

# Government responses to social-ecological impacts of “dzud” in Mongolia

A qualitative case study of social-ecological resilience-  
strengthening measures

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# Abstract

“Dzud” is a unique winter weather phenomenon with devastating effects on livestock and the people of Mongolia. As climate change continues to intensify, the social-ecological impacts of dzud worsens. This qualitative case study analyses the Mongolian government’s response to dzud and its following social-ecological impacts from second-hand material. A measuring instrument based on social-ecological resilience theory was designed to answer the research question. By applying process tracing as an analytical framework, each time-period of 1999-2010 and 2010-2016 are analysed, respectively. This bachelor thesis aims at developing social-ecological resilience theory by providing an instrument capable of measuring the extent to which social-ecological resilience has been strengthened by government measures. There is little research on dzud, especially of the qualitative kind, and this thesis highlights the interplay between human and natural systems synchronously as it contributes to a limited research area. Results concluded that social-ecological resilience was strengthened to a relatively high extent during both time-periods.

*Key words:* Mongolia, dzud, social-ecological resilience, environmental governance, process tracing

Words: 9998

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# 1 Introduction

Earth is rapidly changing. Climate change and its impacts is the defining issue of our time and demands drastic adaptive measures to reduce human-nature devastation (UN, n.d.). Some countries are more vulnerable to the effects of climate change than others. Mongolia is such an example as it is warming almost three times faster than the global average (USAID, 2017). This worsens the effects of a unique weather phenomenon called “dzud”, an extreme winter weather event resulting in outspread livestock starvation and societal suffering. As climate change depletes water sources and increases drought frequency and desertification, the effects of dzud significantly worsens (Fernández-Giménez et al. 2012, 124). While it is not definitely established that climate change directly affects dzud frequency, it is still pointed out as a possible reinforcing factor. More research is needed to be able to draw conclusions (ibid.). Since 1999, Mongolia has suffered more severely from dzud than previously (Fernández-Giménez et al. 2012, 19). Regardless to what extent climate change is a major factor, coping with and adapting to an increasing frequency of dzud is an essential part of developing effective strategies to combat climate change (Fernández-Giménez et al. 2012, 14). This is due to dzud effects becoming more severe with increasing temperatures as a result of climate change (Fernández-Giménez et al. 2012, 124). Following a dzud catastrophe, the state must deal with the consequences dzud brings to society.

This thesis uses social-ecological resilience theory (SERT) as a theoretical framework in analysing how Mongolian state measures have strengthened social-ecological resilience (SER) and hence reduced the inflicted damage on society and nature by dzud. Measures between 1999 to 2016 will be analysed since three major dzud events occurred during this period, but also due to the lack of research on dzud before 1999. The political transition from communism to a market-based democracy starting in 1990 and its protracted decentralization process play a role to why this is (Mearns 2004, 133, 147).

Existing literature on resilience do not offer a practical framework on how to measure the extent to which SER measures have been implemented (Biggs, Schlüter & Schoon, 2015). This thesis aims to fill that research gap by offering a measuring instrument usable for assessing to what extent government response has strengthened SER. Dzud makes a perfect case for SERT since it is a “complex social-ecological phenomenon”, bringing social and ecological impacts (Fernández-Giménez et al. 2012, 8, 22; Munkh-Erdene et al. 2012, 548).

The introductory chapter begins with an explanation of the research problem. A segment on previous research succeeds together with a description of the purpose and the research question of the thesis.

## 1.1 Research problem

This thesis aims at contributing to the resilience theory debate and how impacts from climate change-sensitive weather phenomena such as dzud is tackled at government level. It is analysed through a SER approach within the political science field of environmental governance.

Resilience theory is a broad field that has potential to develop since there is no universal interpretation of how it is built or strengthened (SRC, n.d.; Biggs, Schlüter & Schoon, 2015). This thesis provides a much-needed precise framework for future research on how to establish the extent to which government response strengthens SER. Through scrutinizing political measures to tackle dzud and its social-ecological impacts (SEI) on society, and establishing the extent to which they strengthen SER, this thesis also emphasizes governments' crucial role in tackling challenges of extreme weather events.

This thesis does not necessarily contribute to global climate science but rather acts as a useful example and component in the development of national resilience strategies. Dzud is a regular occurrence in Mongolia and its intensity has potential to increase with climate change (Fernández-Giménez et al. 2012, 2). This stresses the importance of government coping by building resilience to effectively decrease the hazards of dzud in the future.

Analyses of government action from a resilience perspective is relevant to other climate change-vulnerable countries as well, such as Small Island Developing States (SIDS). Such resilience analyses of government measures can play an important role in developing sustainable development strategies, as well as how to manage natural hazards in especially vulnerable countries (SOPAC, n.d). The case of resilience to dzud specifically, being an extreme winter weather phenomenon, is naturally more relevant for countries with colder climates facing similar challenges like Mongolia. China is perhaps the most comparable example (Angerer et al., 2008; Duan et al., 2012).

What this thesis aims to do, is to establish to what extent the Mongolian government has responded to dzud and its SEI by strengthening SER. To the best of my knowledge, this is a research gap this essay aims to fill.

## 1.2 Previous research

Extreme weather phenomena have during the last few years gained a lot of scientific attention, especially weather events connected to drought, and heat waves as a result of global warming (Carbonbrief.org, 2020). Also, research concerning extreme hydro-climatic weather events is an increasing research area. Extreme cold weather phenomena are not getting as much scientific attention as warm weather events (ibid.). Dzud is no exception (Fernández-Giménez et al. 2012, 19, 21).

Just across the Southern Mongolian border is the Chinese province of Inner Mongolia. The natural landscape and environmental prerequisites highly resemble that of the country of Mongolia, which makes research from Angerer et al. (2008) and Lu et al. (2009) valuable for Mongolia as well (Chen et al. 2018, 13). Even though the weather disaster events basically share the same characteristics across the border, it seems like the dzud phenomenon is unique to Mongolia.

Previous research concerning dzud and its impacts in Mongolia are for the most part environmentally centred with a natural science context, often comprised of climatological data and meteorological records (Fernández-Giménez et al. 2012, 2). There is less research on the subject through a social scientific lens, however, Fernández-Giménez et al. (2012) and Chen et al. (2018) are the exceptions. Both studies analyse dzud through a SES (social-ecological systems) approach, with Fernández-Giménez et al. (2012) focusing on how local communities and herder households are affected by dzud. However, Chen et al. (2018) scrutinize five critical SES issues for Mongolia and Chinese Inner Mongolia. They both emphasize that policies need to be applied in line with, and conform to local needs (Chen et al. 2018, 1, 13; Fernández-Giménez et al. 2012, 7-8). Even though reports have been conducted on Mongolian calls for aid assistance, there is a lack of previous research on the social and economic impacts of dzud (Fernández-Giménez et al. 2012, 21).

### 1.3 Purpose & Research question

Studies reveal that there is a dire need for interdisciplinary and transdisciplinary approaches in researching the interplay between human and natural systems (Milkoreit et al., 2018; Stojanovic et al., 2016). Since most previous research on the topic of dzud has been composed of quantitative data and analysis, a qualitative case study design with focus on environmental governance with regards to dzud and its SEI is such an interdisciplinary and transdisciplinary approach. With the wide field applicability of resilience theory, together with the focal point of political action to the extreme weather phenomenon of dzud, this thesis contributes to the overall research area of human-nature interplay from a political standpoint by focusing on state response. Witnessing the ongoing devastation from the 2020 dzud, the importance of an effective state response cannot be emphasized enough. This case study hopefully contributes to the resilience response narrative to reduce the damage inflicted by dzud on the Mongolian society.

The purpose of this thesis is to analyse SER-strengthening government responses to dzud and its SEI from one period of dzud to another: 1999/2002 to 2009/2010 to 2015/2016. The purpose is not to determine the absolute levels of SER during the mentioned time-periods, but rather to look at the extent of to which SER is strengthened by the government response to dzud and its SEI. As state policy with resilience-strengthening effects decrease the extent to which society will take damage from future dzud disasters (Fernández-Giménez et al. 2012, 14), this thesis answers the following research question:

*To what extent has the Mongolian government responded to dzud and its following social-ecological impacts by strengthening social-ecological resilience from 1999 to 2016?*



## 2 Background

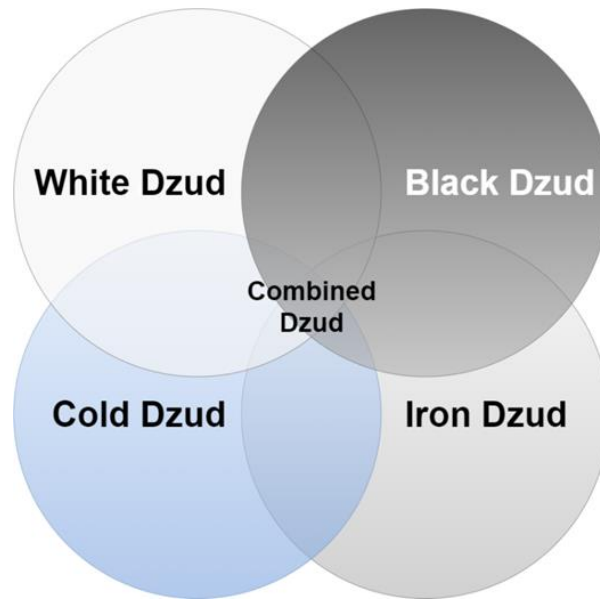
This section contains a basic depiction of Mongolia, followed by a thorough explanation of “dzud”, and its connection to climate change. Different categories of dzud are brought to attention, as well as factors triggering its intensity and impacts. Social-ecological systems (SES) and social-ecological impacts (SEI) are then explained in relation to the case study.

### 2.1 Mongolia

Mongolia is geographically massive with an area three times as large as France. Historically its inhabitants have been massively spread out over its vast plains, living nomadic lives with heavy dependency on livestock. Today 68.7% of the country’s total population live in urban areas (CIA, 2020). The capital of Ulaanbaatar is unsurpassably the largest city, housing nearly 1.6 million people out of the total 3.2 million inhabitants (ibid.). Mongolia’s geography makes it especially sensitive to global and regional climate change (Chen et al. 2018, 1).

### 2.2 Dzud

“Dzud” is an untranslatable Mongolian term in which extreme winter weather conditions leave herds with very limited opportunities for grazing, causing high livestock mortality (Fernández-Giménez et al. 2012, 2). Dzud has always plagued the Mongolian steppe and plays an important role in regulating livestock populations. However, climate change has intensified the impacts of dzud and possibly also reinforced its frequency (Fernández-Giménez et al. 2012, 124). Although Mongolia’s own greenhouse gas emissions have a marginal global effect (Mayer 2016, 239), continuous emitting of greenhouse gas emissions risks triggering further atmospheric changes which could further increase the magnitude and frequency of dzud (Fernández-Giménez et al. 2012, 2). Dzud is a climatic phenomenon with critical implications for Mongolian society and nature. Researching phenomena connected to climate change is vital if resilience strategies are to be successful. This also applies to other climate change-related phenomena, such as the 2020 locust outbreak of East Africa, and the intensification of El Niño (Stone, 2020; GFDL, 2020; Wang et al., 2019).



**Figure 1.** A display of the five different categories of dzud. Based on Leary et.al. (2008, 76).

This thesis refers to dzud as a general phenomenon, as it is broadly referred to in research. However, it is generally acknowledged that there are five different categories of dzud. All of them share the consequence of high livestock mortality (Leary et al. 2008, 76). In a *Tsagaan* (white) dzud, heavy amounts of snow cover the grass, hindering animals to graze. *Khar* (black) dzud consists of freezing temperatures and lack of snow, resulting in a shortage of running water. *Tumer* (iron) dzud covers the grass with a layer of ice as a result of melted snow which has frozen. *Khuiten* (cold) dzud amounts to a continuous very low air temperature combined with strong winds, making the animals expend most of their energy maintaining their body temperature. Lastly, there is *Khavarsan* (combined) dzud, in which at least two types of dzud appear simultaneously. This is often seen as the most devastating type of dzud (ibid.). Some literature also mentions a sixth dzud category, namely “hoof dzud” (Fernández-Giménez et al. 2012, 3, 18). It is triggered by other dzud categories and force herders to move long distances in search of forage. When large numbers of animals extemporaneously gather in one place, the combination of trampling and grazing eliminates forage which was pre-empted for other herds (ibid.).

Between 1999 and 2002 Mongolia experienced the worst period of dzud in modern history. Over half of the population was affected, wiping out 33% of the total livestock population (Groppo & Krähnert 2015, 1). 12.000 herder families lost all their animals whereas thousands more experienced major herd declines, pushing vast amounts of people below the poverty line, resulting in a 7.4% decrease in herder households (Leary et al. 2008, 77). Long-lasting dzud for three consecutive years were further triggered by droughts in the summer months. The calamity exposed the inadequacy of the Mongolian disaster relief funding, forcing the government to request international assistance (Leary et al. 2008, 77). During the 2009/2010 dzud, 40% of herding households lost more than half of their herd (UNDP & NEMA 2010, 41).

Recent years of dzud	Total livestock loss (%)
1999/2002 (3)	33%
2009/2010 (1)	23%
2015/2016 (1)	2,5%

**Table 1.** Livestock loss due to dzud in Mongolia. Sources: (IFRC, 2010; Shinoda & Erdenetsetseg, 2018; Groppo & Krähnert 2015, 1).

Since 1945 it is estimated that 14 dzud have occurred, including the 2020 dzud (Fernández-Giménez et al. 2012, 19; Shinoda & Erdenetsetseg, 2018; Allon, 2020). During the last 20 years, dzud events have reached a magnitude never earlier experienced by Mongolia, especially the dzud events of 1999/2002 and 2009/2010 (Fernández-Giménez et al. 2012, 19). The implications and state responses of the 2020 dzud are still to a high extent uncertain, making it inappropriate for analysis. This thesis will hence focus on the dzud events from 1999 to 2016 as there is enough material to enable conclusions to be drawn from that period. For the sake of clarity, the three-in-a-row seasonal dzud disasters between 1999 to 2002 are summarized as one extended dzud incident.

The large numbers of dead livestock because of combined dzud events exposes Mongolia's inability to cope with climate change and to combat its disasters (Murray et al. 2012, 500). A unique challenge to the complexity of dzud is the difficulty of measurement. Overall, there is no consensus among researchers of how dzud intensity should be measured (Groppo & Krähnert 2015, 10). Defining a dzud as 'severe' is generally based on the negative effects on society and livestock death rates, whereas i.e. the force of cyclones is measured by wind strength (Mayer 2016, 238). Dzud is a complex phenomenon with various combinations of non-linear variables, making it uncertain if its strength is defined by meteorological factors or society's level of resilience (ibid.). However, it is safe to say that the recent dzud disasters have been of substantial proportion, and that summer droughts worsen the effects of dzud (Fernández-Giménez et al. 2012, 19). Desertification and drought are dzud-accelerating effects, which increase in intensity with climate change (Filei et al. 2018, 599-605; Dorj et al. 2013, 222). Until recently it was widely acknowledged that droughts led to dzud (Benson 2011, 18; OCHA & The Government of Mongolia, 2001). However, a recent study disproves any causalities (Sternberg 2017, 27-43). Considering that a completely invalid dzud correlation was widely perceived until just recently, proves the lack of conducted research on dzud.

## 2.3 Social-ecological systems (SES)

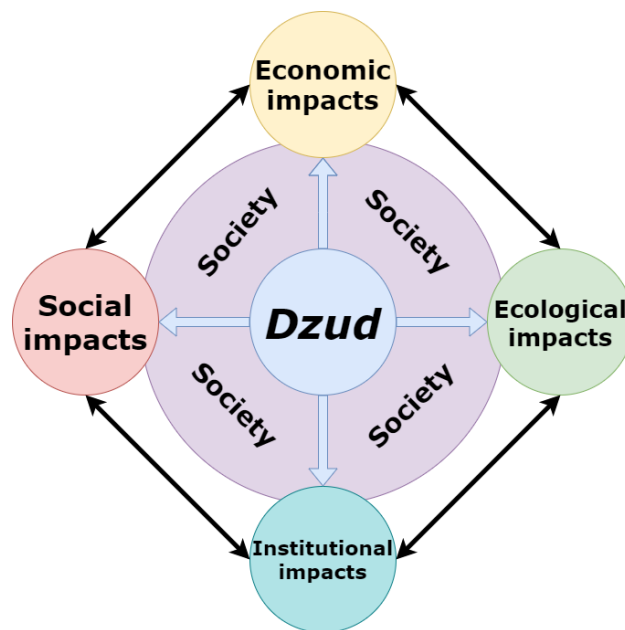
The notion and framework of social-ecological systems (SES) has been widely used within academia since 1998 in a wide array of scientific research areas, ranging from environmental and political sciences to economics and psychology (Colding

& Barthel, 2019). SES is a conceptual framework for the social subsystem of institutional management practises and the ecological subsystem of ecosystems (Colding & Barthel, 2019; Folke & Berkes, 1998). These two subsystems correlate through ecological knowledge and understanding, creating an interlinked social-ecological system (ibid.). The reason for why the term ‘social-ecological’ is used instead of ‘socio-ecological’ is because “social-ecological emphasizes that the two subsystems are equally important, whereas socio- is a modifier, implying a less than equal status of the social subsystem” (Berkes 2017, 3).

SES governance is primarily permeated with discourses on how to respond to SEI. In practise that is done through politics, or more specifically, policymaking (Orach & Schlüter 2016, 21-22). SES and political science are eminently correlated, and the importance of addressing socio-political contexts in SES through political theory is increasingly raised in recent research (Orach & Schlüter 2016, 14).

In this thesis, Mongolia will be identified as a SES, thereby recognizing the existence of a social subsystem and an ecological subsystem in Mongolia. The thesis underlines that the interlinkage between the two subsystems is being tested by dzud. Dzud can henceforth affect the entire SES through its SEI. In Fernández-Giménez et al. (2012), “Mongolian Pastoral SES” with focus on herder households are analysed. Despite a country being a rather abstract concept, resilience in a SES can be applied equally well to countries (SOPAC, n.d.). By recognizing the social-ecological relationship in Mongolia as a connected SES, the SEI of dzud become more apparent.

## 2.4 Social-ecological impacts (SEI)



**Figure 2.** The interconnected direct/indirect social-ecological impact areas of dzud. Based on and modified from Hummel et al. (2006, 26).

Dzud is characterized as a “complex social-ecological phenomenon”, which implies that Mongolia’s level of resilience to withstand dzud is a function of social, institutional, and economic factors (Fernández-Giménez et al. 2012, 8). Dzud also has ecological and environmental impacts, both direct and indirect (Munkh-Erdene et al. 2012, 548; Fernández-Giménez et al. 2012, 22). The affected areas also interact with each other, ensuing in direct and indirect influences. It is safe to say that dzud impacts both social and ecological parts of society, hence the phrase “social-ecological impacts”.

**Social impacts:** Dzud brings severe social consequences, such as the triggering of a “phasing out”-process of Mongolian traditions. This is associated to the significant effect dzud has on internal migration in Mongolia. The extreme weather condition triggers “large-scale migrations of people to urban and peri-urban areas” (Fernández-Giménez et al. 2012, 22). Rural households celebrate traditional festivals to a higher extent than in urban areas (Lehman-Uchner & Krähnert 2015, 16), meaning that urbanization can lead to a decrease in the maintenance of cultural traditions. Furthermore, Mongol culture is permeated by the notion that herding is an element of “true Mongolness” (Lehman-Uchner & Krähnert 2018, 23). In other words, herding as a profession and lifestyle is generally highly regarded in society. Evidence shows that abandoning herding is not a voluntary decision as it entails a loss in social status. Dzud therefore brings a social cost in addition to asset losses (ibid.).

Social impacts also develop as part of reduced financial income for herder households as another consequence of dzud. This affects children through malnutrition and psychological stress, which in turn can decrease the attention span and obstruct learning (Groppo & Krähnert 2015, 7). Additionally, there is an imminent risk of child labour, as dzud often requires additional labour within herder families (ibid.). Children are in this sense especially vulnerable when it comes to SEI of dzud. Research shows that children in herding households, especially boys, experience less optimal physical growth during dzud disasters (Groppo & Krähnert 2014, 7-8). This entails long-term effects which influence society as a whole, especially in rural areas. Studies show that malnutrition at an early age is associated with a lower level of education, shorter physical stature, and generally poorer health as adults, as well as lower lifetime earnings. These consequences can be expected in nomadic families suffering from dzud (ibid.). Reports also show social problems among adults in herder households, mainly an increase in suicide and alcohol abuse in correlation with the 2009/2010 dzud (Siurua & Swift 2009, 88-97).

**Institutional impacts:** Institutional impacts include various challenges which have surfaced in dealing with the inflicted societal damage of dzud. This includes defective strategies of collective action and communication, emergency governance measures and legal constraints (Fernández-Giménez et al. 2012, 22). This limits capacity-building for community institutions, implying lack of information, technology, labour, and incentives, both locally and nationally (Fernández-Giménez et al. 2012, 9). Institutional impacts are hence not directly inflicted by dzud itself but rather a consequence of human response or nonresponse to dzud impacts. The institutional perspective is however in this way essential in the definitive societal damage and can be indirectly connected to dzud.

**Economic impacts:** Research finds the economic effects of dzud to be of a persistent character. Several years after a dzud disaster, herder households are still negatively affected by high debt, lack of access to technology, lack of insurance, and poor access to markets (Lehmann-Uchner & Krähnert 2018, 3; Fernández-Giménez et al. 2012, 4). The nomad population have in some occasions reduced the number of livestock as a mitigating strategy to counter the consequences of dzud. However, it has mainly resulted in a persistent chock of livestock fertility. This failed resilience strategy only brings larger financial losses and forces additional herders to leave the herding economy, resulting in an overall welfare loss for Mongolia (Lehmann-Uchner & Krähnert 2018, 3). After a dzud, unemployment and poverty rise in the urban areas due to nomadic people looking for better prospects in the cities (ibid.).

**Ecological impacts:** Broadly speaking, there are two layers of ecological and environmental impacts. One is directly linked to dzud, mainly the lack of water, lack of pasture lands, and lack of diversity of natural habitats (Fernández-Giménez et al. 2012, 5). Dzud also serves as a natural ecological function through its livestock mortality. This has an ecological impact on the natural environment as it allows pastures to regenerate (Fernández-Giménez et al. 2012, 22). Another environmental impact caused by dzud is the social phenomenon of urbanization. Studies show that as the urbanization process to Ulaanbaatar continues because of dzud, the environmental effects intensify (Munkh-Erdene et al. 2012, 548). In Ulaanbaatar, the most notable environmental effect is the increasing air pollution. Being the coldest capital city in the world with temperatures as low as -40 degrees Celsius in winter brings unique challenges (Munkh-Erdene et al. 2012, 542). Ground pollution and deteriorating waste management are also major environmental impacts of the increasing urbanization (Erdenechimeg et al. 2018, 382).

# 3 Theory

In this section, social-ecological resilience theory (SERT) is explained together with resilience thinking as a whole. Its principles and relevance to dzud is also discussed. To explain how SER can be theoretically applied, a framework based on SERT is demonstrated in chapter six: “Research Design”.

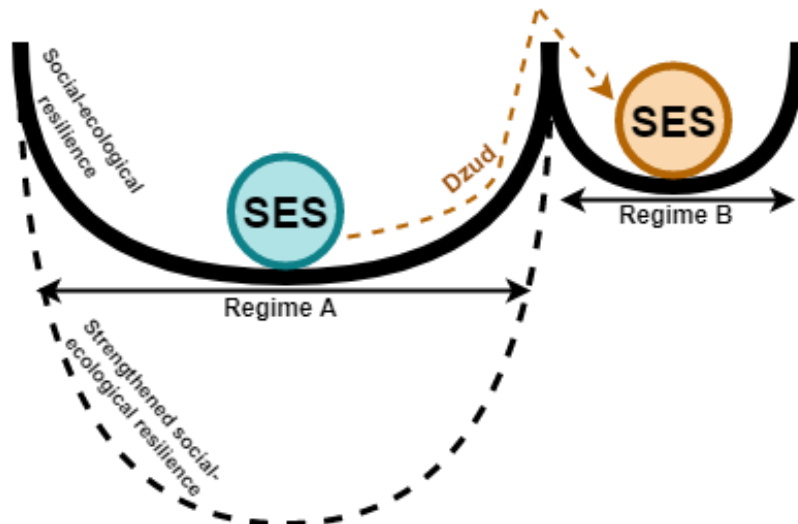
## 3.1 Social-ecological resilience theory (SERT)

Resilience can in sum be defined as the capacity of a system to deal with change, particularly unexpected change, and the way it continues to develop (SRC, n.d.). Resilience is about withstanding shocks and major disturbances within these systems, and how to use the shocks to the system’s advantage by encouraging innovation, or as Folke (2009) prefers to put it: “Resilience, above all, is about turning crisis into opportunity.”

An essential component to resilience theory is that we are always situated in a state of equilibrium, meaning that our system is “in balance” (ibid.). However, a system in equilibrium with strong resilience does not necessarily imply that it has good properties as highly degraded ecosystems still can be very resilient (Fernández-Giménez et al. 2012, 15). Resilience solely aids in avoiding tipping over from a state of equilibrium, due to a triggering factor, to another state of equilibrium, of which the new state is deemed undesirable (Beymer-Farris et al. 2012, 283). From a SER perspective, a state is considered undesirable when the system no longer can provide ecosystem services for the well-being of society (ibid.).

Three features are essential for resilience theory: persistence, adaptability, and transformability (Folke, 2009). Resilience, after all, aims at answering: “How can societies persist and adapt in order to avoid tipping over critical thresholds into undesirable situations? When a shift into an undesired regime appears inevitable (or has already occurred and is irreversible), how can SES transform to fit the new circumstances?” (ibid.). A contemporary example of transformability is the endeavour of replacing fossil fuels with renewable energy to fit with the circumstances of climate change. Persistence, adaptability, and transformability interact on both local and global scales. Resilience can be applied to two kinds of systems: human systems and social-ecological systems (SES) (ibid.).

The concept of resilience has just recently reached policymakers. Benson and Craig (2014, 4) argue that resilience theory is at a critical stage in terms of its theoretical development and practical application. They fear that resilience might end up a hollow concept, just as ‘sustainability’ has become a rhetorical tool providing little answers on actual political decision-making. What exactly is to be sustained? They continue to argue that the pursuit of the UN sustainable development goals has not yet resulted in effective mitigation of climate change (Benson & Craig 2014, 778). The concept of resilience, on the other hand, embraces the complexities of SES and puts emphasis on “adaptive capacity and adaptive management rather than stationarity” (Benson & Craig 2014, 779). However, perhaps the most important component of resilience theory, is its recognition of regime changes, that a state of equilibrium can change to the better or worse. This brings a unique and much needed realistic approach for today’s environmental governance (Benson & Craig 2014, 778-779). This thesis provides a theoretical framework on how governance can be practically analysed from a SER perspective, and hence contributes to the overall theoretical development of resilience theory.



**Figure 3.** Social-ecological resilience theory displayed, with dzud being the triggering factor to potentially cause a regime change to a new state of equilibrium. Based on and modified from: (The Conservation of Change Lab, n.d.; SRC, 2016).

As previously mentioned, resilience can be applied to human systems and SES. SERT is the branch of resilience theory which analyses the structure and function of a SES (Garmestani et al., 2019; Beymer-Farris et al. 2012, 283). It is both social and ecological as a potential shift to a new state of equilibrium have critical implications for both human well-being and nature. The social and ecological are connected since humans’ resource management of ecosystem services are provided by nature (Garmestani et al., 2019). SERT is applicable to Mongolia since dzud acts as the triggering factor in tipping over the SES into a new state of equilibrium. By recognizing Mongolia as the SES, a real case demonstration of how the relationship between a SES and a triggering factor is illustrated. Also, as dzud events are uncontrollable and unlimitable, strengthening SER is the most sensible option to approach and reduce the consequences of dzud (Fernández-Giménez et al. 2012, 15-16). SER is strengthened by increasing the capacity of the SES to cope and adapt



to dzud (Beymer-Farris et al. 2012, 284-285). In the case of Mongolia, its overall level of resilience to meteorological change depends on government measures to provide tools for strengthening SER for herder households. The SES either succeeds in remaining in the same state or a regime shift to a new ecological state is realized (ibid.). Seeing that research recognizes dzud as a “major disturbance that affects Mongolian pastoral systems frequently” (Fernández-Giménez et al. 2012, 22), makes it a perfect research case for SERT.

## 4 Material

The research which the analysis is based upon originates from Nachmany et al. (2015), Benson (2011) and Hannam (2014), as well as the Red Cross (2010). Nachmany et al. (2015) are researchers at Grantham Research Institute and have studied Mongolian climate change legislation, whereas Benson (2011) looks at dzud disaster financing and response on behalf of the World Bank. Hannam (2014) is an Associate Professor at the Australian Centre for Agriculture and Law and has studied legal and policy aspects of rangeland management in Mongolia. Climate scientists Fernández-Giménez et al. (2012) are the major contributors of the SES-perspective and SEI.

The conclusion is not based on the selected researchers' own conclusions but rather on how the elaborated theoretical framework put these empirical results into the analytical process. In a way, only having access to second-hand material can be considered a limitation for the thesis. Additionally, even though research on dzud is limited, there is of course a risk that empirical evidence important for answering the research question has been overlooked, hence affecting the pertinence of the results. Access to governmental sources were extremely limited, partly due to malfunctioning websites, however mostly due to limited material in English. Improving the material in identifying the causal mechanisms would require first-hand information, preferably from government officials and local organisations. Nonetheless, with limited time and resources, the material instead relies on researchers whose experience and expertise surpasses my own.

## 5 Method

This section begins with presenting qualitative case study as the method of choice. An explanation for why qualitative research is chosen over other methods of research is also put forward, including a discussion on the time framing.

Qualitative research on dzud is limited, as most studies are of a quantitative methodology (Fernández-Giménez et al. 2012, 2). Quantitative research on dzud is rarely social scientific, but rather possesses a natural science focus since dzud is a meteorological phenomenon (ibid.). This leaves space for qualitative case studies analysing political measures to tackle impacts of dzud. Due to the covid-19 infection, field studies in Mongolia became an impossibility. Hence, a qualitative case study is under the circumstances the most realistic choice of method.

The main qualitative factor to this thesis is the “social-ecological impacts” of dzud. There is no reference book evidently stating all the SEI of dzud, but rather a number of qualitative studies conducted on the theme (Erdenechimeg et al., 2018; Munkh-Erdene et al., 2012; Fernández-Giménez et al., 2012; Lehmann-USchner & Krähnert, 2018; Groppo & Krähnert, 2014; Siurua & Swift, 2009). The specific SEI this thesis chooses to highlight is based on self-perceived result patterns found in previous studies on impacts of dzud. It is on these SEI the analysis on government responses will be based. With that said, this thesis uses qualitative methodology, as the key variables are selected through a qualitative selection of various resilience studies. The operationalization of the key variables is conducted through a “social-ecological resilience scale”, a designed theoretical framework capable of establishing to what extent SER has been strengthened. It is designed based on qualitatively selected variables scientists deem important for strengthening SER. The framework enables an explicit answer to the research question. The analysis is based on theory-building process tracing, an inductive approach when theory arises from the material and the result of the research (Beach & Brun Pedersen 2016, 16-18).

This thesis is a qualitative case study on the Mongolian government’s responses to dzud and its following SEI with a SER approach. By studying how the government responded to dzud and its SEI between 1999 to 2016 through a custom developed research design, the SER effect of the responses can be concluded. Focus is on government responses from 1999 to 2016 since research on dzud earlier than 1999 does not seem to exist or is very limited.

Mongolia experienced a major political transition in 1990 as the communist system was abolished for a market-based democratic system (Mearns 2004, 133). This included extensive and far-reaching political and economic reform, mainly including a period of decentralization. The latter refers to formal transfers of power to regional and local actors (ibid.). During the 1990s transition, herder families more than doubled, simultaneously as rural vulnerability increased (Mearns 2004,

147). It would be inappropriate to measure government measures to dzud impacts occurring during the communist era and during the most intense decentralization period of the 1990s since the time offered completely different structural opportunities.<sup>1</sup>

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<sup>1</sup> See Chapter 10: “Recommendations for Future Research”

## 6 Research design

This section contains a detailed description of the two research frameworks. Namely, the social-ecological resilience scale (SER-scale) and theory-building process tracing. The description is followed by a summary of the research design as to further clarify its structure. Finally, a discussion on the validity and reliability of this thesis encases this chapter.

### 6.1 Theoretical framework: Social-ecological resilience scale

This segment will deduce how SERT is theoretically and practically applied to the Mongolian government's response to dzud and its SEI. In sum, a presentation of the applied theoretical framework.

This thesis investigates to what extent the government responded to dzud and its SEI by strengthening SER through a SER-scale. However, resilience theory does not provide a universal mechanism in how resilience can be strengthened through policy (Anderies et al., 2006). Also, resilience-strengthening recommendations for governments from resilience theorists vary in theoretical applicability. Henceforth, three variables important for strengthening SER in SES through government measures have been selected. Namely, 1) embracing adaptive governance, 2) implementing reflexive law, and 3) bridging organizations and networks. These key variables originate from work by environmental scientists such as John Anderies from Arizona State University, Brian Walker from Australia's National Science Research Agency (CSIRO), and Ahjond S. Garmestani from the US Environmental Protection Agency, among others (Anderies et al., 2006; Garmestani & Benson, 2013).

Embracing adaptive governance	Yes	Yes	Yes	No
Implementing reflexive law	Yes	Yes	No	No
Bridging organizations and networks	Yes	No	No	No
<b>Strengthening of social-ecological resilience:</b>	<b>High</b>	<b>Relatively high</b>	<b>Relatively low</b>	<b>Low</b>

**Table 2.** An example of how SER is operationalized through the social-ecological resilience scale.

SER will be operationalized through these three variables from one period of dzud to another, 1999/2002 to 2009/2010 to 2015/2016. If all three variables were pursued by the Mongolian government during the examined time-period, the extent

to which the government responded to dzud and its SEI by strengthening SER is established as high. If the analysis results in only 1/3 pursued variables, the scale establishes the extent to which the government strengthened SER to be relatively low. With 2/3 successfully pursued variables, SER was strengthened to a relatively high extent. Finally, if no variables were realized, SER was strengthened to a low extent.

By rating the extent to which SER was strengthened with ‘relatively high/low’ instead of i.e. ‘constant’ results in a fairer conclusion. There should be a difference in the result if one *or* two variables were pursued. Hence, the term ‘relatively high/low’.

**Adaptive governance:** Several case studies prove there is a great need for adaptive governance in managing “with and for change, rather than against it” when enhancing adaptability and transformability (Anderies et al., 2006). What embracing adaptive governance implies, is introducing “flexible, dynamic, institutional and governance structures” to tackle the issue at hand within a SES (ibid.). Olsson et al. (2006) executed several case studies within this area, including on Kristianstads Vattenrike in Sweden, which concluded that adaptive governance was embraced primarily by local entrepreneurs. This thesis will analyse whether and how the Mongolian government structurally adjusted its organization to improve flexibility in order to effectively respond to dzud and its SEI in the SES.

**Reflexive law:** Rapid environmental change requires swift action and a reformed organizational arrangement capable of quick responses. Reflexive law is such a tool (Garmestani & Benson, 2013). Reflexive law is also helpful in the way that an ever-developing process in law- and policymaking is maintained. Implementing reflexive law as a way to respond to SEI also establishes a new organizational norm, which in turn can encourage swift and reflexive laws as a tool to further strengthen resilience in the future. In sum, reflexive law allows regulation to deal with environmental problems (ibid.). For example, Braunig (2005) has argued for reflexive law as an information-based regulatory tool to combat factory farm pollution in the US. Reflexive law is hence a recurrent tool within climate research. This analysis will examine if the Mongolian government implemented reflexive law as a tool to combat dzud and its SEI and hence strengthen SER of the SES.

**Bridging organizations and networks:** Another method to improve environmental governance and strengthen SER of a SES is bridging and including organizations and networks in combating SEI of dzud (Garmestani & Benson, 2013). Intermediaries of informal networks and organizations with societal influence, aid in bridging the disconnection between science and environmental management at policy-level. Such an inclusion raises the capacity to create improved policy as a feedback relationship develops between experts and policymakers, simultaneously as it encourages learning (ibid.). The opportunities of communication due to the bridging of organizations and networks is pointed out as essential for managing resilience (Prager 2010, 722; Garmestani & Benson, 2013). The analysis will explore if the Mongolian government actively pursued a cooperative relationship with organizations, and bridging them as a strategy to

increase the capabilities to effectively combat dzud and its SEI, and hence strengthen SER.

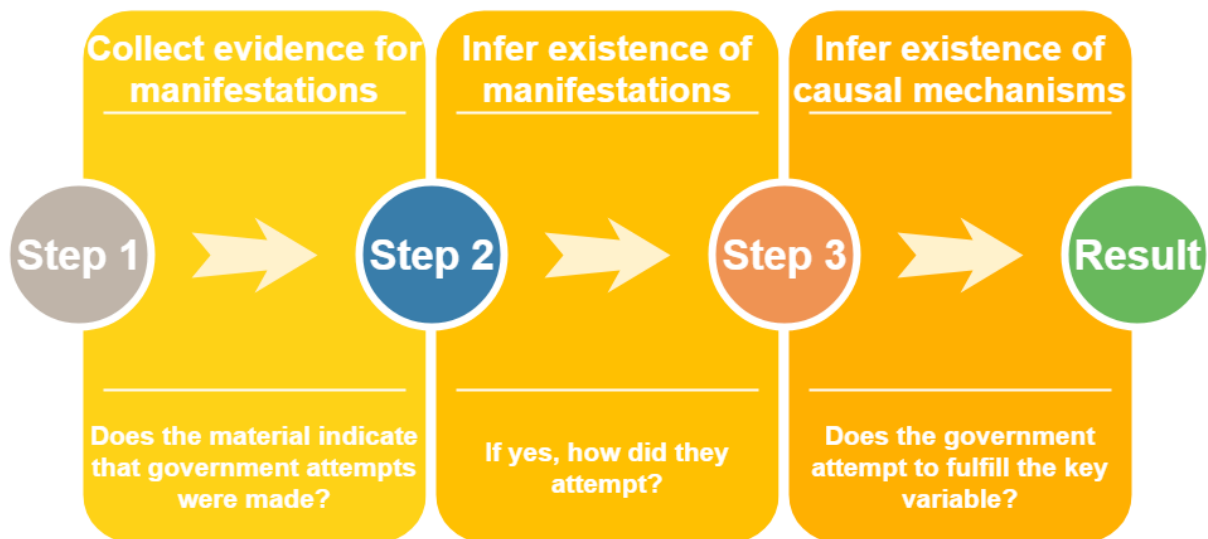
## 6.2 Analytical framework: Process tracing

Applying theory and defining the key variables is one segment, analysing the process of realizing the key variables is another. Here, process tracing is introduced as an analytical framework to enable formulating the procedure in the pursuing of the key variables.

Process tracing is a qualitative analysis methodology which establishes whether, and how, potential mechanisms induce change (INTRAC, 2017). The mechanisms examined by process tracing are evaluated on a lower level of analysis than the key variables of research (Teorell & Svensson 2016, 249). Process tracing is applicable to case studies as it makes within-case inferences about existing or missing variables (Beach & Brun Pedersen 2016, 9-10). In the case of dzud, whether the government responded to dzud and its SEI in a way that strengthened SER, the overall focus on the key variables of 1) embracing adaptive governance, 2) implementing reflexive law, and 3) bridging organizations and networks, will instead be shifted to the government response process.

Process tracing can be applied for three different research purposes (Beach & Brun Pedersen 2016, 9-10). This thesis will apply *theory-building process tracing* (TBPT) because it seeks to build a theoretical explanation from empirical evidence to identify mechanisms, and subsequently develop a theory (Beach & Brun Pedersen 2016, 16-18). Government measures are analysed and identifies possible attempts to strengthen SER by looking at the three key variables. If causal mechanisms are found, or in other words, if the government strengthened SER by attempting to fulfil the key variables, TBPT stimulates the development of SERT.

TBPT comprises three practical steps to analyse within-case inferences (ibid.). The first step collects facts about the case. Namely: “*Are there* any observable manifestations that the government attempted to respond to dzud and its SEI by fulfilling [insert key variable]?”. If indeed there is empirical material suggesting that it might have been attempted, the analysis continues with the second step: “*How does* the government attempt to respond to dzud and its SEI by fulfilling [insert key variable]?”. Finally, after analysing how it was attempted, step three infers the existence of the causal mechanisms by asking the question: “*Does* the Mongolian government attempt to effectively respond to dzud and its SEI by fulfilling [insert key variable]?”. The last step conceptualises the causal mechanism at play by looking at the actors involved and how the measures were conducted. However, case studies rarely follow this specific analytical narrative to the letter since the analytical process relies on a varying access of material (ibid.).



**Figure 4.** Theory-building process tracing. Based on: (Beach & Brun Pedersen 2016, 16-18).

Since it is not certain that government responses to fulfil key variables were made at all, TBPT is more applicable to the case study than the process testing alternatives. *Theory-testing process tracing* is a deductive framework which already establishes a correlation between government measures and the key variable, whereas TBPT examines the facts before building a theory (Beach & Brun Pedersen 2016, 15, 16, 21). *Explaining-outcome process tracing* examines a historical outcome and analyses why it occurred (Beach & Brun Pedersen 2016, 18-21).

Of course, process tracing is not flawless since it never can be ruled out that factors not touched upon in the analysis also come into play (Teorell & Svensson 2016, 261). Furthermore, the analytical framework is already based on a pre-determined theoretical approach and its following defaults. TBPT-studies do not claim the detected causal mechanism, in this case government measures tackling dzud and its SEI by fulfilling key variables, to be sufficient in explaining the overall outcome (Beach & Brun Pedersen 2016, 16). However, it is still highly useful as it seeks to develop a theory by describing a causal mechanism of which the process can be generalized to fit other cases as well (ibid.). The framework of this thesis can hopefully assist in the development of SERT and resilience-based governance. Henceforth, TBPT aids in developing SERT by displaying how it can be applicable analytically. As this thesis aims at developing theory and analysing a process of implementations, TBPT makes a perfect analytical tool. Additionally, process tracing has proven itself of being a useful analytical framework in qualitative case studies specifying on policy (Kay & Baker 2015, 1, 18)

## 6.3 Summary of the Research design



The research design consists of the SER-scale as theoretical framework, as well as the analytical framework of TBPT.

In sum, the SER-scale establishes how SERT can be applied to the case study through an operationalization of the chosen three key variables. Whereas TBPT foremost establishes whether the material indicates that X (the Mongolian government) correlated with Y (key variable). In other words, whether the material indicates that the government attempted to fulfil a key variable or not. If such a causality is suspected, TBPT proceeds by investigating how such an attempt was carried through. Finally, TBPT concludes whether a causal mechanism exists between X and Y, namely if the government actively attempted to fulfil the key variable. Lastly, a conclusion of the extent SER was strengthened in the SES to combat dzud and its SEI, can be drawn from the TBPT-analysis and the SER-scale.

## 6.4 Validity and Reliability

Before conducting the analysis on how the Mongolian government responded to dzud and its SEI in the light of SERT, a remark concerning the validity and reliability of this thesis is needed.

Social science subjects are often observed indirectly and involve complex phenomena (Teorell & Svensson 2016, 55). The theme of this thesis is not an exception. In order to analyse government responses linked to abstract phenomena such as climate change, urbanization, culture, and dzud in particular, the potential causal mechanisms are operationalized in a processable manner in the analytical framework. Operationalization always brings uncertainties, especially when connected to the subject of dzud, since the phenomenon is described as ‘untranslatable’ (Mayer 2014, 2). It is simply through translated explanations that dzud becomes researchable. No indicator connected to dzud is able to provide an unambiguous reflection of its characteristics. Just as many people would characterize a country as democratic simply because elections are held, does not necessarily mean that the country is democratic per se (Teorell & Svensson 2016, 55). The definition of validity is the absence of systematic errors. In other words, the study measures what it claims to be measuring, and hence, securing a solid connection between the theoretical conceptualization and the conducted operationalization (ibid.). As this thesis codes to what extent SER was strengthened through a theoretical scale model based on SERT, the theoretical definition correctly corresponds to the operational indicator. In sum, the validity of this study is to a high extent adequate since it would be impossible to measure something else with a framework specifically designed to measure the extent dzud and its SEI are tackled by strengthening SER.

The SER-scale provides a framework for how the key variables should be operationalized, but in the end, it is a question of qualitative interpretation of how the researcher chooses to decipher the material. This is especially relevant to the key variable of “embracing adaptive governance”, since the signification of “embracing” is relative – even though there is an explanation of what that key

variable implies: “embracing flexible, dynamic, institutional and governance structures” (Anderies et al., 2006). With that said, the reliability of this thesis is likely to be limited since a complete absence of unsystematic errors cannot be guaranteed, due to the relative vagueness of how the key variables could be interpreted in practise. This implies that the same result is not unconditionally insured if this study were to be conducted again (Teorell & Svensson 2016, 59).

# 7 Analysis and Results

In this section, Mongolian state response relevant to dzud and its SEI in strengthening SER in line with the key variables of 1) adaptive governance, 2) reflexive law, and 3) bridging organizations and networks, will be put forward and analysed through TBPT. The first two steps of TBPT are processed in the analysis, namely: 1) if the material indicates that attempts were made, and 2) if yes, how were they attempted? The third step, stating whether the key variables were pursued, is demonstrated in the results. The period of 1999/2002 to 2009/2010 is first analysed, followed by 2009/2010 to 2015/2016. Lastly, the results from the analysis is presented based on the SER-scale.

## 7.1 Dzud 1999/2002 to Dzud 2009/2010

**Adaptive governance:** As the first step in TBPT; Nachmany et al. (2015) and Benson (2011) provide evidence indicating that government attempts were made to implement some sort of adaptive governance.

With the implementation of the Law on Disaster Protection, the government expanded the responsibility of disaster response to municipal level as to effectively target aid at grassroots level (Nachmany et al. 2015, 10). Aid at local level benefits and develops community institutions affected by dzud. However, the government chose not to provide financial capital for municipal disaster response. The state only financed disaster protection activities on national and regional level (Nachmany et al. 2015, 10; Benson 2011, 17). From a local governance perspective, this is problematic since the municipalities are required by law to use their very limited funds for various other environmental responsibilities (Benson 2011, 26). This limits to a certain extent local disaster response (ibid.).

In 2004, the Deputy Prime Minister merged the State Board for Civil Defence, the Fire Fighting Department, and the State Reserve Agency in order to establish the National Emergency Management Agency (NEMA) (Benson 2011, 15-16). NEMA developed frameworks for disaster risk reduction (DRR) and national action plans. It also piloted Community-based Disaster Management Systems and established DRR Partnership Councils on a local level, including 30 herder groups as primary community-based organizations (CBO) for DRR (ibid.). These CBOs participated in NEMA's "National Program on Public Awareness for Disaster Prevention" and for the improvement of the disaster communication and information system (ibid.). On top of this, the government together with development partners have been engaged in development programs to enhance herder resilience to dzud (Benson 2011, 17-18).

**Reflexive law:** Nachmany et al. (2015) and Hannam (2014) present three resilience-strengthening laws, indicating that the government made serious effort in strengthening SER through the implementation of reflexive law. However, only one of them is directly connected to the SEI of dzud specifically, namely the Law on Disaster Protection from 2003 (Nachmany et al. 2015, 9-10). Its purpose is to “prevent, protect and rescue people, livestock, properties and environment from the impact of disasters and to limit their consequences, to facilitate rapid recovery and to train the public for these activities” (ibid.). In order to implement efficient disaster protection activities in line with the Law, the state administrative organization spread out employees all over the country, streamlining state disaster response (ibid.).

Another noteworthy example is the 2008 environmental law investigations, where a new “Natural Resource Management” legislative and institutional administration was identified as the primary agency for managing Mongolia’s natural resources (Hannam 2014, 160). Such an agency was to become an improvement of the old system and could ease the SEI of dzud as implementations of environmental management laws would become administratively clearer. However, nothing practical came about the investigations (ibid.).

**Bridging organizations and networks:** There are no clear indicators that the government strived towards bridging organizations and networks during this time. This can also be said about the legislative body itself. Mongolia had to a large extent issues with distributing ecological responsibility among its own governmental organizations and ministries (Hannam 2014, 159). Areas of agriculture, infrastructure, and energy received almost all environmental attention. Natural resource management, on the other hand, received little attention despite its relevance to all environmental sectors (ibid.). This included the issue of overgrazing.

## 7.2 Dzud 2009/2010 to Dzud 2015/2016

**Adaptive governance:** Nachmany et al. (2015), Hannam (2014) and Benson (2011) provide several indicators of the pursuing of adaptive governance in the empirical evidence.

In 2011, the National Action Programme on Climate Change was implemented which promotes adaptation capacities to climate change and protects the ecosystem (Nachmany et al. 2015, 11). It also promotes awareness on many levels of Mongolian society with ecological balance in society being the final goal. The policy is during the time of writing in its second phase (2017-2021) of implementing adaptation and mitigation measures (ibid.), hence strengthening SER.

A Climate Change Co-ordination Office has also been installed to “carry out the activities necessary to implement the commitments and duties under the UNFCCC and the Kyoto Protocol” (Nachmany et al. 2015, 4). One area of responsibility includes integrating climate issues in more sectors and governmental

bodies (ibid.). This can be seen as an improvement from the previous dzud period when environmental responsibility was more unbalanced (Hannam 2014, 159).

In 2014, Mongolia implemented the Green Development Policy. (Nachmany et al. 2015, 10-11) It also expanded protected nature areas. The policy also aims at reclaiming 70% of the polluted, degraded, and abandoned land areas (ibid.). Since a major SEI of dzud include lack of fresh water and grazelands (Fernández-Giménez et al. 2012, 124; Leary et.al. 2008, 76), such policy is essential in tackling the SEI of dzud.

Local engagement from NEMA has actively worked with herder families in order to protect children from child labour, with focus on school enrolment specifically for children from herder families (Benson 2011, 27). Such engagements target social impacts of dzud in particular.

**Reflexive law:** Nachmany et al. (2015), Hannam (2014) and Gankhuyag (2018) illustrate that the government implemented at least two major laws specifically designed to ease the SEI of climatic changes, including dzud. As previously mentioned, Ulaanbaatar is experiencing heavy pollution as a result of extensive urbanization, partly due to dzud. As a response, the government implemented the Law on Air Quality in 2012 which directly regulates pollution levels nationwide (Nachmany et al. 2015, 8). A task force is running inventory of the greenhouse gases emitted with the aim to be in line with the approved methodology of the United Nations Framework Convention on Climate Change (UNFCCC). Simultaneously as the Law on Air Quality was introduced, the Law on Soil Protection and Prevention of Desertification was implemented. It includes measures to prevent desertification from both human and natural sources, as well as providing direct guidance to the rural population on how to prevent overgrazing, soil erosion and desertification (ibid.). The law hence restrains major dzud-accelerating effects and eases the SEI.

Since 2007, the so-called 'Pastureland Law' has gone through extensive public and parliamentary debate but has still not been implemented as of 2018 (Hannam 2014, 161; Gankhuyag, 2018). It contains a vast amount of proposals, including tax relief for struggling herders, an implementation of a livestock risk fund, but also the general aim of improving social security, legal protection, business environment, and employment opportunities for herder households (Hannam 2014, 161). The main obstacle for its implementation is not political opposition, but rather legal difficulties in establishing such a law in a relatively unregulated pastureland user system (ibid.). Seeing as it has been on the agenda for many years, it can be said that the government has indeed attempted to implement such a reflexive law.

**Bridging organizations and networks:** Initially, Nachmany et al. (2015), Benson (2011) and IFRC (2010) seemed to possibly indicate that government bridging of organizations occurred because organizations and networks based both inside and outside of Mongolia to a high extent organized aid and relief in the aftermath of the 2009/2010 dzud.

The government called for international aid, and several organizations responded. The Mongolian Red Cross was also invited as a civil society member in the State Emergency Commission together with government officials (Benson 2011, 16). State coordination of organizations and networks were nonetheless non-

existent due to the lack of an information-sharing mechanism. This forced actors to focus on individual coordination efforts instead of a joint response (IFRC 2010, 3).

An intergovernmental bridging example involves the Climate Change Coordination Office (CCCO), in which key officials from all related governmental ministries and deputy ministers of Mongolia are represented (Nachmany et al. 2015, 4). However, this only includes governmental ministries and does not fulfil the qualifications of bridging intermediaries of informal networks and organizations (Nachmany et al. 2015, 4; Garmestani & Benson, 2013).

Many NGOs and bilateral and multilateral agencies were indeed active in the 2009/2010 dzud response (Benson 2011, 20), however, the Mongolian government did not actively pursue a cooperative relationship by bridging organizations and networks on the ground. The government did however, appeal to the international community for support, of which UN agencies started the coordinated disaster response and donor contributions (Benson 2011, 18). The government henceforth submitted the major responsibility of disaster response to the UN, which in turn engaged in bridging UN agencies for a coordinated response to the dzud (Benson 2011, 38; IFRC 2010, 3). If NGOs indeed were actively encouraged and included in a coordinated manner in the dzud response, it is more likely that the UN was the bridging actor rather than the Mongolian government, especially since the UN played the most integrated part in dzud preparedness and response (Benson 2011, 38). In sum, it has not been the government agencies who have included the UN in its coordination efforts, but rather the other way around.

### 7.3 Results

<b>Dzud 1999/2002 to 2009/2010</b>	
Embracing adaptive governance	Yes
Implementing reflexive law	Yes
Bridging organizations and networks	No
<b>Strengthening of social-ecological resilience:</b>	<b>Relatively high</b>

The analysis finds the government responses to dzud and its SEI to strengthen SER to a relatively high extent during the time-period of 1999/2002-2009/2010.

During that period, the Mongolian government embraced adaptive governance through the ramification of the Law on Disaster Protection which implied a distribution of responsibility to local actors. Furthermore, with the creation of NEMA, further decentralization of government responsibility was carried through. By realizing structural adjustment to the governmental body, proves that the government embraced adaptive governance to effectively respond to dzud and its SEI.

As to the implementation of reflexive law, the government successfully carried out the Law on Disaster Protection. It laid the foundation of dzud response and

defined as well as specified, what disaster protection implied in practise. Based on no previous disaster protection legislation, it is safe to say that it indeed can be characterized as a reflexive law.

The government did not succeed in bridging organizations and networks as there are no clear indicators that it was attempted. As the governmental body itself had an unclear distribution of responsibility as well as a lack of bridging among its own governmental agencies, it is even more unlikely that any bridging of organizations not connected to the government occurred.

<b>Dzud 2009/2010 to 2015/2016</b>	
Embracing adaptive governance	Yes
Implementing reflexive law	Yes
Bridging organizations and networks	No
<b>Strengthening of social-ecological resilience:</b>	<b>Relatively high</b>

The analysis finds the government responses to dzud and its SEI to strengthen SER to a relatively high extent during the time-period of 2009/2010-2015/2016.

Both the National Action Programme on Climate Change and the Climate Change Co-ordination Office were established to counter the impacts of climate change and to strengthen resilience. This implied that the government allocated responsibility to specialized units as a strategy to improve flexibility in order to effectively respond to dzud and its SEI, especially the ecological impacts, despite entailing a sort of decentralization. Hence, the government embraced adaptive governance during this period.

In terms of implementing reflexive law, the government implemented the Law on Air Quality together with the Law on Soil Protection and Prevention of Desertification. The former counters air pollution in Ulaanbaatar, which is the result of extensive urbanization and in turn partly is a SEI of dzud. The latter limits the societal damage of dzud by promoting a more sustainable use of land, which highly benefits opportunities for grazing. Even though the long-processed Pastureland Law still has not come into effect, two reflexive laws were implemented as a tool to combat the SEI of dzud.

The government made serious advancements in terms of bridging intergovernmental organizations and agencies as a streamlining strategy. The Mongolian Red Cross was indeed invited to the State Emergency Commission, however, there was no government response coordination, which indicates that an overall bridging of organizations and networks did not occur. The responsibility was rather submitted to UN agencies who then directly directed the disaster response and resilience measures on behalf of the government. It can therefore be stated that the government did not actively pursue a cooperative relationship by bridging and including organizations and networks.

## 8 Discussion

Based on three key SER variables, results concluded that SER was strengthened during both time-periods to a relatively high extent through government measures to tackle dzud and its SEI. However, even though both time-periods received the same result, it can be argued that there were differences to the extent SER was strengthened, especially in fulfilling the key variable of “embracing organizations and networks”. During the second time-period the government made serious advancements in its fulfilment compared to the first time-period. It is a defect of the SER-scale which can be sorted in future resilience research.

It can also be argued that three variables alone are insufficient for measuring SER. That may be true, but since resilience theory lacks an acknowledged general remedy in how resilience in detail is strengthened makes it difficult to prove otherwise (SRC, n.d.; Biggs, Schlüter & Schoon, 2015). Neither is there a reference book stating all SEI of dzud. The selection was hence qualitatively based on second-hand material at hand, not guaranteeing the elected key variables and SEI to perfectly display the most effective responses to dzud from a SER perspective in reality. This implies that if the SER-scale were to be based on other key variables, the result could be a different one. Still, the chosen key variables and SEI were based on relevant research and offer a measuring instrument on how SER can be assessed in a case study. Perhaps there are other key variables that represent SER more fairly than those chosen in this thesis. The research design and the key variables can nevertheless be adjusted accordingly, thus aiding in developing SERT, which is the overall purpose of this thesis.

The purpose of this thesis is not to recommend specific SER-strengthening measures to the Mongolian government. However, if there is anything recommendable from this thesis, it is that the government should work more closely and coordinatively with organizations and networks in future dzud response. Especially since the Red Cross has noted an absence of an “information sharing mechanism” (IFRC 2010, 3).



## 9 Conclusion

The purpose of this thesis is to contribute to the theoretical development of social-ecological resilience (SER) and its practical application, including the research area of human-nature interplay. This was done by conducting a case study on Mongolian state response to dzud and its social-ecological impacts (SEI) as well as identifying Mongolia as a social-ecological system (SES). Since there is relatively little qualitative research on dzud, this thesis also contributes to an understanding of lesser-known climate change-related phenomena by answering the research question:

*To what extent has the Mongolian government responded to dzud and its following social-ecological impacts by strengthening social-ecological resilience from 1999 to 2016?*

The theoretical framework provided a measuring instrument, the SER-scale, which established to what extent SER was strengthened. Empirical material was analysed through theory-building process tracing (TBPT), which enabled the analysis to conclude whether the government actively attempted to fulfil the key variables of 1) embracing adaptive governance, 2) implementing reflexive law, and 3) bridging organizations and networks. The analysis concluded that SER was strengthened to a relatively high extent during both time-periods: 1) 1999/2002 to 2009/2010, and 2) 2009/2010 to 2015/2016. If the government had bridged organizations and networks in its response to dzud and its SEI, the analysis would have found SER to have been strengthened to a high extent.

## 10 Recommendations for future research

Since Chinese Inner Mongolia and Tibet face challenges similar to dzud (Angerer et al., 2008; Duan et al., 2012), a comparative study of Chinese and Mongolian state measures to counter such extreme weather events from a SER perspective would qualify as a relevant sequel to this case study.

From a Mongolian political science- and historical perspective, a comparative qualitative study of resilience strategies of the communist era with today's political system is also a relevant research area. Using questionnaires answered by herders as a data-collecting method could reveal the preferred political system in the areas most affected by dzud.

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