a disaster. Prior to the empirical research, a literature study was conducted to analyze the most important concepts for researching disaster governance from a social-ecological systems perspective. Furthermore, secondary data about disasters was analyzed, such as statistics from the UNISDR on the impact of disasters on societies, the predicted influence of climate change on the frequency of hazards and disasters, and studies by NGOs on the impact of disasters on local communities. This informed the understanding of the embeddedness and (dis)articulation of post-disaster governance among local, regional, national and international levels, as well as the relationships between disaster scholarship and practice.
**Document analysis**

In all three cases, governments and/or public-private institutions created policies, plans and strategies for post-disaster recovery. For instance, a vision for recovery, new rules and regulations, and a framework to rebuild more sustainable were developed. For this PhD research, several plans were analyzed to obtain an accurate understanding of governance processes, political-institutional relationships, and democratic envisioning processes. The aim of the document analysis was to gain insights in the processes that shaped the realities of people and their actions. Moreover, it allowed the examination of dominant power relations that structure the underlying assumptions in policy documents (Rose, 2007). Furthermore, international protocols with regard to post-disaster recovery were analyzed to learn about responses to a disaster, as discussed in section 1.2.4.

In Christchurch, plans were analyzed regarding the institutional set-up and recovery of the city. In Chiloé, policies and laws regarding the institutional set-up and regulations on aquaculture provided a source for contextual understanding. However, in the case of Chiloé no specific plans were available. In Groningen, strategies were analyzed regarding the institutional set-up, policy evaluations and strategic plans.

**Participant observation**

Participant observation is used in this PhD research as a form of primary data collection. It can be characterized as an active process of participating in the study cases (Crang and Cook, 2007). Complementary descriptive evidence and a contextual understanding can be obtained by participant observation. Moreover, it allows the in-depth interpretation of a case through direct experience and the validation and enrichment of data (Crang and Cook, 2007).

For this research, the researcher attended and/or participated in public information meetings, workshops and seminars about, for instance, the recovery processes. In particular, in Christchurch several grassroots initiatives, information evenings for the recovery plans, and workshop for neighborhood reconstruction were attended. The participatory observation was aimed to get an understanding of the customs and culture of individuals and institutions interacting and taking decisions in and about (post-disaster) development paths. Moreover, several on-site visits have been undertaken to enhance the researcher’s insights in the cases. In Chile, visits to salmon farms were made and local community gatherings were observed to get an understanding of the local impact of the disaster. As the earthquakes in Groningen were still ongoing, many information evenings, workshops and expert meetings were organized at the time of this research. The meetings that were observed in this research helped (1) to get insights in the feelings and frustrations of people about (recovery) governance processes, (2) to get an understanding of the relationships between the plans that were written by authorities
and the wishes and feelings of people in society, and (3) to check and compare the data obtained from the in-depth interviews with the wishes and feelings of the general public, since for ethical reasons only stakeholders were interviewed about their formal positions in the situations.

**In-depth interviews**
The main source of primary data for this PhD research consists of in-depth interviews that were conducted in the three case-studies. In-depth interviews are a qualitative form of data collection through which insights into different opinions, perceptions, realities and experiences of actors can be obtained (Babbie, 2010). In-depth interviews offer respondents the ability to express their perceptions, opinions and emotions in their own ways rather than being guided during the interview through more structured questionnaires. Respondents are enabled to emphasize what they regard as important and can express complex personal issues. This in-depth information from a variety of involved actors informed the analysis of the cases.

The multi-level governance and social-ecological systems approaches used in this research not only structured the theoretical part of the study, they also guided the research methods. First, various public, private and civil society actors from different levels played a role in the governance processes of the disasters. The selection of interview respondents was consequently done following from these different groups of actors. Second, although this research is focused on enriching the social side of social-ecological systems and disasters by investigating governance, actors are also interviewed about the natural and technical elements of disasters. Consequently, both the theoretical foundation and the methodology follow the acknowledgement that social-institutional and natural-technical elements cannot be separated, but have to be studied in their integrality.

For the purpose of this research, 89 in-depth interviews were conducted: 40 in the case of Christchurch, 37 in the case of Chiloé and 12 in the case of Groningen. The interviews were conducted as part of fieldwork in the three countries and, therefore, took place in specific time periods during this PhD trajectory. The interviews in Christchurch were part of two research visits to New Zealand late 2012 and early 2014, the interviews in Chiloé of two fieldwork periods late 2014 and mid-2015, and the interviews in Groningen were conducted mid-2016. Besides these fieldwork periods, the developments in all three cases were followed by informal conversations, workshops, and newspapers and other online media. In this regard, it should be mentioned that the dynamic character and the constantly changing nature of the cases are important elements that might have influenced the outcomes of the interviews.
Prior to contacting potential interview respondents, a stakeholder analysis of the cases was made. In all three cases, the stakeholders were categorized in three groups: public, private and civil society institutions, and the hybrids between them. The technique of ‘snowballing’ was used: one interview often led to a contact for another interview. Although there were differences in the recruitment of the interview participants, the ‘official’ invitation for an interview was done in a structured and similar manner: first, an invitation email was sent and/or a potential respondent was called. After setting the appointment for an interview, a summary of the general interview questions as well as a consent form were sent to the respondent. The consent forms and a full list of the anonymized interview respondents can be found in appendices A.1, A.2 and A.3

The interviews were conducted in a semi-structured way. An interview guide was designed for the interviews and the researcher could follow the structure of the interview guide. However, the flexible character of the interviews allowed the researcher to elaborate more on a specific issue or to ask for more clarity when desired. The average duration of the interviews was about an hour, although some took forty-five minutes and others lasted for an hour and a half. The interview guides are as well presented in appendices A.1, A.2 and A.3.

All interviews were tape-recorded and transcribed in order to facilitate the analysis of the data. Some respondents preferred not to be tape-recorded. In this case, a summary was made of the interview. In qualitative research, transcripts are made to obtain a presentable, readable form of the tapes and to ensure an accurate source of information. According to Flowerdew and Martin (2005), transcribing makes that the researcher gets familiar again with the information obtained during the interviews, which is valuable for later steps in the research. As well, it allows less room for personal interpretation by the researcher of what is being said during the interviews (Flowerdew and Martin, 2005). The transcripts were coded to transform the data into a standardized form (Babbie, 2010). Codes were used as descriptive labels or categories that were attached to a part of the transcript or to a phrase, regardless of the length (Flowerdew and Martin, 2005). The codes were made based on the method of ‘open coding’, meaning that the researcher reads through the transcripts and writes a few words by every part of the transcript that emerge as ideas based on what is said during the interview (Flowerdew and Martin, 2005).

Triangulation was conducted for the interviews, as the validity of the information obtained through the interviews was ensured by sending the transcript or interview summary to the particular respondent in order to check if the information was correct. Also, this cross-check was a means to verify if the interviewee still agreed with what was said during the interview. In this way, it could be ensured that valid information was used for the analysis of the interviews.
Chapter I

1.6 Structure of the thesis

This PhD thesis is structured as follows:

Chapter 2 – ‘Governance in shaky societies: Experiences and lessons from Christchurch after the earthquakes’ examines the interactions between different spatial and temporal levels of governance in the face of disasters. By applying a social–ecological systems perspective to disaster governance, it argues that disasters occur through the interactions between nature and societies. The chapter provides essential insights in disaster contexts through an in-depth case study of Christchurch, New Zealand, in the aftermath of the 2010 and 2011 earthquakes. Whereas international experts usually regard Christchurch as an exemplary recovery process, people in the city experience frustration as they call for a more socially inclusive process. These diverging views can be explained by the variety of challenges that the earthquakes pose on the society and the consequent different needs and wishes related to different temporal stages and geographical areas. The chapter argues that homogenous governance approaches for post-disaster recovery for all stages and areas are inadequate, and makes a plea for hybrid governance constellations to enhance resilience and sustainability.

Chapter 3 – ‘Learning from the rubble: The case of Christchurch, New Zealand, after the 2010 and 2011 earthquakes’ focuses on one aspect of resilience: learning. Triggered by the fact that many societies are repeatedly overwhelmed by disasters, the chapter aims to find out what learning really means, which actors and institutions learn, and how learning of wider governance systems can be enabled. Arguing that learning is a central, but under-researched element of resilience, a deep analysis is conducted of what is needed to enable learning and why learning is often hindered. The many civil society initiatives that characterize the post-earthquake recovery process of Christchurch suggest that the city is recovering into a more resilient and sustainable city. However, it seems that all individual actors learn, but the learning experiences are not linked, bridged and scaled-up to wider governance improvements. This chapter contributes to a better understanding of resilience by investigating the facilitation and blockage of learning, and argues that knowledge of different actors has to be integrated in recovery processes in order to translate individual learning experiences into wider learning and to become more resilient to future disasters.

Chapter 4 – ‘The fragile resilience of the salmon industry in Chile unmasked by the ISA disaster’ further explores governance dynamics underlying the interactions between different elements of a social-ecological system. It investigates the case of Chiloé, an island in southern Chile, that was impacted by the virus Infectious Salmon Anemia (ISA) in 2007. The ISA virus disrupted the local society and caused a severe social, economic and environmental disaster. Based on in-depth interviews with a wide variety of actors
involved in the ISA disaster, the chapter analyzes the contradicting interests of different actors that seem to limit the instalment of an institutional system to support wider societal transitions. In particular, the strong biotechnological resilience of the industry, on the one hand, hinders changes aiming for resilience of the wider system, on the other. The chapter concludes by questioning whether resilience is always desirable, since resilience of some subsystems can be so rigid and resistant that it hinders other parts and the sustainability of the wider system. Consequently, it states that both adaptation and transformation are needed to enable widespread resilience and sustainability.

Chapter 5 – ‘Analyzing the social-lead up to a human-induced disaster: The gas extraction-earthquakes nexus in Groningen, the Netherlands’ enriches the understanding of disaster governance by investigating processes that generate the social lead-up to a human-induced disaster, and that are installed to deal with its consequences. Building on the understanding of disasters as being socially created, this chapter explores several dimensions to the social creation of disasters. It focuses on the case of Groningen, the Netherlands, where gas extraction leads to earthquakes, and investigates the interrelationships between different state and non-state actors in the governance dynamics that structure the processes to deal with the earthquake issues. The chapter highlights that public-private institutional structures, the nature of the disaster and societal (dis)trust are entangled in the case of Groningen. As such, these interdependencies make that both the causes of (human-induced) disasters, and the approaches to disaster mitigation, lie in these political-institutional and governance fundaments.

Chapter 6 – ‘Discussion: What disasters can tell us about governance for resilience and sustainability – A confluence of case-studies of New Zealand, Chile and the Netherlands’ highlights the insights that disasters can bring to enrich the understanding of governance. It combines the insights from chapters 2 till 5 in which three disaster cases are analyzed that all developed through the interactions between nature and society. Moreover, the chapter explores the governance changes, institutional innovations and resilience and sustainability transitions that disasters can trigger. In all three case-studies, innovative forms of governance can be observed. These initiatives range from special-purpose state institutions, to civil society initiatives to enable public participation in recovery processes. Although these forms of governance can form a fertile ground from which transitions towards enhanced resilience and sustainability can grow, these post-disaster transitions cannot always be observed. The chapter concludes by arguing that an integral understanding of disasters and governance can allow multi-level linkages and bridges between actors in different areas and from different disciplines, that are needed to enable societies to use disasters as a trigger for transitions to more resilient and sustainable societies.
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Chapter 7 – ‘Conclusions’ presents the main findings and discusses the conclusions of this research. Furthermore, the implications of this research for disaster academia are discussed, as well as the limitations of this research. Building on the limitations of this research, considerations for future research on disaster governance are discussed. The chapter finishes with presenting several policy recommendations.

Table 1.3 shows the contribution of each chapter to the research questions and domains.

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Research questions</th>
<th>Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Governance in shaky societies: Experiences and lessons from Christchurch after the earthquakes</td>
<td>What is a disaster and how do its characteristics influence disaster governance?</td>
<td>Disasters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hybrid governance</td>
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<td>Institutions</td>
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<td>Social-ecological systems</td>
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<td></td>
<td>What is the role of governance and collective social action in post-disaster recovery processes?</td>
<td></td>
</tr>
<tr>
<td>3. Learning from the rubble: The case of Christchurch, New Zealand, after the 2010 and 2011 earthquakes</td>
<td>What is the role of governance and collective social action in post-disaster recovery processes?</td>
<td>Resilience</td>
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<td>Learning</td>
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<td></td>
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<td>Public, private and civil society actors</td>
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<td></td>
<td>How do post-disaster societies learn from, adapt to and transform in response to disasters?</td>
<td></td>
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<tr>
<td>4. The fragile resilience of the salmon industry in Chile unmasked by the ISA disaster</td>
<td>How do post-disaster societies learn from, adapt to and transform in response to disasters?</td>
<td>Governance</td>
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<td></td>
<td></td>
<td>Social-ecological systems</td>
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<td>Resilience, adaptation and transformation</td>
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<tr>
<td>5. Analyzing the social-lead up to a human-induced disaster: The gas extraction- earthquakes nexus in Groningen, the Netherlands</td>
<td>What is a disaster and how do its characteristics influence disaster governance?</td>
<td>Different categories of socially created disasters</td>
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<td>Human-induced disasters</td>
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<td>Governance</td>
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<td></td>
<td>Which types of transitions can disasters and their underlying shock events trigger?</td>
<td>Public-private institutions</td>
</tr>
</tbody>
</table>

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6. Discussion: What disasters can tell us about governance for resilience and sustainability – A confluence of case-studies of New Zealand, Chile and the Netherlands

| What is the role of governance and collective social action in post-disaster recovery processes? | How do these transitions bring enhanced resilience and sustainability to societies? | Disasters  
Resilience and sustainability  
Governance  
Trust  
Disaster politics |

Table 1.3: Contribution of chapters to research questions and domains (source: author)
Chapter I

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Introduction: Disaster governance


