Risk Management and Early Actions Required against *Dzud* Disaster in Mongolia

（モンゴルにおけるゾド（*Dzud*）のリスクマネジメントと早期対応の必要性）

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ABSTRACT

A cold-season disaster in Mongolia, locally known as *dzud*, occurs due to the interaction of climate hazards including summer drought and harsh winter, with socioeconomic vulnerability. Between 1940 and 2015, Mongolia witnessed 12 *dzuds* that ravaged more than half of its territory, with four events (1944–1945, 1967–1968, 1999–2002, and 2009–2010) causing the largest livestock losses.

Due to socioeconomic changes, that is, transition from a socialist system to a free-market economy in the 1990s, the country experienced major *dzuds* in the winters of 1999–2002 and 2009–2010, which killed approximately 12 million (11.6% in 1999–2000, 18.5% in 2000–2001, and 12.2% in 2001–2002 of the total animal population) and 10 million (22%) livestock heads, respectively. The aim of this study was to investigate the social causes of *dzud* by examining *dzud* risk management practices in Mongolia employed during the country-wide *dzud* events in the past three decades since socioeconomic changes. Importantly, the study also questions whether early actions played a vital role in mitigating a *dzud* disaster by conducting a field survey in one of the northern provinces of Mongolia.

In the socialist era, there was a steady system in which the state managed *dzuds* as a whole and bore all costs arising from the losses. However, the changes and reforms since then have led to a shift from social to personal responsibility as herders are now able to maintain livestock privately, and the quality of state involvement in *dzud* has changed. Therefore, it is necessary to reconsider public measures against d*zud* events.

In addition to climate-driven hazards, socioeconomic and political changes since the 1990s, such as the privatization of the agricultural sector, which collapsed the state provision of veterinary services, winter camps, wells, trucks, and machinery, as well as emergency hay and fodder systems, has severely impacted livestock husbandry in Mongolia.

Although a *dzud* is a “slow-onset” natural hazard that affords sufficient time and

opportunity to prepare and implement disaster prevention and mitigation measures, the country has not fully addressed it and continues to experience significant losses. Disaster management efforts aim to reduce or avoid potential losses, carry out response actions (assure prompt and appropriate assistance to affected herders), and achieve rapid and effective recovery.

To fulfill the first objective of the study, a comprehensive review was conducted based on two major reports on *dzuds* during the winters of 1999–2000 and 2009–2010, issued by the Government of Mongolia in cooperation with international organizations. The review demonstrated that weak *dzud* management and a lack of accountability had a significant negative impact on livestock husbandry.

To achieve the second objective of this study, a field survey in Khuvsgul, the northernmost province, was conducted in October 2017. I interviewed 30 herder households to gather information on herders' vulnerability, resilience, and governmental efforts to prevent and respond to the *dzud* that occurred during the winter of 2016–2017. Namely, information on herder families, their winter preparations, seasonal movements, and governmental actions taken to mitigate against the 2016–2017 *dzud*, along with household-level data, were collected through structured, open-ended interviews. A field survey examining the effectiveness of *dzud* mitigation strategies showed that early action at the local level plays a vital role in reducing herders' vulnerability, livestock mortality, and *dzud*-inducing damage. Herders' actions in *dzud* preparation and mitigation were found to be heavily dependent on government policies, governmental arrangements, and actions taken by local authorities.

Overall, this work shows that *dzud* is highly dependent on *dzud* risk (or disaster) management activities and can be overcome with less damage if early actions are taken at both the state and local levels. It also provides recommendations for improving *dzud* risk management systems in Mongolia and establishing solid *dzud* mitigation strategies, such as early warning and early actions.

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CHAPTER ONE: INTRODUCTION

1.1. Research background

This chapter starts with the background of the study by introducing Mongolia and *dzud*, a wintertime disaster. It will also introduce the purpose of the study, followed by a presentation of the thesis structure.

Mongolia, which is situated in the northeast Asian region, is landlocked between two large countries, Russia and China. The country has historically faced threats from various natural hazards, including floods, forest and steppe fires, *dzuds* (severe winter conditions), human and animal infectious diseases, and earthquakes. Its geographical location, climatic conditions (including climate change), and long-standing tradition of nomadic pastoralism are largely believed to be responsible for *dzuds*, which are common to northern Asian drylands.

Dzud is a Mongolian term used for severe winter conditions. Natsagdorj and Dulamsuren (2001) explicated *dzud* as a condition in which livestock is unable to cover its consumed energy due to starvation, resulting from a lack of pasture. Shinoda (2017a) defined *dzud* biogeophysically as abnormal climatic and/or land surface conditions, leading to reduced accessibility and availability of pastures and extensive livestock mortality over the winter–spring seasons. *Dzuds* generally occur from November to April and can even last until May. Depending on their characteristics, they can be classified into five types: black (low air temperature and lack of snow), white (abundant snow and low temperature), iron (impenetrable ice cover that prevents livestock from grazing), hoofed (when dozens of livestock get concentrated in a limited area, resulting in overgrazing), and combined (when two or more types of *dzuds* occur simultaneously) (Natsagdorj and Dulamsuren, 2001; Rao et al., 2015). However, d*zuds* are not simply natural phenomena characterized by heavy or no snowfall, extreme cold, strong winds, or a combination of these. While previous studies have shown that *dzuds* are arise from climatic and land-surface conditions, many researchers have

linked them to drought. Although, some researchers have found a lack of causality between the two (Shinoda, 2017a; Sternberg, 2018). From a human dimension, a *dzud* is described as a condition of anomalous livestock loss caused by a lack of preparedness to withstand such severe weather conditions.

As pastoral livestock husbandry remains the mainstay of the Mongolian economy, *dzuds* have a major impact on the nation's economic and employment landscapes. In 2020, the sector contributed 12.8% to the nation's gross domestic product (GDP), engaged approximately 24% of its total labor force, and accounted for 5.6% of its export income (National Statistical Office (NSO), 2020). *Dzuds*, which are often worsened by freezing temperatures and winds, tend to cause high livestock mortality by blocking access to pasture and forage, leading to both large and small herders losing their livestock and main source of livelihood.

Over the past few decades, *dzud* events have become more frequent and extreme in Mongolia, with extreme instances occurring once every 5–10 years nationwide and "localized" *dzuds* almost every year. According to the *Dzud National Report 2009–2010* and *The Mongolian Environment: Climate Change, Desertification and Permafrost in Mongolia*, between 1940 and 2015, Mongolia witnessed 12 *dzuds* that ravaged more than half of its territory, with four events (1944–1945, 1967–1968, 1999–2002, and 2009–2010) causing the largest livestock losses. Among them, the *dzud* of 1944–1945, the so-called "monkey year" in the Lunar calendar, was recorded as the deadliest in Mongolian history, as it resulted in the death of 8.6 million livestock heads, or 37% of the country's total livestock (Natsagdorj and Gomboluudev, 2017; UNDP et al., 2010). Twenty-two years later, a *dzud* in 1967–1968, another monkey year, wiped out approximately 2.6 million heads of livestock, or 11.9% of the total livestock. In the winter of 1999–2000, approximately 10 years after Mongolia transitioned from a centrally planned socialist economy to a free market economy, a

large-scale *dzud* was experienced in over 70% of the country's total territory. Nearly three million livestock heads, or almost one-quarter of the national herd, perished during this disaster. Consecutive *dzuds* in the next two years (2000–2001 and 2001–2002) overwhelmed herders and took the total livestock mortality in the three years from 1999 to 2002 to 12 million. The continuous occurrence of *dzuds* over three years made 12,000 herder families lose their entire herd (Hahn, 2018). Ten years later (2009–2010), another severe *dzud* killed 22% or approximately 10 million heads of livestock, causing significant economic losses (Du et al., 2017; Rao et al., 2015; UNDP et al., 2010).

In contrast to "sudden onset" natural hazards, such as earthquakes and tsunamis, *dzuds* are typically "slow-onset" natural hazards and thus afford sufficient time and opportunity to prepare and implement disaster prevention and mitigation measures. Nevertheless, as noted above, *dzuds* still cause significant livestock losses, resulting in increased unemployment, poverty, and urbanization. In recent decades, *dzuds* have emerged as an imminent threat to Mongolian pastoralism-based society, which is already suffering from not only a drastically changing climate but also rapidly increasing grazing pressure (Nandintsetseg et al., 2018). Since the 1990s, livestock numbers have risen precipitously following the collapse of collectivized pastoralism in Mongolia—from more than 33 million heads in 1999 to nearly 70 million heads in 2021. Consequently, the carrying capacity of pastures has been greatly exceeded, thereby exacerbating the vulnerability of livestock to *dzuds* (Chuluunbaatar, 2013; National Statistical Office (NSO), n.d.; Rao et al., 2015; Sternberg, 2010). Nandintsetseg et al. (2018) showed that 47.3% of *dzud* impact, namely livestock mortality, was derived from weather conditions, while 46.2% was from herders' vulnerability, namely livestock overpopulation and lack of coping capacity.

Although *dzuds* have been studied for several decades, little research has been conducted to specifically investigate whether *dzud* management works to mitigate *dzud* and

reduce its vulnerability, risk, and impact over the three decades following the shift to democracy by Mongolia. Research and assessments conducted so far have treated *dzuds* as natural disasters and have mostly focused on specific areas, such as weather conditions including summer drought, vulnerability, the economics of Mongolian husbandry, and so on. (Batjargal et.al., 2002; Begzsuren et al., 2004; Nandintsetseg et.al., 2018; Shinoda and Morinaga, 2005; Sternberg, 2018; Tachiiri et al., 2008). For example, the relationship between drought and *dzud* was examined by Begzsuren et al. (2004b), Sternberg et al. (2009), Tachiiri et al. (2008), and Sternberg (2018b); the vulnerability of herders and communities was examined by Fernandez-Gimenez et al. (2012) and Clark and Crabtree (2015); livestock productivity was examined by Joly et al. (2018); and forecast-based financing was examined by Gros et al. (2022). In contrast, systematic investigations exploring the socioeconomic aspects of *dzuds* are relatively rare (Fernández-Giménez et al., 2015b; Sternberg, 2010; Thrift and Ichinkhorloo, 2015).

1.2. Purpose of the study

The aim of this thesis was to consider what turns a *dzud* to a disaster by examining *dzud* management based on the proactive and reactive measures taken by state and local authorities during the *dzuds* of 1999–2000 and 2009–2010. It also focuses on *dzud* mitigation strategies by examining early actions through fieldwork in the Khuvsgul region of northern Mongolia. The guiding questions for my research are as follows:

1. How does *dzud* management work to mitigate *dzud* and reduce risk?
2. To what extent do *dzud* mitigation strategies affect herders and livestock mortality?

The overall objective of this research was to provide an in-depth study of *dzud* management factors and processes that inform government policies and strategies on

livestock husbandry against *dzud*.

1.3. Overview of the study

This thesis is organized into six chapters. Chapter Two provides a historical perspective for the reader by examining previous research areas of *dzud* to first establish a basis on which to ground the investigation along with the background of the study area, Mongolia. In addition, this chapter covers disaster management concepts and theories that are highly related to the study. Chapter Three investigates *dzud* causes by focusing on lessons learned from past *dzuds*, and *dzud* disaster management by applying a systems approach, which is widely used to perceive, think through, and look at a problem as a whole. More specifically, I consider *dzud* as a social-ecological system and attempts to understand how the system affects subsystems and their components. In a complex social-ecological system, subsystems such as resource system (e.g., livestock husbandry), resource units (livestock), users (herders), and governance systems (organizations and *dzud* management) are relatively separable but interact to produce outcomes at the system level. This chapter frames the problem by investigating *dzud* management, which is a social aspect of the system. Chapter Four provides the results of the fieldwork, which aimed to identify *dzud*-inducing climatic and socioeconomic factors and evaluates the effectiveness of early actions implemented by national and local governments and by herders by comparing two neighboring sub-provinces in Khuvsgul, Mongolia. Chapter Five discusses the implications of the findings for mitigating and reducing *dzud* risk and impacts and provides recommendations for future disaster management improvements. Finally, Chapter Six concludes the study with a summary of the investigation and proposes future study areas.

Lastly, I would like to note that the main part of the dissertation is based on two scholarly journal articles authored by me during my academic research. Each article focuses

on debates specific to identify causes of *dzud* in Mongolia and to evaluate the effectiveness of early actions to mitigating *dzud* and minimizing its impacts.

CHAPTER TWO: LITERATURE REVIEW AND THEORETICAL BASIS

2.1. *Dzud* studies

First, this chapter provides a summary of the literature, including findings, limitations, and niches for further research. It will subsequently chart the development of both domestic and international disaster management perspectives in recent decades.

Over the past hundred years, Mongolia has been experiencing natural phenomena known as *dzuds*, which have many different definitions (Batjargal et al., 2002; Nandintsetseg and Shinoda, 2013; Rao et al., 2015; Sternberg, 2010). A *dzud* is most widely defined as an event in which livestock die from starvation because a lack of grazing pastures (Natsagdorj and Dulamsuren, 2001).

This phenomenon has attracted widespread attention, as Mongolia is one of few countries that has preserved its nomadic civilization. Consequently, *dzuds* are a subject of interest among domestic as well as international decision makers, policy developers, academics, disaster management practitioners, and the media. Therefore, many different analyses can be conducted to study *dzud* causes (be they hydro-meteorological, physical, social, cultural, economic, or governance-related), impacts, mitigation strategies, and response measures.

Before 1990, *dzud* events were mostly studied by domestic researchers and scientists (Nandintsetseg et al., 2018a). However, during the 1990s, the Mongolian political and socioeconomic system shifted from socialism to a democratic free market. As Mongolia established diplomatic ties with other countries, international experts, practitioners, and researchers began to study *dzuds*. After this transition, Mongolia experienced several large-scale *dzuds*, which attracted more attention from researchers.

Although natural hazards are directly linked to loss of life and property damage, socio-economic factors influence the vulnerability of human populations to such hazards

(Wisner et al., 2004). Therefore, disasters are the result of the intersection between natural hazards and socioeconomic factors. Although natural hazards (such as earthquakes, floods, landslides, and storms) cannot be prevented, the social, cultural, economic, and political factors affecting human vulnerability to hazards can be altered (Chmutina et al., 2019; Chmutina and von Meding, 2019; Wisner et al., 2004). Similarly, *dzuds* represent the intersection of natural, social, cultural, economic, and political processes, and can be studied through the lens of various systems.

Climate hazards are the leading cause of *dzud* events. Studies found that a combination of summer growing season drought and harsh winter weather resulted in *dzuds* with high rates of livestock mortality (Batjargal et al., 2002; Begzsuren et al., 2004; Rao et al., 2015; Shinoda and Morinaga, 2005; Tachiiri et al., 2008b).

Nandintsetseg et al. (2018a) studied the contributions of both natural and social processes to livestock mortality and reported that variations in livestock mortality during *dzud* events from 2000 to 2014 were caused by a combination of climate hazards (47.3%) and herder vulnerability (46.2%). They concluded that herder vulnerability was significantly affected by social, economic, and political changes in the 1990s, including weakened state-based disaster risk management. Herder vulnerability was also impacted by livestock overpopulation, a lack of capacity, and insufficient hay and fodder accumulation.

The socioeconomic and political changes of the 1990s changed the direction of research on the relationship between human vulnerability and the impact of *dzud* events. Many studies and reports from financial institutions like the World Bank argued that snowball shocks, particularly the economic crisis in the early 1990s, privatization of livestock, and collapse of public services exacerbated the impacts of *dzuds* (Benson, 2011; Finch, 2002; Mearns, 2004; Rao et al., 2015; Thrift and Ichinkhorloo, 2015).

Numerous reports and studies have highlighted the importance of early warning

systems and mitigative preparations (Asian Ministerial Conference on Disaster Risk Reduction, 2018; Du et al., 2017; Du et al., 2018; Nandintsetseg et al., 2018a, 2018b; UNDP et al., 2010). Specifically, the UNDP et al. (2010) highlighted the need for improved pasture management, capacity building for herder families, and sufficient winter preparations to effectively respond to and mitigate the impact of *dzuds.* Other factors that reduce livestock mortality include *otor* (movement to seek better pastures, fatten livestock, or escape unfavorable conditions), preemptive hay and fodder accumulation, and the availability of warm shelters (Du et al., 2018).

Social science studies on *dzud* events in Mongolia tend to focus on the management strategies and dynamics of individual herder households, non-herders, and government institutions at the local level. This includes the creation of pasture user groups, roles and responsibilities of *soum* and *bagh* authorities, and relationship between herders and local government (Ahearn-Ligham, 2016; Ahearn, 2018b; Fernández-Giménez et al., 2015). Sternberg (2010) highlighted how herder vulnerability and a lack of adequate preparation led to devastating *dzud*-related impacts in Mongolia.

Most findings of the *dzud* studies have addressed some issues of *dzud* management and have only given general recommendations that should be improved.

There is awareness of *dzud* among herders, state and local authorities, decision makers, and development partners, and also a certain level of preparedness against it. Although the country has still been suffering from *dzud*. Therefore, the issue how to mitigate *dzud*, reduce risk and overcome it with minimal damage and loss is critical. To solve the issue, it requires to examine *dzud* as a whole, evaluate *dzud* management system, clarify roles and responsibilities of players in the sub-systems, and propose applicable approaches. Thus, this study focuses on *dzud* management that allows to investigate *dzud*-causing social factors, assess the effectiveness of the management and examine *dzud* mitigation strategy. Bringing

out the issues of the existing *dzud* management system in Mongolia will help to address social causes of *dzud*, find solutions to improve the system including establishment of better and coordinated communications and cooperation networks among stakeholders, and propose alternative approaches and strategies against with *dzud*.

2.2. Traditional disaster management versus disaster risk management

Traditionally, it has been believed that natural hazards, and the associated damage and loss of life, are caused exclusively by natural systems. Furthermore, traditional disaster management is understood as a continuum of interlinked activities, such as prevention, mitigation, preparation, disaster impact, response, recovery, and development (Carter, 2008). However, in the last several decades, the Hyogo Framework for Action (United Nations International Strategy for Disaster Reduction Secretariat [UNISDR], 2005) and Sendai Framework for Disaster Risk Reduction (United Nations Office for Disaster Risk Reduction [UNDRR], 2015) have transitioned from traditional disaster management to disaster risk management. UNDRR defines disaster risk management as the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses (UNISDR, 2009). Now, it is widely acknowledged that hazards can also include "latent conditions that may represent future threats and can have different origins: natural (geological, hydrometeorological, and biological) or induced by human processes (environmental degradation and technological hazards)" (Ray-Bennett, 2018; UNISDR, 2015). The former UN Secretary-General emphasized that hazards become disasters when people's lives and livelihoods are destroyed (Annan, 2003). This sentiment was recently echoed by the UN Secretary-General's Special Representative for Disaster Risk Reduction, stating that hazards turn into disasters when human decision-making does not reduce vulnerability or exposure to

those hazards. Therefore, disasters are in some way human-made (Mizutori, 2022). Furthermore, Ray-Bennet (2018) argued that deaths are not only due to socio-ecological vulnerability, but also vulnerability within organizations, such as the disaster management system.

In May 2022, representatives from around the world gathered in Bali, Indonesia for the 7th Session of the Global Platform for Disaster Risk Reduction (GP 2022) under the theme "From Risk to Resilience." The participants, ranging from the President of the Republic of Indonesia to youth groups, discussed systematic risk reduction and management. As summarized in the *Bali Agenda for Resilience* (United Nations Office for Disaster Risk Reduction, 2022), the main findings of GP 2022 were that the global understanding of risk, particularly regarding emerging and future hazards, remains limited; government policies are largely reactive; and disaster risk reduction and climate change adaptation have the common objectives of reducing vulnerability and enhancing capacity and resilience, necessitating a comprehensive and integrated disaster and climate risk management approach.

Several studies and reports have concluded that *dzud* management in Mongolia has historically adhered to the traditional disaster management system, as illustrated in Figures 1 and 10 (Chadraabal et al., 2020; Fernández-Giménez et al., 2015; Hahn, 2018; Sternberg, 2010; UNDP and Government Cabinet Secretariat of Mongolia, 2000; UNDP et al., 2010). However, in the last several decades, especially since the major *dzud* of 2009–2010 and global shift to disaster risk reduction, the Mongolian government and other role-players, such as academics, domestic and international non-governmental organizations (including development partners), and civil society have developed new approaches to *dzud* management. The Mongolian government has taken measures to ensure sustainable development by reducing disaster risk and adapting to climate change, such as developing a medium-term strategy for the implementation of the Sendai Framework for Disaster Risk Reduction.

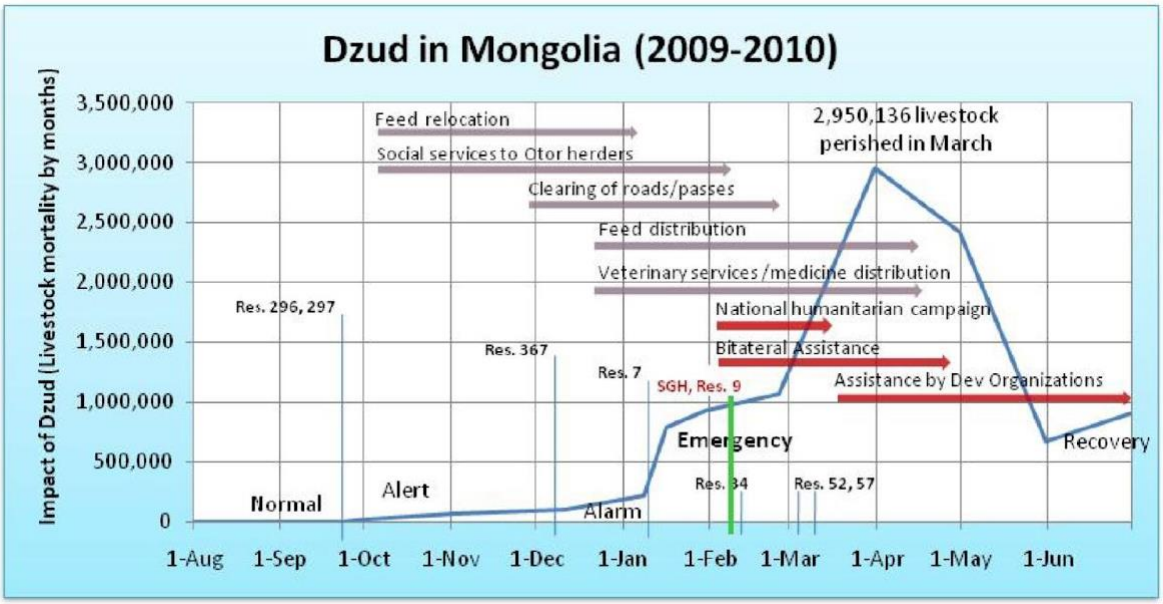


Figure 1. Livestock mortality and actions taken during the dzud *of 2009–2010, adopted from the Dzud Report 2009–2010 (UNDP et al., 2010).*

Shinoda (Nandintsetseg et al., 2018b; Shinoda, 2017b) proposed a comprehensive drought, *dzud*, dust, and desertification early warning system for more proactive disaster management in Mongolia through the Integrating Dryland Disaster Science Project between 2013 and 2017. In partnership with the Information and Research Institute of Meteorology, Hydrology and Environment of Mongolia, this project produced a *dzud* risk map, which is currently widely used for early warning and response. In addition, the JICA project included a disaster risk reduction education program in the Khovd *aimag* (province) of Mongolia to customize disaster risk reduction strategies based on local conditions and thereby improve the resilience of local communities. One of the educational tools of the program was the use of Japanese Bosai Carta custom-made for Mongolian children (Suzuki et al., 2019).

However, it is not clear whether these disaster related policies, strategies, efforts and initiatives are coordinated and implemented by the unified management and achieve their goals. The thesis aims to fill this gap by unravelling Mongolian *dzud* management system using systems approach and proposing recommendations for future improvements of the

system. This thesis also highlights the effectiveness of early actions, examined through the fieldwork that hinting at moving from reactive *dzud* management approaches to proactive risk management approaches.

CHAPTER THREE: RECENT *DZUDS* AND *DZUD* MANAGEMENT SINCE THE 1990S

3.1. Introduction

Since the *dzud* is a major disaster in Mongolia, and it has brought severe damages to the country's socio-economic life for a long time, there has been awareness about it among ordinary herders and state, *aimag* and local authorities, and decision makers. In addition, the *dzud* is a slow onset natural hazard that provides some time and opportunities to prepare for and mitigate it. It is argued that livestock mortality is "avoidable" due to advancement in disaster management, weather forecasting systems, such as early warning, and others. There is also a certain level of preparedness against it. Nonetheless, *dzud* risk reduction measures have so far produced little result (Sternberg, 2010; UNDP et al., 2010). There is also an obscurity on what actions can be taken to further reduce *dzud* risk and overcome the harsh winter disaster. Previous studies and assessments have treated *dzuds* as a phenomenon which are natural in origin and more or less considered on specific areas, such as weather parameters, livestock policy, the economics of Mongolian husbandry, as well as herders' interaction with the environment and *dzud*. However, most studies have provided common recommendations related to *dzud* vulnerability and risk, defining causes and factors remains significant not only for mitigating *dzud* and reducing mortality but also for improving disaster management in Mongolia. UNDP et al. (2010) questioned that this is perhaps because not many studies have considered *dzud* as a systemic issue. This has led me to argue that this natural disaster has not been examined as a whole focusing on *dzud* management and risk mitigation actions have not been taken effectively. Moreover, *dzud* is no longer climate-induced natural hazard. It's a systemic issue with the complex, interdependent and interconnected networks of social, technical, environmental, and economic systems. Consequently, there is a need for fresh approaches to study *dzud* and *dzud* risk management.

The aim of this Chapter is to examine *dzud* as a systemic issue through applying a

systems approach, which is widely used to perceive, think through, and look at a problem as a whole. To be more specific, I consider *dzud* as a social-ecological system and try to understand how the system affect subsystems and their components. In the complex social-ecological system, subsystems such as a resource system (e.g., a livestock husbandry), resource units (livestock), users (herders) and governance systems (organizations and *dzud* management) are relatively separable but interact to produce outcomes at the system level. This study frames the problem through investigation of *dzud* management, a social aspect of the system. From the perspective of systems approach, it is essential to see problems in terms of the past, present, and future (Basher and Ono, 2022). In order to do that, the *dzud* of 1999–2000, which occurred barely 10 years after Mongolia's transition to a free-market economy, represents the "past" and the *dzud* of 2009–2010, which followed a decade later, serves as the "present. Then I compare both "past" and "present" *dzuds* to develop the larger picture, investigate their causes, and suggest possible measures to prevent *dzuds*, reduce their risk, and overcome them with minimal loss and damage in the "future." In order to present the differences between two *dzuds*, I also consider the social change in the 1990s in Mongolia, as it brought impacts to the livestock husbandry. The rest of this Chapter is organized as follows: Section 3.2 discusses the research design, Section 3.3 covers social changes and *dzuds* in the winter of 1999-2000 and 2009-2010, Section 3.4 presents results and implications. Section 3.5 provides the brief conclusions of the study.

3.2. Research Design

While many studies have been conducted on the *dzuds* of 1999–2000 and 2009–2010 in Mongolia (Batjargal et al., 2002; Fernández-Giménez et al., 2015; Nandintsetseg et al., 2018a; Nandintsetseg et al., 2018; Sternberg, 2010, 2018; UNDP et al., 2010; UNDP and the Government Cabinet Secretariat of Mongolia, 2000), I focused on key research that involved

the Government of Mongolia, the National Emergency Management Agency (NEMA), JEMR, a private consulting firm, United Nations Development Programme (UNDP), the Swiss Agency for Development and Cooperation (SDC), and the Food and Agriculture Organization (FAO) (UNDP et al., 2010; UNDP and the Government Cabinet Secretariat of Mongolia, 2000). The primary criteria for choosing these reports were to consider not only hydrometeorological conditions, but also socio-economic factors including *dzud* management, and to provide recommendations on the lessons learned from the past *dzud* and what further action could be taken. The reports provided an opportunity for some generic exploration into the causes of *dzuds* and shed light on actions taken by herders, governments, international stakeholders, and other stakeholders to tackle them. These served as the major data points for my analysis, which was primarily qualitative, and allowed me to draw my own conclusions and recommendations on the critical features of *dzud* management during Mongolia's socioeconomic transition. Here, I would like to note two limitations. First, my descriptions and analysis were mostly based on the actions taken at the government level. Second, my conclusions were based on an analysis of the two research reports; thus, the data I analyzed was limited.

Pastoral animal husbandry is the mainstay of Mongolia's nomadic culture and society and can be considered as a nested and interconnected "social-ecological system" of "herder-pasture-herd" interactions that support adaptation through traditional comprehensive knowledge and build resilience. As an interactive human-nature system, pastoral animal husbandry has played a vital role in the lifestyle and socioeconomic development of the Mongolian population and therefore, needs to be studied using a systems approach.

A "system" can be described as a set of structural and nonstructural elements that are connected and organized to achieve specific objectives. In addition, a system can only be fully understood by observing it as a whole for example, by examining all the interactions between

the different parts and observing the following performance. Taking a system view helps to create an understanding of how the separate parts of the system interact. Meanwhile, a "systems approach" is a way of seeing and thinking through a problem by determining and focusing on significant elements. This paradigm engages systems and interconnections between their components, but a system is larger than the sum of its parts (Chen, 1975; Godin, 2009; Groundstroem and Juhola, 2021; Simonovic, 2011, 2015). Nowadays, it urges us to use appropriate tools to managing more complex disasters or emergencies like *dzud*. In order to manage the *dzud*, it is important to identify the right problem, not just dealing with the total system. A systems approach permits a wider variety of factors and interactions to be taken into account for defining problems, the right problem. Therefore, a systems approach is used for identifying key issues underlying the problem. To locate the key issues, I decided to look at the *dzud* management using the systems approach.

Disaster management is a complex system. The complexity of the system is played out through the network space of actors and organizations in a disaster or an emergency like disaster management organizations, stakeholders, policies, strategies, and others. In Mongolia, *dzud* management refers to a set of system that policies and activities involving the government, state and local authorities, the Ministry of Food, Agriculture, and Light Industry, the National Emergency Management Agency, the National Agency for Meteorology, Hydrology, and Environment Monitoring, environmental and other sectors, as well as herders. In particular, a *dzud* management system can be described as a set of structural and nonstructural elements or subsystems oriented toward achieving the common goal of *dzud* prevention, mitigation, response, and recovery through the control and distribution of resources, energy, and information, among others. Here, the government is responsible for managing and coordinating the activities of subsystems, such as ministries, agencies, local authorities, and herders, to ensure that they operate independently and contribute to the

overall goals of the system. To achieve the goals for *dzud* prevention, mitigation, response and recovery, the Ministry of Food, Agriculture, and Light Industry has been made responsibility of professional *dzud* management, the local authority for managing and carrying out activities, and herders for overcoming *dzuds*. Although policies and strategies are in place, measures against the *dzud* are carried out by the relevant authorities and herders, the country has still been experiencing *dzud.*

In this research, I have tried to see *dzud* and its management as a whole based on "knowledge-based" and "realistic" principles that ensure national safety and security, as well as support the effective distribution of limited resources for overcoming potential *dzud* threats and challenges.

3.3. Social Changes and *Dzuds*

3.3.1. Livestock Husbandry and Social Change

Before Mongolia's independence in 1911, livestock husbandry was a key element of its economy, trade, and political legitimacy. Even after independence, pastoralism continued to play an important role in the country's socioeconomic life. This was reflected in the nation's livestock population, which increased from 9.6 million in 1918 to 13.8 million in 1924 and then to 24 million in 1930. Following the Soviet Union's collective farming experiment in 1929, Mongolia launched an unsuccessful attempt at livestock collectivization in 1930, with herders contesting the decision to dismantle livestock ownership. As a result, the number of livestock decreased from 24 million in 1930 to 16.2 million in 1932. Thereafter, until the late 1950s, herders were granted a reprieve from collectivization. Re-collectivization efforts were again started in 1955 for state ownership of livestock, while allowing herders to have a fixed number of livestock as their own. By the time the collectivization of livestock husbandry was completed in the late 1960s, the state owned approximately 75% of livestock;

however, land remained uncollectivized (Endicott, 2012). Collectivization benefited herders: In preparation for winter, the state provided manpower, equipment, and fodder to them, and in the event of severe winters, snow, and *dzud*, it provided them a salary for herding livestock. Moreover, local authorities supplied not only trucks and other machinery but also labor to herders for seasonal movements, provided state-subsidized services such as veterinary services, including breeding, winter shelters, and mechanical wells, as well as continuous health and education services (Ahearn, 2018b; Endicott, 2012).

However, in the late 1980s and the early 1990s, demonstrations and rallies for political and economic change began in Mongolia, prompting the country's transition to a democratic and free economy. While making the transition, the Mongolian economy suffered a major crisis in 1990–1992 due to the collapse of cooperatives, the privatization of industry and agriculture, and the "blind transition" to the market system (Chuluunbaatar, 2013). After the privatization of the agricultural sector, livestock production became impossible and state provision of veterinary services, winter camps, wells, trucks, and machinery, as well as emergency hay and fodder systems, collapsed. In addition, the number of livestock and inexperienced herders increased sharply between 1990 and 1998. The country's livestock population swelled by more than 20%, and herders, who accounted for 18% of the total labor force in 1989, came to represent approximately 50% of the workforce by 1998 (Ahearn, 2018a; Hahn, 2018; Sneath, 2003). The livestock population grew steadily thereafter, reaching 44 million in 2008, with herders accounting for more than 36% of the labor force (National Statistical Office (NSO), 2009) (Figure 2). The consequences of changes in not only the livestock husbandry sector but also in all socioeconomic sectors became clearly visible during the *dzuds* of 1999–2000 and 2009–2010.

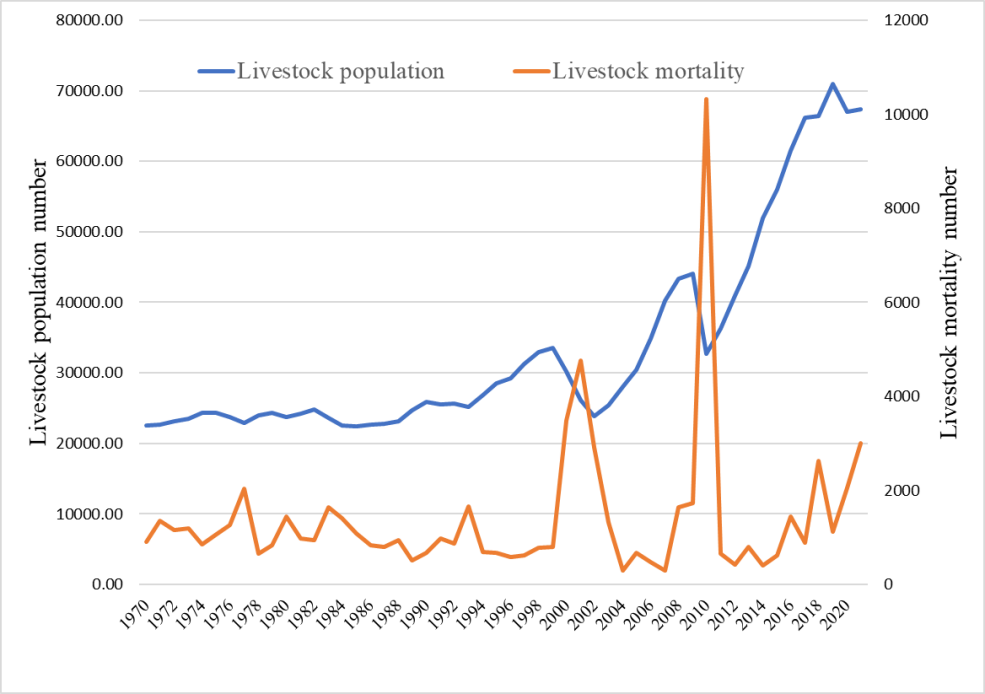


Figure 2. Number of livestock population and mortality 1970-2020

Over time, the changes and reforms led to a shift from social to personal responsibility as herders privatized their livestock and became private entrepreneurs who engaged in market relations to maintain their families and livestock. Another major change for herders was self-sufficiency: they were able to control their herd's composition, number of livestock, breeding, movements, and pasture use, among others. However, herders were personally responsible for the negative consequences of this change like the loss of livestock during the *dzud*, expenses for accumulation or purchase of hay and fodder, human and veterinary services, student tuition fees, and others (Chuluunbaatar, 2013). In addition, the privatization of the livestock sector, decline in services, and *dzud* led to large-scale internal migration from rural to urban areas. Educational and cultural issues also began to rise.

3.3.2. *Dzuds* of 1999–2000 and 2009–2010

After almost 10 years of de-collectivization, Mongolia experienced a devastating *dzud* in 1999–2000, which affected over 70% of its territory (Figure 3) and killed about 4

million livestock, or almost a quarter of the national herd (UNDP and the Government Cabinet Secretariat of Mongolia, 2000). The country suffered a harsh spring and drought in the summer of 1999. There was no rainfall over most of Mongolia in May that year, and hot days continued until the end of July. In many places, extreme hot days (when outdoor temperatures rose above + 30^{o} C) lasted for approximately 13 days. Consequently, 35% of the country experienced a dry spell and 15% recorded a drought. At the end of September, the country received heavy snowfall, reaching a depth of up to 80 cm in some places, which delayed livestock grazing by 4–6 days. By the end of November, the snow depth reached 20–26 cm, blocking access to pasture; however, a warming in November left pastureland covered in ice. In January 2000, extreme cold temperatures, reaching - 30^{o} C to - 38^{o} C, were reported in most parts of Mongolia and the cold surge continued until the end of February. During this time, most of Mongolia was hit by a white *dzud*, while the Gobi region experienced a black *dzud*.

Figure 3. Dzud-*affected* aimags *in 1999-2000*

The fact that previous winters had been extremely unpleasant further compounded the problems in the husbandry sector. The adverse hydrometeorological conditions prevented

livestock from fattening, which is important for maintaining the condition of herds during winter. They also impeded the preservation of sufficient hay and fodder for emergency supply. Even as herders struggled to cope with the aftermath of the 1999–2000 *dzud*, the country experienced two consecutive *dzuds* in 2000–2001 and 2001–2002, which further decimated livestock populations. As a consequence, several thousand herders lost their entire herds (Hahn, 2018).

Ten years later, more than, 60% of the Mongolian territory was struck by another *dzud*. The 2009–2010 disaster affected over 750,000 inhabitants or 28% of the total population (Figure 4) (UNDP et al., 2010).

Figure 4. Dzud-*affected* aimags *in 2009-2010*

The *dzuds* put a considerable financial strain on herders as their pre-existing debt swelled (Hahn, 2018; Nandintsetseg et al., 2018a; Sternberg, 2010; UNDP et al., 2010). According to a report prepared by UNDP et al. (2010), the *dzud* of 2009–2010 was similar to that of 1999–2000 in terms of weather conditions, livestock mortality, and the measures taken against the *dzud*. One of the causes for the 2009–2010 *dzud* was the lack of precipitation in the summer of 2009, which led to a decline in pasture biomass. Meanwhile, heavy snow fell

in early October in the mountainous, steppes, and Gobi regions, and thawed partially in early November due to warming. Nighttime freezing left pastureland covered in ice. In addition, approximately 75% of the total territory was covered by heavy snowfall that prevented herds from grazing. As a result, livestock started to perish. Severe temperatures of below - 40^{o} C and heavy snowfall in late December caused additional livestock mortality. Then, a series of freezing cold nights and dry dust storms in early March 2010 led to more livestock deaths (UNDP et al., 2010). Rao et al. (2015) found that the winter of 2009–2010 was the coldest after the winter of 1944–1945, and it resulted in the highest livestock mortality in Mongolia. Overall, most territories of the country were faced with a white *dzud* and some areas were combined *dzud*. To make the situation worst, there was an outbreak of H1N1 swine flu in Mongolia in 2009–2010. Thus, the government had to simultaneously focus on combating the outbreak and *dzud* response.

3.4. Results and Implications

3.4.1. Lessons Learned from *Dzuds*

Following the *dzud* of 1999–2000, the UNDP carried out a major study in collaboration with the Cabinet Secretariat of the Mongolian Government, the National Agency for Meteorology, Hydrology and Environment Monitoring, and JEMR (UNDP and the Government Cabinet Secretariat of Mongolia, 2000). The research team listed lessons learned from the 1999–2000 *dzud* under three main categories: 1) *dzud* risk reduction, 2) *dzud* assessment, and 3) *dzud* disaster mitigation. It also stressed some measures and approaches to studying risk reduction, assessment, and disaster mitigation. The researchers advised that within the framework for *dzud* risk reduction, *dzud* preparation not be limited to haymaking, fencing, and securing water supplies, but entail comprehensive preventive measures based on the country's development policies, such as on infrastructure development, social services,

economic provision, and environment management. They recommended that a methodology for assessing *dzud* risk and potential damage and loss be developed and used for decision-making at all levels. They also advised the relevant authorities to make timely and prompt decisions, ensure effective implementation of the decisions, execute risk mitigation measures in line with the country's socioeconomic changes, and improve disaster management and information systems.

Moreover, the study provided specific recommendations to the government on building a legal environment and setting up a system for natural disaster risk reduction; regulating the ownership and utilization of pasture, hay, water, and other pastureland resources; establishing a national network that apprises governments of foreign countries, international organizations, and development agencies of the scale, mortality, and damage and losses caused by natural disasters, appeals for assistance, and coordinates receipt and distribution of aid; as well as including disaster issues separately in the concept of sustainable development of pastoral animal husbandry.

In addition, the Ministry of Food, Agriculture, and Light Industry and JEMR conducted further research after the *dzud* of 2000–2001, and the pastoral risk-management project led by FAO conducted another study in 2003 (Swift and Baas, 2003). Both teams released reports and recommended step-by-step actions for all levels—from herder households to the national government—regarding risk reduction, disaster mitigation, winter preparation by herder households, adjusting the number of livestock to pasture carrying capacity, and winter preparation reports and risk forecasts. They also recommended that the Government of Mongolia reform its disaster management system (UNDP et al., 2010; UNDP and the Government Cabinet Secretariat of Mongolia, 2000). Based on these studies and recommendations, it can be said that the *dzud* management system was still lacking in Mongolia under the new social and economic order.

Further, studies and reports that followed the 2009–2010 *dzud* mostly repeated the lessons derived the 1999–2000 *dzud*. This indicates that Mongolia had failed to learn from previous *dzuds*. At this juncture, a joint research team from NEMA, UNDP, and SDC suggested a new approach to avoid repeating the recommendations of a previous study (UNDP et al., 2010). They decided on the following assumption: "*Dzud* is a systemic issue, which has never been addressed as such so far." The rationale provided for the assumption was that a great number of research papers, assessments, and reports focused on *dzud* as a natural disaster and more or less addressed specific areas, such as weather conditions, livestock policy, the economics of Mongolian husbandry, pasture management, and herders' capacity, and provided similar, duplicated, and clichéd recommendations. The team also noted that the recommendations had been implemented. It also reported that NEMA and the Government responded to floods and fires and dealt with H1N1 swine flu in 2009, in addition to *dzud*; thus, less focus was accorded to *dzud* mitigation (Sternberg, 2010).

The joint team provided three explanations for why the prevailing system did not work: 1) as the system did not explicitly define the roles and limits of stakeholders, there was a lack of clarity on how far they could pursue the prescribed goals and where they needed to let other players take over, 2) there was a lack of self-coordination for achieving comprehensive goals, and 3) it did not share responsibility and decision-making power with others.

3.4.2. Policies and Strategies

Since the *dzud* of 2009–2010, the Government of Mongolia has been working to update and improve its livestock husbandry policies and strategies, and closely cooperate with stakeholders, including the United Nations and other international organizations, to prevent and prepare for *dzuds*. For example, it established a humanitarian country team under the UN Resident Coordinator's Office in 2011 (Government of Mongolia (GoM) and United Nations

County Team (UNCT), 2011). The National Emergency Management Agency co-led the team and organized monthly meetings to improve coordination of humanitarian assistance and coherence of all efforts made by stakeholders and exchange information, among others.

Based on the lessons learned from the *dzud* of 1999–2000, the Government of Mongolia formulated a number of major policies and strategies to strengthen the legal framework for livestock animal husbandry, including the National Program to Assist the Protection of Livestock from Drought and *Dzud* in 2001. The main objectives of the program were to protect livestock from drought and *dzud*, improve the disaster response and recovery mechanism, establish a relief network, define the responsibilities of herders, livestock owners, and all levels of government authorities, and develop and implement policies and regulations for the sustainable development of livestock husbandry. The program made many significant recommendations. One of them pertained to creating hay and fodder reserves with at least three days of supplementary fodder at the level of *soums* (administrative units under *aimags*, or sub-provinces) by taking into account the daily hay consumption of each *soum*. This was an important criterion in the winter preparations of herders and *soums* and has remained one to this day. The criterion is still used to determine the quantity of fodder that needs to be stored in *aimags* and *soums* each year by the government while issuing decrees. In addition, by the Law of Mongolia on administrative and territorial units and their governance, the administrative and territorial unit management shall delegate state functions and one of them is stockpiling livestock fodder. However, it is questionable whether there is a mechanism in place to hold *aimag* and *soum* governments accountable for failing to accumulate hay and fodder reserves because there are no any provisions for imposing liabilities in the program and government decrees on winter preparation in the case if officials fail to adequately prepare for the winter. For example, based on the National Program to Assist the Protection of Livestock from Drought and *Dzud* and other regulations that referred to the quantity of hay

and fodder to be prepared for the *aimag* and *soum* safety reserves for winter, the government issued a decree in June or July each year and tasked *aimag* governors with monitoring preparations. However, the *aimag* authorities were not held accountable for failing to prepare enough hay and fodder or for failing to prepare for *dzuds*. There was no legal accountability mechanism for such lapses. Although there is no countrywide investigation on accountability mechanisms, Chadraabal et al. (2020) demonstrated the case study on accountability for *dzud* countermeasures. They have clarified this in their study, which has shown how in one *soum* where the administration had prepared a certain quantity of hay and fodder, the livestock survived a *dzud* with almost no casualties, while more than 10% of livestock died in a neighboring *soum* because of insufficient hay and fodder stores. Although there was no accountability mechanism, in this case, herders held local authorities accountable for the poor winter preparations and did not reelect them in elections held the same year as the *dzud*; however, a well-functioning *soum* administration got reelected. Unfortunately, the herders eventually paid for this by affecting *dzud* and bearing the loss. Under the national program, many activities were to be started, implemented, and evaluated by 2005. Unfortunately, information on the program's implementation was not available with the main implementing authority, the Ministry of Food, Agriculture and Light Industry, and other sources. This led me to conclude that monitoring and evaluation of the program was either inadequate or entirely lacking.

3.4.3. Disaster Management

Based on studies, reports, and recommendations from domestic and international organizations after the *dzud* of 1999–2000, the Government of Mongolia reformed its disaster management system. It reformulated its disaster management legal framework and environment by adopting the Law on Disaster Protection in 2003 and established the NEMA

in 2004. The agency was assigned the responsibility of carrying out disaster prevention, disaster risk reduction, search and rescue, response and recovery measures, and other disaster management activities nationwide. However, a study after the 2009–2010 *dzud* contended that NEMA had failed to fulfill its responsibility in terms of implementing the state disaster protection policy, legislation on disaster protection, and organizing nationwide disaster protection activities (UNDP et al., 2010).

Guided by these lessons and other internal and external factors, NEMA embarked on reforming disaster protection approaches, legislation, and organizational structure. The government also shifted from disaster management to disaster risk management and risk reduction and committed to ensuring the implementation of the Sendai Framework for Disaster Risk Reduction 2015–2030 along with the Paris Agreement on Climate Change and Sustainable Development Goals 2030.

In addition, it reformulated the Law on Disaster Protection in 2017 by reflecting on pre-disaster activities/disaster prevention, disaster risk reduction, national and local councils on disaster risk reduction, humanitarian assistance, and disaster financing. After its reformulation, the law was amended three times, with the last amendment made in 2020 owing to the coronavirus pandemic. These changes enable us to understand disaster risk in all its dimensions of vulnerability, exposure, hazard characteristics, the environment, and capacity. Consequently, it could become leverage for pre-study risk assessment, prevention and mitigation of *dzud*, and implementation of *dzud* preparedness and practical response to *dzud*.

3.5. Conclusions

The goal of this chapter was to look at *dzud* as a whole through applying a systems approach. A couple of major reports on past *dzuds* helped me to see *dzud* and *dzud*

management in a wider lens. In brief, from the systems approach perspective, a system should be integrated and coordinated, and subsystems should contribute to the larger system according to their role. However, the analysis has revealed that, although the government has achieved a degree of coordination on disaster mitigation, it is yet to clarify the roles and participation of other stakeholders. The next issues are planning, organization, and execution. Dozens of policies, strategies, projects, and programs were formulated to protect the agriculture sector, including animal husbandry, from *dzud*. However, their outcomes have proved inadequate. This is because of insufficient criteria for evaluating the results achieved and lack of accountability mechanisms. The aforementioned scenario highlights the lack of result-based planning. If monitoring and evaluation of hay and fodder production, *dzud* exposure, and livestock mortality had been done annually according, the loss of livestock could have been controlled in future *dzuds*.

Above all, the study encourages to address accountability mechanism issues in all phases especially preparation and mitigation to better act against *dzud*. Enhancement of accountability mechanism will bring substantive results in *dzud* management especially *dzud* mitigation and risk reduction.

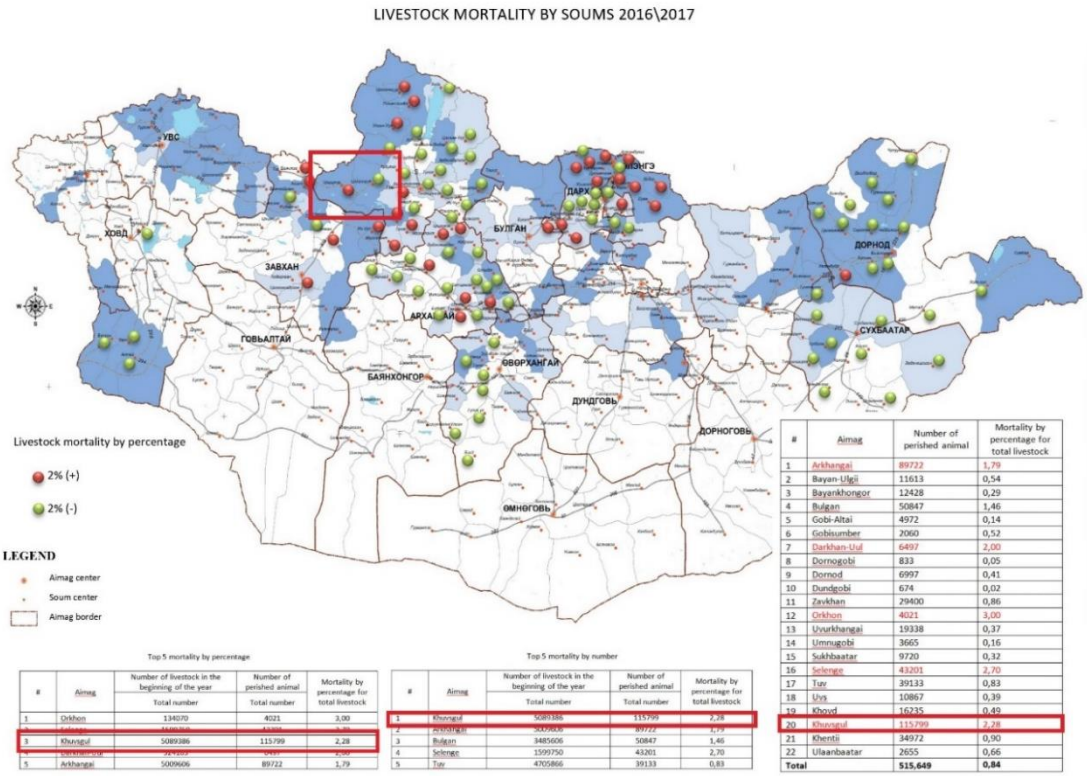
CHAPTER FOUR: *DZUD* MANAGEMENT AT THE LOCAL LEVEL IN 2016-2017 AND ITS EFFECTS AND PROBLEMS: COMPARATIVE STUDY IN KHUVSGUL REGION

4.1. Introduction

This Chapter stresses the need for a paradigm shift from reactive measures to proactive measures against *dzud*. It underlines the importance of early actions by local players. The field survey, done in 2017 in northern part of Mongolia, helps me to introduce how proactive measures taken by locals played a vital role in overcoming *dzud* with possible minimal losses and damages. First, a brief background of study is introduced followed by research design. Then, it continues with reporting results including livestock mortality, weather, and socioeconomic conditions, *dzud* prevention and response actions at all levels, as well as interpretation of herders' evaluation of government actions. The section highlights the importance of early actions to mitigate the *dzud* and minimize the loss. The Chapter concludes with a summary and discussion of the results.

4.2. Background of the study

The current study focuses on the pre-disaster coping capacities of herders and of governments especially local governments for handling *dzuds* that generally lead to economic and livestock losses (Du et al., 2017; Du et al., 2018). Specifically, it focuses on the 2016–2017 *dzud* that occurred in Khuvsgul *aimag* in northern Mongolia, with the aim of clarifying how certain climatic and socioeconomic factors associated with the occurrence of the *dzud* as well as early actions taken by herders and national and local level governments affected the *dzud's* impacts. Two reasons are given why Khuvsgul provides an ideal case study for examining differences in livestock mortality within two neighboring *soums* during the winter of 2016–2017. The first reason is that the livestock mortality rate in Khuvsgul during that winter was the highest in Mongolia. The second reason is that the differences in livestock mortality rates between *soums* in Khuvsgul were substantial (Figure 5).



#	Aimag	Number of perished animal	Mortality by percentage for total livestock
1	Arkhangai	89722	1,79
2	Bayan-Ulgii	11613	0,54
3	Bayankhongor	12428	0,29
4	Bulgan	50847	1,46
5	Gobi-Altai	4972	0,14
6	Gobisumber	2060	0,52
7	Darkhan-Uul	6497	2,00
8	Dornogobi	833	0,05
9	Dornod	6997	0,41
10	Dundgobi	674	0,02
11	Zavkhan	29400	0,86
12	Orkhon	4021	3,00
13	Uvurkhangai	19338	0,37
14	Umnugobi	3665	0,16
15	Sukhbaatar	9720	0,32
16	Selenge	43201	2,70
17	Tuv	39133	0,83
18	Uvs	10867	0,39
19	Khovd	16235	0,49
20	Khuvsgul	115799	2,28
21	Khentii	34972	0,90
22	Ulaanbaatar	2655	0,66
Total		515,649	0,84

Figure 5. Livestock mortality by soums *in the winter of 2016-2017*

Prior to the main field survey, I visited Khuvsgul *aimag* in August 2017 to meet with some officials to verify the accuracy of the preliminary information and the location. This was followed by the field survey in October 2017 in Tsagaan-Uul and Tsetserleg *soums*.

In connection with nomadic herding, it would be appropriate to give about pre- and survey visit months. Mongolians, especially herders, are very busy with herding all year round. Every year in July, the *Naadam*, the biggest national holiday of wrestling, horse racing and archery, is celebrated. There is an old saying ‘Autumn is after the *Naadam*’. After the *Naadam*, everyone gets busy preparing for a coming winter such as hay and fodder accumulation, livestock shelters repair, livestock bedding preparation and many more, and plus school year preparation which starts in September 1. Furthermore, herders get busy again before moving to their winter camps in early November. Basically, there are gaps between busy herder life in mid-August and October. Therefore, I went to Khuvsgul for the first time in August, and again in October for granting enough time to conduct interviews with herders by visiting individual herder family one by one (Picture 1). When I visited in October most of

the territory of Tsetserleg soum was covered by snow, but there was partial snow cover in some parts of Tsagaan-Uul soum (Picture 2).

Picture 1. An interview process, October 2017

Picture 2. Snow cover in Tsetserleg (left) and Tsagaan-Uul (right) in October 2017

I started my survey right away when I reach Urankhairkhan *bagh* (the smallest administrative nit under *soum*) of Tsetserleg *soum* late afternoon.

4.3. Research Design

4.3.1. Study area

Khuvsgul *aimag* is the northernmost Mongolian province with an area of 109,628 km^2, a total human population of 136,794, and a total livestock population of 5,943,210 (National Statistical Office, 2021). About 43.5% of the total area of the *aimag* is used for pasture, 0.5% for haymaking, 0.3% for agricultural cultivation, and 33.6% comprises forest. The terrain of the *aimag* is mostly mountainous, with elevations ranging between 1,500 m and 3,000 m above sea level (Picture 3). Khuvsgul falls within Khangai, which is the region with the most vegetation in Mongolia that encompasses several natural zones, such as mountains, mountain steppes, and Siberian taiga forests. Because of Mongolia's high elevations, its climate is generally colder than that of other countries at the same latitude, with average annual temperatures of 0.7 ^{o}C. Extreme minimum temperatures recorded in January range from -31.1 °C to -55.3 °C, and the highest temperatures recorded in July, range from 28.5 °C to 44.0 °C (Ministry of Environment and Green Development of Mongolia, 2014; Nandintsetseg et al., 2007).

Picture 3. On a way to one of herder households in 1980m above the sea level, Khuvsgul

Khuvsgul's climate is strongly continental, entailing long cold winters and very short summers. The average temperature in January ranges between -30 °C and -34 °C, and in July,

it remains below 15 °C in the valleys of the high mountains (Batima et al., 2005). Thus, Khuvsgul is one of the coldest *aimags* in Mongolia.

Of the 21 aimags in Mongolia, Khuvsgul ranks second in the country both for its total heads of livestock (sheep, goats, camels, cattle, and horses) and numbers of sheep; third for its total cattle heads; fourth for its total number of goats, and eighth for its total number of horses. Agriculture is the main economic sector, accounting for about 50% of the GDP of the aimag.

Tsetserleg and Tsagaan-Uul *soums*, which were selected as case studies, are located in the far western part of Khuvsgul *aimag*. According to statistical data (Khuvsgul Statistical Office, 2016; National Statistical Office (NSO), 2014) obtained for 2016, Tsetserleg *soum* covers an area of 7,452 km^2 and has a total of 1,291 households and 273,734 heads of livestock. Tsagaan-Uul *soum* covers an area of 5,866 km^2 and has a total of 1,540 households and 400,199 heads of livestock, making it the *soum* with the largest livestock population in Khuvsgul *aimag*. The average annual precipitation for the period 1981–2010 was 192.3 mm for Tsagaan-Uul (hereinafter referred to as T-U) *soum* and 205.6 mm for Tsetserleg (hereinafter referred to as Tse) *soum*. During this period, the annual average temperature was -5 °C in Tse *soum* and -3.8 ^{0}C in T-U *soum*.

4.3.2. Data

I extracted data on livestock numbers and mortality during the period 1970–2016 in the two *soums* under investigation from the National Statistical Office of Mongolia and the Statistical Year Books of Khuvsgul *aimag*. The dataset was analyzed to determine past trends in livestock numbers and mortality.

Meteorological data, including air temperature and snow depth, were obtained from the National Agency for Meteorology, Hydrology and Environmental Monitoring and the

Meteorological Department of Khuvsgul *aimag*. This dataset was used to compare anomalous weather and pasture conditions using the indicator of normalized anomaly.

Information on government decrees and governors' orders relating to winter preparations and *dzud* mitigation efforts and responses were collected from NEMA, the Integrated System for Legal Information of Mongolia, and from the offices of the governors of the *aimag* and respective *soums*.

4.3.3. Methods

In addition to collecting the above data, I conducted an interview-based survey in October 2017 that covered a total of 30 herder households. The aim of the survey was to gather information on herders' vulnerability, resilience, and governmental efforts to prevent and respond to the *dzud* that occurred during the winter of 2016–2017. Information on herder families, their winter preparations, seasonal movements, and governmental actions taken to mitigate against the 2016–2017 *dzud*, along with household-level data, were collected through structured, open-ended interviews conducted with 30 herder households (15 in Urankhairkhan *bagh* of Tse *soum* and 15 in Agar *bagh* of T-U *soum*) in 2017. Households were randomly sampled. Urankhairkhan *bagh* (hereinafter referred to as U *bagh*) was the most severely affected area with the highest livestock mortality rate, whereas the livestock mortality rate under similar climatic conditions in Agar *bagh* (hereinafter referred to as the A *bagh*) was the lowest. The interviews elicited information on received commodities/services provided by the state and by international organizations, governmental activities aimed at preventing and responding to the *dzud*, as well as the vulnerability and resilience of households.

Interviews were also conducted with local government officials within each *soum* and with veterinary and breeding specialists in T-U *soum*, who played a prominent role in collecting information on winter conditions and preparation, and on herding and pasture

conditions, and coordinated early actions, responses, and relief efforts at the local level. Humanitarian aid information was also collected during the field survey while data on government decrees and beneficiaries of international assistance were collected from NEMA and from the United Nations Resident Coordinator's Office (UN RCO) in Mongolia.

I further analyzed governmental decrees and orders issued by local governors on winter preparations and on *dzud* mitigation and responses to identify the actions that were actually implemented by national and local authorities to mitigate or reduce the risk of a *dzud* and to evaluate their effectiveness.

4.4. Results

4.4.1. Livestock mortality

Figure 6 shows livestock mortality by percentages in Mongolia and in Khuvsgul *aimag* during the winter of 2016–2017. More than 115,000 heads of livestock perished in Khuvsgul during the winter of 2016–2017, accounting for 2.3% of the total livestock population of the *aimag*. Khuvsgul *aimag* ranks highest among the 21 *aimags* and the capital, Ulaanbaatar, for its livestock mortality rate during the winter of 2016–2017. However, the impact of the *dzud* varied within the *aimag*. Livestock mortality figures within Tse and T-U *soums*, which we selected as our case studies, were 32,110 heads (11.7%) and 2,672 heads (0.7%), respectively. Moreover, Tse *soum* evidenced the highest livestock mortality rate within the *aimag*.

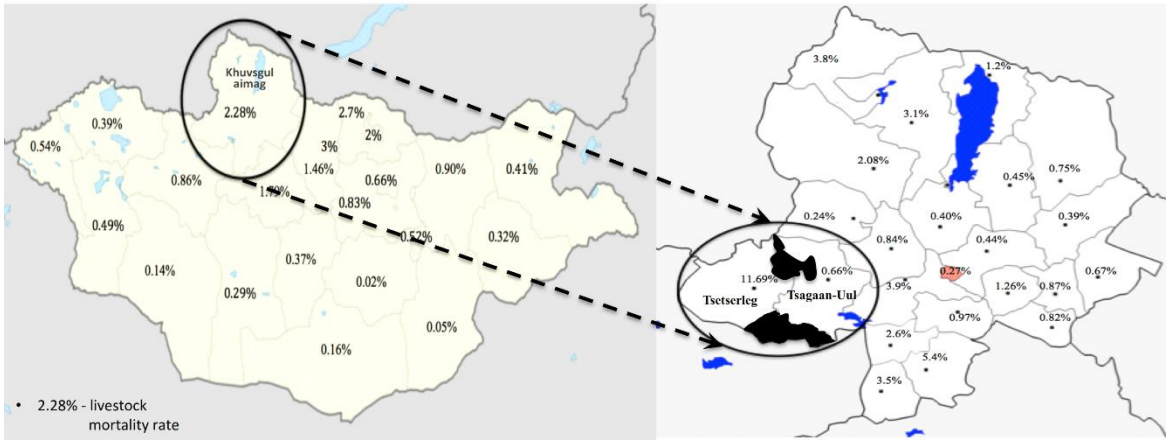


Figure 6. Livestock mortality rates (in percentages) in Mongolia and Khuvsgul during the winter of 2016–2017

The *baghs* where the study was conducted are shaded black.

Figure 7 depicts interannual variability in livestock numbers and mortalities in Tse and T-U *soums* for the period 1970–2016. The livestock mortality during the winter of 2016–2017 did not constitute the greatest loss experienced in these *soums* during this entire period. The highest livestock mortality figures were recorded for both *soums* during the *dzuds* of 1999–2000 and 2009–2010. However, during the winter of 2016–2017, 11.7% of the livestock in U *bagh* of Tse *soum* were lost compared with 0.7% of animals that perished in A *bagh* of T-U *soum.*

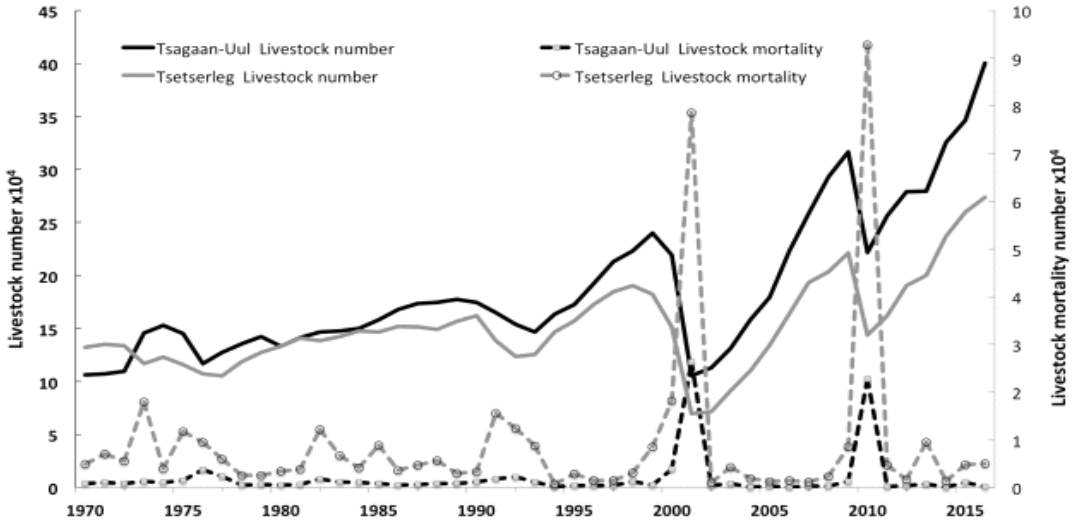


Figure 7. Interannual variability in livestock numbers and mortalities in Tsetserleg and Tsagaan-Uul soums

When I asked to specify the cause of the *dzud* that occurred in the winter of 2016–2017, all 30 respondents noted that it was solely a natural phenomenon. Almost all the herders highlighted the occurrence of unexpected rain in November 2016 that led to the pastureland being covered by a sheet of ice, thus preventing the animals from grazing. However, conditions in the two *soums* differed. Tse *soum* had fewer heads of livestock than T-U *soum*, and its livestock mortality rate was higher. By contrast, the livestock mortality rate during the winter of 2016–2017 was very low in T-U *soum*, which had the highest number of livestock heads (Table 1).

The relatively low livestock mortality rate during the winter of 2016–2017 in T-U *soum* can be attributed to the special circumstances prevailing in this *soum* in relation to its fodder fund. In the past, each *aimag* maintained its own state fodder fund comprising stored hay and fodder that could be distributed across the country during a disaster or emergency situation (Ahearn, 2018b). T-U *soum* still retained a portion of its fodder fund, and its authorities continued to manage and maintain this fund, ensuring the collection and

distribution of fodder as well as the fund's security (Picture 4). According to the Governor's Decree no. A/88, issued in 2016 (Order of Governor of Tsagaan-Uul Soum, Khuvsgul Aimag on Winter Preparation, 2016), every civil servant was required to collect 300 kg or 15 bundles of hay to secure fodder stocks, with the total quantity of collected hay amounting to 152.7 tons. Further, Decree no. 163, issued by the government on November 28, 2016 allowed for the temporary, emergency deployment of this fund as one of the three inter-*soum* hay and fodder funds during the winter of 2016–2017 (Government Decree # 163 on Some Measures for Harsh Winter Condition, 2016). Currently, as a result of a government decree issued in 2018, the fund is being managed as a state reserve fund by NEMA.

Picture 4. Fodder Fund in Tsagaan-Uul soum, Khuvsgul, October 2017

4.4.2. Weather conditions

Table 1 shows the weather parameters in the two *soums* during the winter of 2016–2017. It should be noted that winter temperatures in both *soums* were close to the average winter temperature. However, both *soums* experienced more snow than normal, with conditions being more extreme in Tse *soum* (the value of the standardized anomaly was 1.6). During interviews, officials as well as herders repeatedly mentioned that heavy rain in November 2016 subsequently froze, resulting in the formation of an ice sheet over the

pastureland. Also, meteorological data collected by the local stations showed greater amount of precipitation in November. This situation induced an "iron" *dzud* in some parts of Tse and T-U *soums*, which was followed by a "white" *dzud* caused by heavy snowfall in December in most parts of both *soums.* The "iron" and "white" *dzud* conditions resulted in harsh winter situations for herders and for their animals that were unable to graze. Batima et al. (Batima P., Bat B., Tserendash S., 2008) noted that an iron *dzud* "occurs when snow cover melts and refreezes to create an impenetrable ice cover that prevents livestock from grazing." This phenomenon was clearly evident in Tse and T-U *soums* in the winter of 2016–2017.

	Tsetserleg	Tsagaan-Uul
Livestock mortality rate for 2016/2017 %	11.7	0.7
Average mortality rate for 1970-2015 %	6.1	4.9
Standard deviation %	3.9	3.0
Normalized anomaly for 2016/2017	5.6	-4.3
Winter temperature (Nov 16 - Mar 17) °C	-21^0C	-16.2^0C
Average winter temperature °C	-19.7^0C	-17.4^0C
Standard deviation	10.5	13.1
Standardized anomaly 2016/2017	-0.1	0.1
Average snow depth (Nov 16 - Mar 17) cm	17.8	8.8
Average snow depth cm	5.3	4.7
Standard deviation	7.9	4.1
Standardized anomaly 2016/2017	1.6	1.0
Pasture carrying capacity %	83.7	71.3
Prepared hay for *soum* secure fund ton	13.3	152.7
Prepared hay by herders for individual use ton	11000	12394

Table 1. Mortality, meteorological and other parameters of Tsetserleg and Tsagaan-Uul soums

Figure 8 shows the pasture carrying capacity conditions in Khuvsgul *aimag*, evaluated by the Information and Research Institute of Meteorology, Hydrology and Environment of Mongolia (IRIMHE) in August 2016. The following criteria were applied in the evaluation: pasture vegetation, livestock numbers, pastureland size, and grazing duration. As shown in Figure 8, the pasture carrying capacity for the Tse and T-U *soums* reflected adequate pasture. There are many ways of estimating the pasture carrying capacity. Because of certain constraints associated with the universal estimation of pasture carrying capacity, the Research Institute of Animal Husbandry of Mongolia customized this estimation based on assumed values of seasonal fodder use and the daily grazing intake rate for particular vegetation zones and standard animal units within the country (Nandintsetseg et al., 2018a).

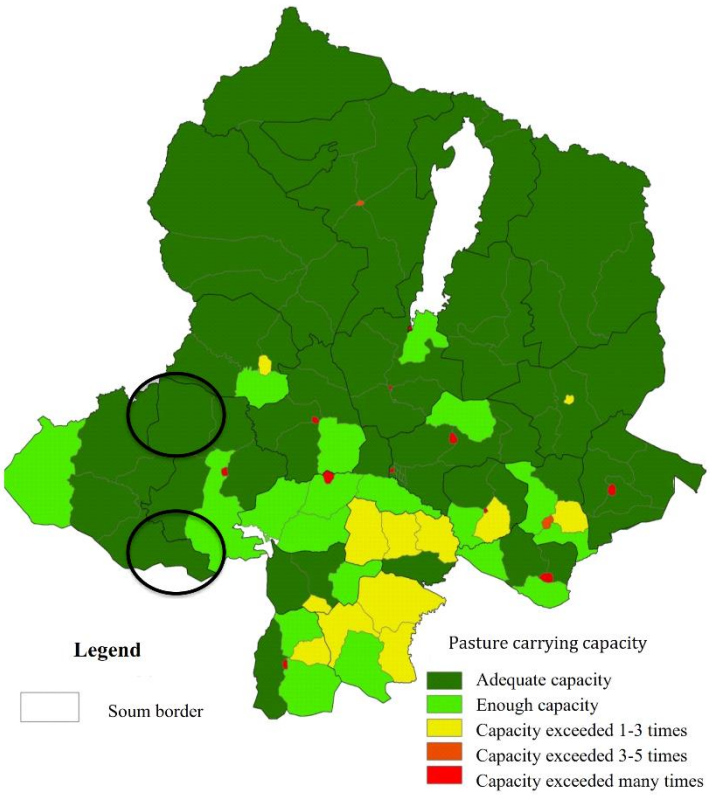


Figure 8. Pasture carrying capacity during the winter and spring of 2016–2017 in Khuvsgul aimag

4.4.3. Socioeconomic conditions

Herders are the main producers within Mongolian society. Among the interviewed herder families, the average age of the household head was 45 years in both U and A *baghs.* On average, families comprise four persons, with maximum family sizes of five and six persons in U *bagh* and A *bagh*, respectively. The total numbers of livestock in U *bagh* and A *bagh* were similar: 5,032 and 6,235, respectively. However, total mortality rates in the winter of 2016–2017 differed significantly in the two *baghs*: 1,763 heads or 35% of total livestock (with maximum and minimum values of 405 and 0 per family, respectively) in U *bagh* and 392 heads or 6.3% of the total livestock (with maximum and minimum values of 91 and 0 per family, respectively) in A *bagh*.

Livelihood sources constitute an important parameter of herders' financial capacities and their *dzud* resilience. Herding was the sole livelihood source for all 15 interviewed households in T-U *soum* and for 14 out of 15 households in Tse *soum*. One male herder in the latter *soum* earned a supplementary income from handcraft production apart from herding. Some families with elders, disabled members, or children under 18 years received social welfare, such as pensions, disability grants, and financial support for children. After the winter of 2016–2017, one herder family in T-U *soum* that had lost most of its livestock migrated to the *soum* center seeking jobs and better incomes.

Table 2, which shows the herders' infrastructure, reveals that almost all herder families owned their own livestock shelters, TVs and radios, and solar panels. About half of the interviewees owned cars, which were mostly used for transporting prepared hay and fodder, goods and seasonal movements. U *bagh*, which was severely affected by the *dzud* of 2016–2017 had slightly more infrastructure than A *bagh*.

	Interviewed HHs	Hut or livestock shelter per HH	TV and radio per HH	Motorcycle per HH	Car per HH	Tractor per HH	Solar panel per HH
U *bagh*, Tse *soum*	15	0.8	1.0	1.0	0.6	0.1	1.0
A *bagh*, T-U *soum*	15	0.7	1.0	0.7	0.6	0.1	1.0

Table 2. Assets (with numbers of each item) owned by herder households in Urankhairkhan bagh of Tsetserleg soum and in Agar bagh of Tsagaan-Uul soum

Herders use different coping or adaptive approaches when preparing for and responding to a *dzud*. During the interviews, it was apparent that elders and herders with more than 600 heads of livestock had more herding knowledge and experience. Several experienced herders mentioned a number of key coping or adaptive strategies, notably management of pasture allocation; the presence of livestock huts, shelters, or winter and spring camps; seasonal movements, especially *otor* to fatten animals or to escape from the *dzud*; and observation of plant, animal, climatic, and celestial warning indicators of *dzuds*.

Fernandez-Gimenez et al. (2015) and Thrift and Ichinkhorloo (2015) identified mobility is one of five key strategies for mitigating and responding to *dzuds*. Figure 9 shows patterns of seasonal mobility described by interviewed herders. The average distances travelled were 27 km and 7 km in A and U *baghs*, respectively. Surprisingly, only six herder households in A bagh and four herder households in U bagh practiced *otor*. The herder families who wintered in mountainous areas in U *bagh* could not practice *otor* because of the inaccessibility of the Bulnai mountain range caused by snowfall, lack of available pastureland,

and poor management and coordination of these movements by local authorities. Moreover, the primary factors restricting movement were the cost of transportation and the lack of human capacity.

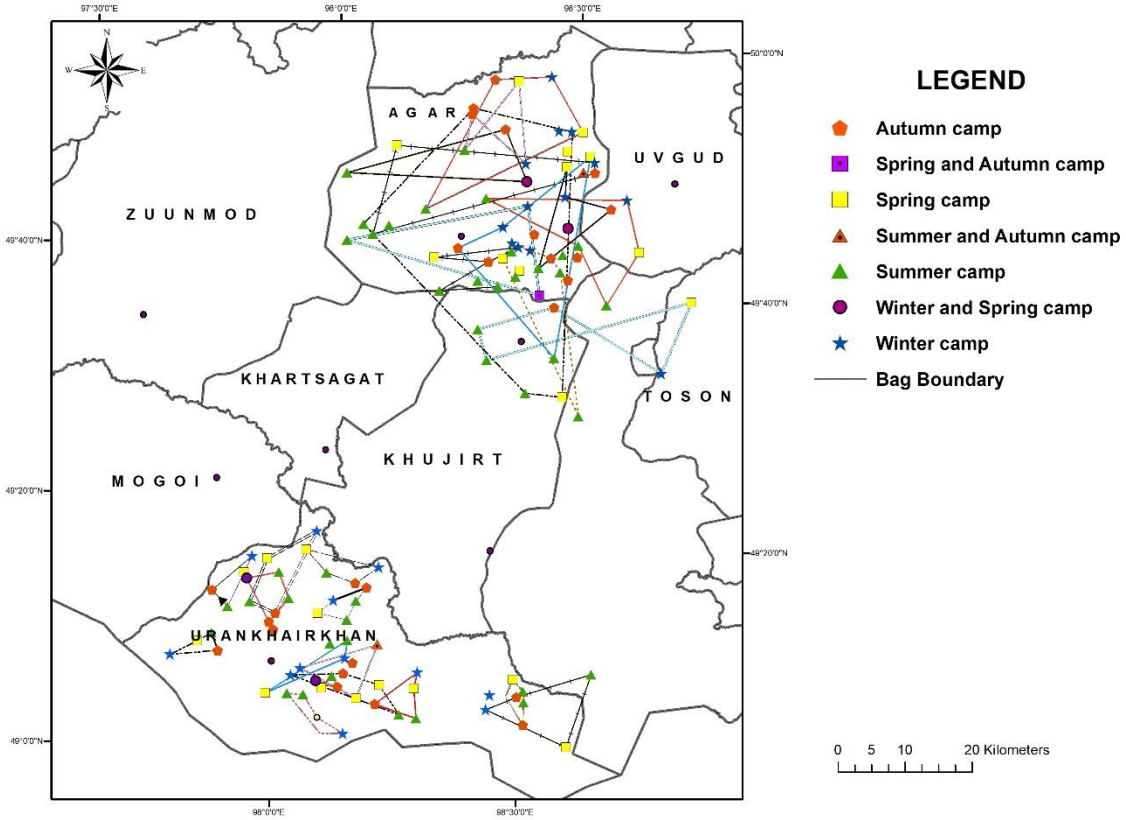


Figure 9. Seasonal movements undertaken by interviewed herder households in Urankhairkhan bagh of Tsetserleg soum and in Agar bagh of Tsagaan-Uul soum

Given the evident importance of herders' financial capacities, the fact that nearly all households are indebted to banks (86.7% and 80% of herder families in U bagh and A *bagh*, respectively) is an important concern. Almost all of herders apply for new loans immediately after paying back the previous loan by selling cashmere wool. All interviewees stated that they prepared and stored adequate quantities of hay and fodder for their livestock and repaired the warm shelters as strategies for winter preparation.

In sum, the herders' adaptive strategies, which include hay and fodder accumulation and the frequency of *otor* and seasonal mobility, as well as distances traveled, are critical for

adequately maintaining livestock and for reducing livestock mortality rates.

4.4.4. Dzud prevention and response actions at all levels

Figure 10 illustrates pre- and post-*dzud* actions taken by national and local governments, international organizations, as well as herders. The Government of Mongolia began preparations for the winter of 2016–2017 by issuing Decree no. 322 on June 13, 2016, which specified quantities of hay and fodder to be collected and prepared by each *aimag* and *soum* in Mongolia. Accordingly, the estimated quantities of hay and fodder to be collected and prepared for the secure fodder fund of Khuvsgul *aimag* for use in an emergency or disaster situation were 553 tons and 277 tons, respectively. Each *soum* was required to put aside 100 tons of hay and 30 tons of fodder (Government Decree # 322 on Agriculture Sector Winter Preparation for Winter of 2016-2017, 2016). Thus, a total quantity of 2,953 tons of hay and 997 tons of fodder were to be prepared for the emergency needs of 4.4 million heads of livestock.

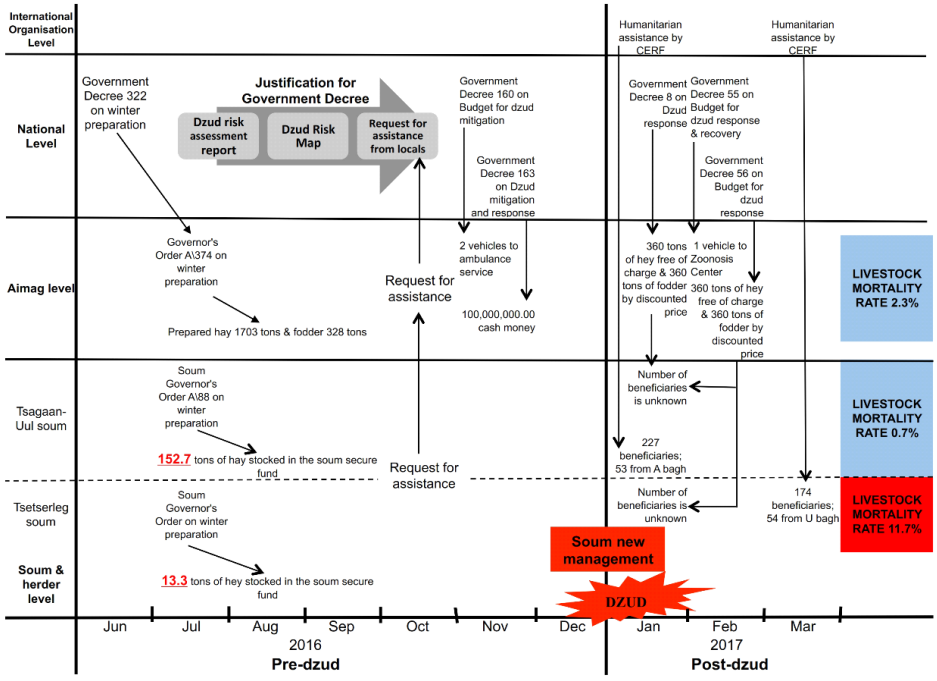


Figure 10. Pre- and post-disaster actions taken at national and local levels during the winter of 2016–2017

This government decree was followed almost a month later by an order issued by the governor of Khuvsgul *aimag* on July 18, 2016, relating to winter preparation. Following this order, the governors of Tse and T-U *soums* issued their own orders on winter preparation at the end of July. In light of the quantities of hay and fodder to be collected, as stipulated in the decree and related orders, winter hay and fodder collection and preparation in the *aimag* and *soums* commenced from the end of July. Consequently, 1,703 tons of hay (triple the quota) and 328 tons of fodder were prepared and stored in the *aimag*. At the level of the *soums*, 152.7 tons of hay were prepared for T-U *soum's* secure fodder fund, whereas only 13.3 tons of hay were prepared for Tse soum's secure fund. In addition, the herders of T-U *soum* prepared 12,394 tons of hay and 70.5 tons of fodder while herders in Tse *soum* prepared 11,000 tons of hay and 30 tons of fodder.

Calculations of the winter requirements of hay and fodder for secure local fodder funds were based on the guidelines for livestock winter and spring preparation and its assessment and monitoring issued by the Ministry of Food, Agriculture and Light Industry in 2016. According to these guidelines, a daily quota of 1 kg of hay per animal is to be provided to 30% of the total livestock, and the same amount of fodder is to be allotted daily per sheep unit for a period of three days (MOFALI, 2016). Accordingly, a daily quota hay stock was prepared for 30 percent of the total livestock at the level of the *aimag* as well as in T-U *soum.* However, in Tse *soum*, only 13.7% of the quantity of daily hay required to feed 30% of the total livestock was prepared. Apart from hay and fodder preparation, the decree and orders covered several other issues, including the identification of *otor* areas and numbers of livestock wintering in these areas, preparations for treating animal infectious diseases during the wintertime, preparation and repair of livestock shelters and wells, and household preparations.

Considering winter conditions and some requests for assistance received from

local-level authorities, the government realized that some of the *aimags* and *soums* were experiencing harsh winter conditions. Consequently, it decided to establish two working groups tasked with visiting all 21 *aimags* in Mongolia to assess the risk of *dzud.* A decree issued by the State Emergency Commission, led by the Deputy Prime Minister of Mongolia, on November 11, 2016 resulted in the establishment of the two working groups that collected relevant data for the risk assessment and provided some direction and guidance on *dzud* mitigation and risk reduction to local authorities in the 21 *aimags*. The groups released their assessment report on November 20, 2016, at which time, the *dzud* risk map prepared by IRIMHE was also released. After reviewing the working group report and *dzud* risk map, along with requests for assistance received from the *aimags*, the government issued a second decree (no. 160) on budgetary allocation for *dzud* mitigation activities on November 23, followed by a third decree (no. 163) on *dzud* mitigation and response activities on November 28 (GoM, 2016; GoM, 2016). As a result of these decrees, Khuvsgul *aimag* received two vehicles for providing ambulance services and MNT 100 million, which is equivalent to USD 37,735.8 (US$1= MNT 2,650 in 2016) in cash for clearing blocked roads and restoring access to areas that were cut off, organizing *otor* movements, providing health and other public services, and for undertaking other mitigative measures deemed necessary.

Because of the heavy snowfall at the end of November and in early December, herders and local authorities requested the government to reduce hay and fodder prices, provide ambulance and search and rescue vehicles, as well as heavy equipment for clearing blocked roads and mountain tracks, and to make arrangements for fuel provision. Moreover, in conjunction with herders, local authorities organized *otor* movements for some herder households located in mountain areas to the Gobi region to enable them to escape from the harsh winter conditions. In addition, the administrators of Tse *soum* were replaced by a new team in early December as a result of the local election, held once every four years, that took

place on October 19, 2016 (Parliament of Mongolia, 2015; 2016). The previous administration of Tse *soum* failed to win the confidence of the herders and lost the election. However, the new administration received only 13.3 tons of hay in the *soum's* secure fund for feeding 65,532 heads of livestock in total. As per its agreement with its neighbor, T-U *soum*, Tse *soum* received an additional 1,000 bundles or 20 tons of hay. However, this additional hay was insufficient for reducing the livestock mortality rate.

Given deteriorating winter conditions, the government issued four further decrees on the subject of *dzud* response and recovery in January and February 2017. Khuvsgul *aimag* received 360 tons of hay free of charge and 360 tons of fodder at a discounted price from the state reserve as a result of a government decree (no. 8) issued on January 11, 2017 (GoM, 2017). In addition, the *aimag* received 200 tons of hay free of charge and 140 tons of fodder at a discounted price as a result of Decree no. 56 issued on February 15, 2017 (GoM, 2017). All of the governmental aid provisions were transported to the *aimag* center. After receiving provisions from the central government, the *aimag* authorities took charge of their allocation and delivery to the center of each *soum.*

Apart from providing the above assistance, the government and NEMA co-led a Humanitarian Country Team, comprising UN agencies and some other international organizations, together with the UN Resident Coordinator, and coordinated all of the humanitarian assistance provided during disaster or emergency situations. As the government works closely with international organizations in Mongolia, the Deputy Prime Minister requested these organizations to provide assistance for vulnerable herders and local communities in December 2016. Consequently, in January 2017, the UN allocated US$1.1 million through the Central Emergency Relief Fund (CERF) to provide agricultural support and early relief for 3,500 of the most vulnerable herders in 36 *soums* located within 13 *aimags.* The T-U *soum* was one of the first *soums* in Khuvsgul *aimag* to benefit from humanitarian

assistance provided under this Fund, as the winter conditions in this *soum* were evaluated as being severe by the government. A total of 227 herder households in T-U *soum* received humanitarian assistance, of which 53 households were located in A *bagh*.

Then, in the third week of March 2017, the government asked the UN to provide humanitarian assistance to an additional 500 herders, located in 9 *soums* of 5 *aimags,* who were experiencing increased livestock losses. The government declared that Tse *soum* in Khuvsgul *aimag* had experienced the highest animal mortality rate of 8.2% for the first time during the winter of 2016–2017, which exceeded the average livestock mortality rate during a regular winter season. Consequently, 174 herder households in Tse *soum* received UN assistance commencing from April 2017; of these households, 54 were from U *bagh* (Trankmann, 2017).

The information on the coordination of these efforts to provide humanitarian assistance, including registration, distribution and usage was sketchy, especially at the local level. This information on humanitarian assistance was obtained from NEMA, the UN Resident Coordinator's Office, as well as other reports prepared by international organizations.

The degree of effectiveness of early actions was evidently the most critical factor in *dzud*-related mitigation, as illustrated by the benefits associated with the early actions taken by the government of T-U *soum,* which led to a reduced livestock mortality rate and enabled vulnerable households to escape from the *dzud* disaster.

4.4.5. Herders' evaluations of governmental actions

The primary aim the interview-based survey was to evaluate the effectiveness of government actions both at national and local levels. More than 73% of interviewees in U *bagh* of Tse soum reported that they received some information on the government's actions,

but only 46% of them were aware of *dzud*-related governmental actions. Almost half of the interviewees assessed early, responsive, and recovery-focused activities to be inadequate. About 60% of interviewees observed that governmental actions and assistance did not help to overcome the *dzud* by reducing losses. Only 40% of the interviewees opined that the humanitarian assistance was delivered at the right time.

By contrast, about 80% of interviewees in A *bagh* of T-U *soum* stated that they had received some information and were aware of *dzud*-related governmental actions. Almost half of the interviewees assessed preventative, responsive, and recovery-focused activities relating to the *dzud* to be sufficient. More than 70% of the interviewees replied that governmental actions and assistance helped to reduce losses and overcome the *dzud*. More than 65% of the interviewees felt that humanitarian assistance was delivered at the right time.

Herders in Tse *soum* repeatedly mentioned that the local government did not cooperate effectively with the herders before, during, and after the *dzud*. By contrast, herders in T-U *soum* were satisfied with local government actions. They felt that the local government was supportive and had encouraged them to prepare for the winter by collecting and distributing hay and fodder. Other forms of governmental assistance included managing and facilitating the herders' mobility and *otor* movements.

Because herders in Tse *soum* complained extensively about the *soum* authorities' poor management of the *dzud*, government officials recorded the difficulties they had experienced, for example, those relating to the new administration, their lack of financial capacities, the inaccessibility of some herder families because of excessive snow cover and a lack of proper vehicles, and many more.

Overall, herders were aware of the kinds of mitigative actions taken by the national and local governments against the *dzud*. However, the effectiveness of preventative actions varied dramatically between the two *soums*, depending on the local governments' actions, as

discussed in the previous section.

4.5. Conclusions

This Chapter has illustrated important issues with *dzud* management at local level. The field survey was conducted in two *soums* of Khuvsgul *aimag* to identify *dzud*-inducing climatic and socioeconomic factors and to investigate the effectiveness of actions taken by national and local governments to prevent and mitigate livestock mortality rates during the *dzud* of 2016–2017. My comparative study of the two *soums* revealed that even though their climate was the same and they shared similar geographical features, their livestock mortality rates differed significantly. One of the main findings was poor local government actions could increase vulnerability of herders and livestock that leading to disaster as herders' actions against the *dzud* was greatly depended on governments at all levels. Many studies pointed the accumulation of hay and fodder by herders is an effective approach for minimizing the impact of *dzud* (Ahearn, 2018b; Fernández-Giménez et al., 2015; Sternberg, 2010), and this study also revealed the importance of it.

A practical contribution of the study is our formulation of a flow chart depicting pre- and post-disaster actions (Figure 10). This chart clearly depicts the sequence of actions and their impacts over an extended period of time from the pre-disaster phase to the post-disaster phase. It will provide valuable inputs for not only national government but also local governments, enabling them to develop effective mechanisms to reduce the risk of disasters. The flow chart can be used for coming winters for monitoring *dzud* preparation and mitigation, especially accumulation of hay and fodder at the local level, establishing an accountability mechanism that allows increasing responsibility at all levels, and coordinating *dzud* relief timely and effectively and others.

CHAPTER FIVE: DISCUSSION AND RECOMMENDATIONS FOR FUTURE *DZUD* COUNTERMEASURES IN MONGOLIA

5.1. Discussion

This chapter discusses the findings related to *dzud* management and *dzud* mitigation strategies, namely, early actions. After the discussion, it focuses on recommendations for future *dzud* countermeasures regarding the enhancement of *the dzud* management system and *dzud* risk reduction in Mongolia, followed by recommendations for future research.

This study had two aims:1) How does *dzud* management work to mitigate *dzud* and reduce risk? and 2) To what extent do *dzud* mitigation strategies affect herders and livestock mortality?

To provide a foundation for data analysis, the background of the study is based on reports released after the *dzuds* of 1999–2000 and 2009–2010 by the Cabinet of Mongolia jointly with international organizations. The goal was to examine *dzud* management in Mongolia, whether it works to mitigate *dzud*, reduce risk, and to minimize the impact of *dzuds*. In addition, to evaluate the effectiveness of *dzud* mitigation strategies, such as early action, I conducted a field study in October 2017 in the northernmost area of Mongolia, namely, in two neighboring *soums* of Khuvsgul *aimag*, Tsetserleg and Tsagaan-Uul.

This analysis yielded several significant findings. First, it identified the coordination of activities and efforts of *dzud* response stakeholders, specifically their roles and responsibilities. The second set of issues involves planning, organization, and execution of *dzud* related policies and strategies, along with accountability. Third, this study addressed the issues of organizational structure and capacity. Fourth, the results showed how early actions at the local level can mitigate *dzud* disasters.

First, from the systems approach perspective, a system should be integrated and coordinated and subsystems should contribute to the larger system according to their role. However, the analysis revealed that although the government has achieved a degree of

coordination in disaster mitigation, it is yet to clarify the roles and participation of other stakeholders. Specifically, the Ministry of Food, Agriculture, and Light Industry, which is in charge of formulating and implementing livestock-related policies, is playing a key role in *dzud* prevention and mitigation with other subsystems, such as herders, local authorities, meteorological organizations, emergency services, and international organizations; however, it is not clear how they are working together to prevent *dzuds*, reduce risks, and prevent new risks. Similar arguments have been made by Sternberg (2010) that stakeholders such as climatologists, disaster practitioners, pastoral experts, and other professional are working independently; a lack of cooperation between agencies restricts communication and cooperation. He also argued that "… no office with clear responsibility for climate change adaptation (CCA) or disaster risk reduction (DRR), restricts capability, integration, and communication within the government."

The next set of issues involves planning, organization, and execution. After the 1999–2000 *dzud*, dozens of policies, strategies, projects, and programs were formulated to protect the agriculture sector, including animal husbandry, from *dzuds*. However, their outcomes have proven to be inadequate. This is due to insufficient criteria for evaluating the results and a lack of accountability mechanisms. A similar trend was observed in Mongolia during the COVID-19 pandemic. Citizens and businesses suffered as a result of erroneous and incoherent policies, decisions, and actions taken by relevant government bodies. However, no one was held accountable.

The aforementioned scenario highlights the lack of result-based planning. Ideally, for instance, the results of the National Program to Assist the Protection of Livestock from Drought and *Dzud* and other policies and programs should have been considered, and their achievements, successes, challenges, and failures should have been evaluated and reflected upon for future planning and activities. This would have allowed for effective and efficient

efforts. If monitoring and evaluation of hay and fodder production, *dzud* exposure, and livestock mortality were performed annually according to the national program, the loss of livestock could have been controlled in future *dzud events*. The systems approach involves learning from the past, incorporating it into present actions, and preventing future risks. Monitoring and evaluation results must inform policies and management (Fernández-Giménez et al., 2017).

Third, this study identified the issue of disaster management structure and capacity. The *dzud* management system in Mongolia was still lacking under the new social and economic order. The severity of *dzuds* during the last three decades and the adverse effects on the community, society, economy, and environment highlight the incapability and ineffectiveness of existing disaster management system. Although *dzud* management failure and lack of capacity have been questioned in many studies since the 1990s (Ahearn, 2018b; Fernández-Giménez et al., 2015; Hahn, 2018; Sternberg, 2010), recently, Mongolia has been reforming its disaster management system, including disaster management frameworks, and working to improve its capacity. These results will be tested in future disasters. Had the country learned from its past *dzuds* (1990–2000 and 2000–2002) and improved its disaster management system earlier, it would perhaps not have lost almost a quarter of its livestock population during the *dzud* of 2009–2010.

Fourth, the field study showed the effectiveness of early actions at the local level. A comparative study of the two *soums* (Tsetserleg and Tsagaan-Uul) revealed that even though their climates were the same and they shared similar geographical features, their livestock mortality rates differed significantly. The climatic conditions in the winter of 2016–2017, especially the occurrence of rain in November that turned into ice over the pastureland, was a major factor influencing livestock mortality. Another significant finding of this study was that

inadequate local governmental arrangements could induce vulnerability, leading to emergencies or disastrous conditions. As this research has shown, the significantly higher livestock mortality rate in Tsetserleg *soum* can be attributed to inadequate preparation related to insufficient accumulation of hay and fodder stocks and a weak *dzud* management system created by the local government. Sternberg (2010), Fernández-Giménez et al. (2015a), and Ahearn (2018) noted that the storage of forage by local herders in preparation for severe winters is an effective approach for coping with harsh winter conditions. Herders' actions were found to be heavily dependent on government policies, governmental arrangements, and actions taken by local authorities. In addition, the interview-based survey conducted among the herders shed light on their evaluations of national and local government actions against *dzuds*. Herders who experienced high livestock mortalities expressed low levels of satisfaction with these actions, whereas the satisfaction levels of those who experienced lower livestock mortalities were comparatively high. The findings of this study further revealed that the self-reliant actions of herders in Tsagaan-Uul *soum* resulted in fewer mortalities and losses. These actions included, for instance, the winter preparations of individual households, as well as *otor* and seasonal movements, and their distance and frequency, which contributed significantly to lower livestock mortality rates. Endorsing the findings of previous studies (e.g., (Du et al., 2018; Fernández-Giménez et al., 2012)), this study has highlighted the key roles of herders associated with the inducement of *dzuds*, such as the degree of their winter preparedness and their (non)practice of *otor*. However, the findings indicate that even when herder households are sufficiently prepared for winter by fattening their livestock, preparing winter camps, and storing adequate stocks of hay and fodder, weak local governmental actions and preparation increase livestock vulnerability and the overall risks faced by herders.

A practical contribution of this study is the formulation of a flow chart depicting the pre- and post-disaster actions (Figure 10). This chart clearly depicts the sequence of actions and their impact over an extended period, —from the pre-disaster phase to the post-disaster phase. It will provide valuable inputs for both national and local governments, enabling them to develop effective mechanisms to reduce the risk of disasters. The flow chart can be used to monitor *dzud* preparation and mitigation, especially the accumulation of hay and fodder at the local level, establish an accountability mechanism that allows increasing responsibility at all levels, and coordinate *dzud* relief in a timely and effective manner. Detailed information collected from the flow charts for each *soum* will greatly help future studies evaluate the effectiveness and impact of governmental policies and measures on pastoralism, and envision a future of *dzud*-tolerant, viable pastoralism-based society.

5.2. Recommendations for "future" *dzud* management

In light of these findings, I propose the following recommendations for herders, government, aid providers and other stakeholders.

First, the coordination of all stakeholder activities and efforts should be enhanced. This can be achieved through clarification and determination of the roles and responsibilities of each stakeholder, a clear articulation of responsibilities across stakeholders, and ensuring mutual collaboration, partnership, and accountability. In addition, a set of long-term directions in *dzud* management could clarify the results to be achieved, and accordingly, the roles and responsibilities of stakeholders will be clarified.

Second, a monitoring and evaluation system should be developed and enhanced in collaboration with stakeholders of various *dzud* management subsystems, and accountability mechanisms should be established at all levels. In particular, the enhancement of accountability mechanisms will bring substantive results in *dzud* management, especially

dzud mitigation and risk reduction. One possible way to do this is to revise and reformulate the liability in the relevant laws, such as the Law of Mongolia on administrative and territorial units and their governance, administrative and territorial unit management, and other legal frameworks.

Simultaneously, to make *dzud* risk reduction effective and efficient, it is imperative for the government to develop policies, plans, and standards based on lessons learned and policy results. There needs to be a broader and more people-centered preventive approach to *dzud* risk by ensuring the involvement of herders, women, youth, people with disabilities, the elderly, and local authorities in policy development and decision-making (leave no one behind). The inclusion of local people and authorities is important for disaster prevention and risk reduction.

Third, the country should consider the audacious step of shifting from traditional *dzud* management to *dzud* risk management by interpreting global initiatives and approaches for disaster risk reduction into local circumstances. One applicable approach to *dzud* risk management would be anticipatory actions such as early warning and early action (Figure 11).

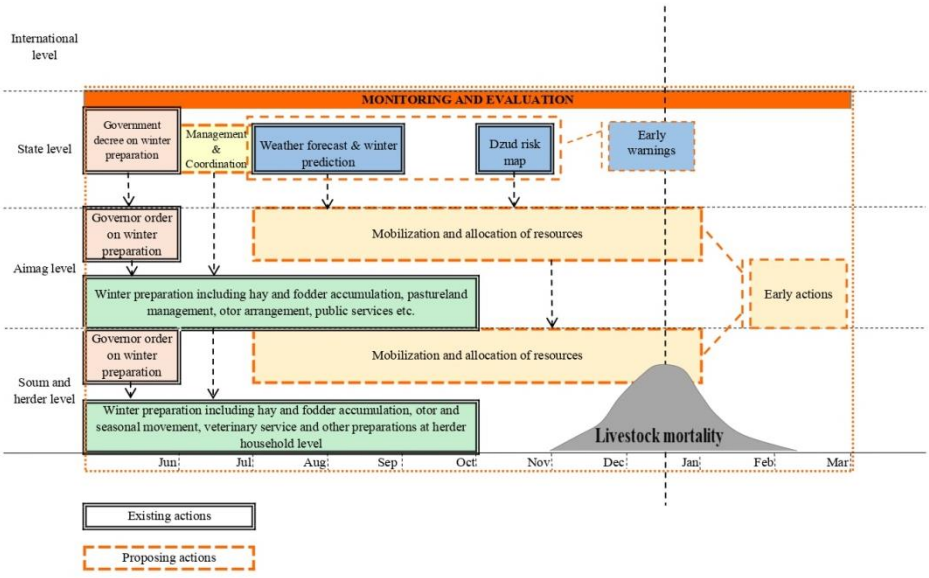


Figure 11. Dzud *anticipatory actions (recommended approach)*

Early warning and early action strategies are related, for example, to the dissemination and use of weather forecasts and *dzud* risk maps, adequate storage of hay and fodder, proper preparation of winter shelters and animal bedding, and increasing the distance and frequency of seasonal movements and *otor*, and prompt and timely mobilization and allocation of resources. Again, a *dzud* risk map, a good practice of early warning and action, but is only briefly mentioned in the literature review, should be used widely among not only practitioners in government and the humanitarian sectors but also among local authorities and herders.

Most importantly, it is ineffective if there is no monitoring or evaluation at all stages of management, even if the country does the appropriate shift in its management. A plan-do-check-act (PDCA) cycle can be used to ensure effective *dzud* risk management in Mongolia.

CHAPTER SIX: CONCLUSIONS

This chapter concludes the study by providing a summary of key research findings regarding the research aims and questions and discusses the contribution thereof. It also reports on the limitations of the study and proposes opportunities for future studies.

6.1. Conclusions

Livestock husbandry has been practiced in Mongolia since times immemorial. Then, why should it bring challenges to the country since the socioeconomic changes in the 1990s? This research aimed to consider what turns a *dzud* into a disaster by examining *dzud* management based on the proactive and reactive measures taken by the state and local authorities during *dzud events* in the last three decades. It also focused on *dzud* mitigation strategies by examining early actions through fieldwork in the Khuvsgul region of northern Mongolia.

The study indicates that *dzud* management in Mongolia has failed to mitigate the disaster and reduce the loss due to lack of coordination, uncertain roles and responsibilities of stakeholders, inadequacy of monitoring and evaluation at all phases of the management that leads to lack of accountability, ineffectiveness of its structure, and inadequate capacity. Further findings from a comparative study of two *soums* in northern Mongolia confirmed the effectiveness of early local actions that result in lower livestock mortality rates and reduced *dzud* impact. By analyzing the effectiveness of *dzud* management, including early action, this thesis has shown how weak *dzud* management can directly affect *dzud* events and turn them into a disaster.

In other words, this research showed that one of the major social factors that turns a *dzud* to a disaster is inefficient *dzud* management. In addition, this study is one of the few that systematically investigated the socioeconomic aspects of *dzuds,* and it would thus contribute

as a basis for future studies and knowledge.

6.2. Limitation and future studies

This study had two limitations. First, *dzud* management descriptions and analyses were mostly based on state-level measures carried out by the state level. Second, the discussions and conclusions on *dzud* management were based on an analysis of the two research reports which published after the *dzuds* of 1999-2000 and 2009-210; thus, the data analyzed were limited.

This study identified that Mongolia needs to make a paradigm shift in *dzud* management. Since 2005, a large shift from natural disaster management to disaster risk management and beyond has been made globally. Similar experiences, opportunities, successes, challenges, and mistakes can be instructive for Mongolia's livestock husbandry and *dzud* management system enhancement. This would clarify the impact of *dzud* management if a study applies physical, biological, socioeconomic, and institutional factors. Yet again, accountability issues would need to be identified and discussed in detail. Therefore, the study encourages addressing accountability mechanism issues in all phases, particularly preparation and mitigation, to better act against *dzuds*.

In general, this study offers a critical perspective on *dzud* management including *dzud* mitigation strategies e.g., early actions by examining previous *dzud* events in Mongolia. The discussions have important implications for improving *dzud* risk management systems in Mongolia and establishing solid *dzud* mitigation strategies, such as early warning and early actions. From the systems approach perspective, it is vital to create a comprehensive mechanism where the responsibilities and roles of all the stakeholders are clear, and for continuous communication and cooperation between them for achieving the overarching goal of protecting herders and livestock from the *dzud*.

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ANNEX

Questionnaire template used during the field survey in 2017 in Khuvsgul *aimag*

1. Sample from Agar *bagh* of Tsagaan-Uul *soum*, Khuvsgul aimag

The Government Actions to and Its Effects on Dzud Mitigation and Response in Mongolia
Dzud 2016-2017

Questionnaire No:_ 1_ _ _

	Date: / /2017	**Time from: to:**
Full name (Head of the household):	Цавхлантаа Ахбаяр	Contact phone (Head of the household): 98565858
Age of the head of household.	37.	
Aimag	Хөвсгөл	Sources of household income Livestock: (Yes) No
Soum	Цагаан Үүл	Selling live animal Yes
Bagh	Агар	Selling animal products Yes
Location	Бор зураг	Social welfare allowance: (Yes) No
Number of family members	6	If Yes:
Of which: Adult F 1 M 1		Pension Child money 2016-2017.07. Disability living allowance Food voucher
Elderly	–	
Disabled	–	
Children: 0-12 month 1-5 years 6 -18 years	4	Other sources (please specify):
Hut (ger, house)	Гэр	
Herding years	20 жил	The reason to become a herder. Жаргалтай.

			Total	Horse	Camel	Cattle (yak)	Sheep	Goat
Number of animal by the livestock census2016			705	35	–	44	509	217.
Number of animal by May 2017 (after dzud)	1095	1 y.o and above		35	–	44	509	217
		New born		5	–	17	243	25

No mortality.
Total 705

Hay & fodder
10 ногоо ... ~ 10 тонн = 10.000 кг ≈ 500 bundle

The Government Actions to and Its Effects on Dzud Mitigation and Response in Mongolia
Dzud 2016-2017

Received commodities/ services provided by the State and International Organizations:

Commodity / service	Source (e.g.State, aimag, soum, IO, others)	Quantity / No received	Comments by beneficiaries (by usage)
Cash			Food Medicine Warm clothes Animal hay and fodder Fuel (petrol/cash for transportation to access markets and health centers) Firewood Phone credit Loan Purchase of livestock Other:
Concentrated fodder (pellet)			
Milk replacement			
Mineral block			
Vitamin supplement			
Fish oil			
Ointment for treatment of abrasions			
Ointment for treatment of klieg eyes			
Pour-on for control of external parasites			

2

Herders' manual for nursing of weak animal			
Food			
Nutrition			
Multiple Items			
Others			

Household questionnaire:

	YES	NO	Comments:
Do you have an access to pasture?	☑ ☐	☐ ☐	If no, why?
Do you have a hut or shelter for livestock (malin hashaa) at winter camp site?	☑	☐	If no, why?
Did you do Otor during 2006-2007 dzud ?	✓		If yes, where did you go for Otor? Буянтын ам (Овоонт оноос 20км)
Do you have protected area or land for collecting the hay and fodder?	✓		If yes, the size of the land: Байгалийн хадлан
Do you belong to any herder groups\community?	☑	☐	If yes, list the activities of the group or community: 1. Малчин бүлэг – Мийгаашин бүлэг 2. 3.
Do you participate any capacity building events, trainings, drills and exercises?	☑	☐	If yes, how often: Бэлтгэлийн ажлаар Багийн хурал – Жилд 1 удаа (суурийн үед тэр мэдээлэх)
Do you participate any dzud planning activities?	☐	☑	If yes, list of the activities: 1. 2. 3.
Do you participate in decision-making for dzud mitigation and response?	☐	☑	If no, why? Би тэгэж үзсэн, хадлангаа авсан бэсэн.
Do you receive weather forecast?	☑	☐	If yes, list the source: 1. TV 2. Утасны орон нутгаас мессеж ирнэ. 3.

			If no, why? [illegible]
Do you receive any information on Government activities to dzud?	☑	☐	If yes, list the source: TV
Do you familiar with Government actions on dzud mitigation and response? - Government resolution on winter preparation - Weather services e.g. maps, forecast, etc - Dzud trainings - Assistance	☐	☑	If no, list the reasons: [illegible] TV [illegible]
Do you think that the cause of dzud 2016-2017 is natural?	☑	☐	If no, list the reasons: 1. 2. 3.
Did the Government carry out dzud prevention and mitigation well in dzud 2016-2017?	☐	☑	If yes, list the achievement: 1. 2. 3. If no, list failure\weakness: 1. 3. [illegible] 2. 3.
Did the Government carry out dzud response and recovery well in dzud 2016-2017?	☑	☐	If yes, list the achievement: 1. [illegible] 2. [illegible] 150% [illegible]) 3. If no, list failure\weakness: 1.

			2. 3.
Did the Government activities contribute to overcoming harsh winter conditions with fewer losses?	☐	☑	If yes, what activity and how? [illegible]
Was the Government assistance delivered at the right time?	☑	☐	If no, when was the right time?
Was the Government assistance contribute to overcoming harsh winter conditions with fewer losses?	☐	☑	If yes, how? If no, why? [illegible]
Is there any additional item/s that should have been included in assistance?	☐	☑	If yes, list maximum three items: 1. 2. 3.
Are there any enhancements that could be introduced for future supplies?	☑	☐	If yes, list maximum three items: 1. [illegible] (yanne) 2. 3.
Do you have any comments or recommendations for Government action on dzud mitigation and response?	☑	☐	If yes, list activities: 1. [illegible] 2. [illegible] 3. [illegible]

The Government Actions to and Its Effects on Dzud Mitigation and Response in Mongolia
Dzud 2016-2017

Household vulnerability and resilience related questionnaire:

	YES	NO	Comments:		
Does your household have debt?	☑	☐	If yes please specify the amount: Before dzud 2016-2017(MNT 4'000'000); As of April, 2017 (MNT 0)		
Are you planning to take another loan in the coming month?	☐	☐	If yes, how much and for which expenditures? MNT 4'000'000 - 5'000'000 магадгүй. Expenditure: - Өвс тэжээл - Ахуйн хэрэглээ.		
Did your debt increase since dzud 2016-2017?	☐	☑	If yes, Before dzud 2016-2017 MNT 4'000'000; in now MNT 0		
Has the price of household items increase or decrease over the last 6 months?	☑	☐	If yes, for which items? - хүнсний бүтээгдэхүүн - ахуйн бараа бүтээгдэхүүн - бензин, тос		
How do you evaluate how was the household preparation to overcome the winter-spring 2016-2017?				Sufficient	Not sufficient
			Food	✓	
			Warm clothes	✓	
			Household dignity items/medicine	✓	
			Warm shelter and bedding for animal	✓	

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The Government Actions to and Its Effects on Dzud Mitigation and Response in Mongolia
Dzud 2016-2017

How and how much animal fodder was prepared to overcome the winter-spring?	How		How much: Amount of hay 10 тэрэг өвс Amount of concentrated fodder — Other feed stuff (minerals) 20 уут хужир.
What problems were faced for preparation of a sufficient amount of animal fodder			Financial shortage ✓ Lack of hay making field ✓ Lack of hay making machineries Lack of knowledge on how to prepare No near market access
What were the challenges for marketing live animal and products of animal origin?			① Мал, малын бүтээгдэхүүн үнэгүйдсэн
Do you insure your animal (flock) by the index based insurance system?	Yes☐	No ☑	If no why? хувь хүн өөрөө аминдаа. Сумын холын [illegible] [illegible] [illegible] [illegible] үгүй.
Do you teach your children or younger herders on livestock herding knowledge?	Yes☑	No ☐	Зааж өгдөг.
What kind of strategies do you have for coping with dzud disaster?	Good preparation Knowledge on herding Financial capacity Others: Өвс бэлтгэл хийсэн. Өвс тэжээл сайтар бэлтгэх.		
How many times did you change your camp sites during a year?	Өвөлжөө - Хаваржаа - Зуслан (3-4 удаа хол нүүдэл) ... 80-100км - Намаржаа (2 удаа) 10 удаа		

8

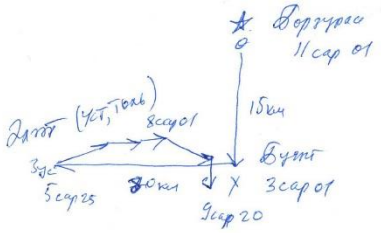
The Government Actions to and Its Effects on Dzud Mitigation and Response in Mongolia
Dzud 2016-2017

Do you have radio, TV, car, motorcycle, tractor?	Radio	Yes□	No ☑
	TV	Yes☑	No □
	Car	Yes☑	No □
	Motorcycle	Yes☑	No □
	Tractor	Yes□	No ☑
	Others	нарын зай хураагуур	
The depth of snow around your winter camp during 2006-2007 dzud.	15см – 30 см		

Name/ Signature of interviewed herder: _____
Date: _____

9

Freq. 4
Av. dis 39.7



*At the end of each survey, I draw a seasonal movement of a household and estimated the frequency and an average distance.

2. Sample from Urankhairkhan *bagh* of Tsetserleg *soum*, Khuvsgul *aimag*

The Government Actions to and Its Effects on Dzud Mitigation and Response in Mongolia
Dzud 2016-2017

Questionnaire No:__1__

	Date: / /2017	Time from: to:
Full name (Head of the household):	[illegible]	Contact phone (Head of the household):
Age of the head of household.	38	98850685
Aimag	khuvsgul	Sources of household income Livestock: (Yes) No
Soum	Tsetserleg	Selling live animal yes
Bagh	Uran khairkhan	Selling animal products yes
Location	Sogoot Dood Ulaan khad	Social welfare allowance: (Yes) No
Number of family members	4	If Yes:
Of which: Adult F 1 M 1		Pension Child money 2016 – 2017.07. Disability living allowance Food voucher
Elderly	–	
Disabled	–	
Children: 0-12 month 1-5 years 6 -18 years	2	Other sources (please specify): No
Hut (ger, house)	Ger	
Herding years	13 years	The reason to become a herder. Traditional / Low education

		Total	Horse	Camel	Cattle (yak)	Sheep	Goat
Number of animal by the livestock census2016		120	–	–	10	70	40
Number of animal by May 2017 (after dzud)	80	1 y.o and above	–	–	7 (-3)	54 (-16)	21 (-19)
		New born	–	–	4	–	–

Total 120
Mortality 38
After 80

Hay 1 fodder
13 [illegible] = 13000 [illegible] = 650 [illegible]
[illegible], [illegible] – 2 тн
30 [illegible] – 1,5 тн

1

The Government Actions to and Its Effects on Dzud Mitigation and Response in Mongolia
Dzud 2016-2017

Received commodities/ services provided by the State and International Organizations:

Commodity / service	Source (e.g.State, aimag, soum, IO, others)	Quantity / No received	Comments by beneficiaries (by usage)
Cash			Food Medicine Warm clothes Animal hay and fodder 1 press hay and 1 fodder Fuel (petrol/cash for transportation to access markets and health centers) Firewood Phone credit Loan Purchase of livestock Other:
Concentrated fodder (pellet)			
Milk replacement			
Mineral block			
Vitamin supplement			
Fish oil			
Ointment for treatment of abrasions			
Ointment for treatment of klieg eyes			
Pour-on for control of external parasites			

2

Herders' manual for nursing of weak animal			
Food			
Nutrition			
Multiple Items			
Others			

Household questionnaire:

	YES	NO	Comments:
Do you have an access to pasture?	☑ ☐	☐ ☐	If no, why?
Do you have a hut or shelter for livestock (malin hashaa) at winter camp site?	☑	☐	If no, why?
Did you do Otor during 20~~0~~6-20~~0~~7 dzud ?		✓	If yes, where did you go for Otor?
Do you have protected area or land for collecting the hay and fodder?		✓	If yes, the size of the land: Preparing near the winter place
Do you belong to any herder groups\community?	☐	☑	If yes, list the activities of the group or community: 1. 2. 3.
Do you participate any capacity building events, trainings, drills and exercises?	☑	☑	If yes, how often: (No any activities) Carcase removal training in spring (1 time)
Do you participate any dzud planning activities?	☐	☑	If yes, list of the activities: 1. 2. 3.
Do you participate in decision-making for dzud mitigation and response?	☐	☑	If no, why?
Do you receive weather forecast?	☑	☐	If yes, list the source: 1. TV 2. SMS – rarely. (message from NEMA) 3.

[illegible]

			If no, why?
Do you receive any information on Government activities to dzud?	☑	☐	If yes, list the source: TV programme – News channel
Do you familiar with Government actions on dzud mitigation and response? - Government resolution on winter preparation - Weather services e.g. maps, forecast, etc - Dzud trainings - Assistance	☐	☑	If no, list the reasons: Watching on tv No maps usage.
Do you think that the cause of dzud 2016-2017 is natural?	☑	☐	If no, list the reasons: 1. 2. 3.
Did the Government carry out dzud prevention and mitigation well in dzud 2016-2017?	☐	☑	If yes, list the achievement: Medium to low 1. 2. N/A 3. If no, list failure\weakness: 1. No transportation of fodder to soum from aimag reserve 2. Lack of management and organisation of dzud mitigation 3. Late assistance (e.g. in May)
Did the Government carry out dzud response and recovery well in dzud 2016-2017?	☐	☑	If yes, list the achievement: 1. 2. 3. If no, list failure\weakness: 1. No implementation of soum activities.

			2. [illegible] 3. [illegible].
① Did the Government activities contribute to overcoming harsh winter conditions with fewer losses?	☐	☑	If yes, what activity and how?
② Was the Government assistance delivered at the right time?	☐	☑	If no, when was the right time? Distribution was made in May. 12р сарын 10 [illegible] [illegible] 12.20-с 1р сарын [illegible].
Was the Government assistance contribute to overcoming harsh winter conditions with fewer losses?	☐	☑	If yes, how? If no, why? Too late.
Is there any additional item/s that should have been included in assistance?	☑	☐	If yes, list maximum three items: 1. Hay & fodder – enough 2. Cash – most important 3. Food – гурил, будаа.
Are there any enhancements that could be introduced for future supplies?	☑	☐	If yes, list maximum three items: 1. Hay quality needs to be improvement 2. 3.
Do you have any comments or recommendations for Government action on dzud mitigation and response?	☐	☐	If yes, list activities: 1. [illegible] 2. [illegible]. 3. [illegible].

Household vulnerability and resilience related questionnaire:

	YES	NO	Comments:		
Does your household have debt?	☑	☐	If yes please specify the amount: Before dzud 2016-2017(MNT 1'800'000); As of April, 2017 (MNT 1'800'000)		
Are you planning to take another loan in the coming month?	☑	☐	If yes, how much and for which expenditures? MNT 1'200'000 Expenditure: - for winter preparatory for hay & fodder - food		
Did your debt increase since dzud 2016-2017?	☑	☐	If yes, Before dzud 2016-2017 MNT ________; in now MNT________		
Has the price of household items increase or decrease over the last 6 months?	☑	☐	If yes, for which items? - Flour - Rice -		
How do you evaluate how was the household preparation to overcome the winter-spring 2016-2017?				Sufficient	Not sufficient
			Food	✓	
			Warm clothes	✓	
			Household dignity items/medicine	✓	
			Warm shelter and bedding for animal		✓
			Hay & fodder (13 машин өвс)	✓	

How and how much animal fodder was prepared to overcome the winter-spring?	How		How much: Amount of hay 13 машин Amount of concentrated fodder 2тн - [illegible] Other feed stuff (minerals) 1,5тн -30[illegible]
What problems were faced for preparation of a sufficient amount of animal fodder			Financial shortage Lack of hay making field Lack of hay making machineries Lack of knowledge on how to prepare No near market access
What were the challenges for marketing live animal and products of animal origin?			[illegible] 1000 төгрөг. [illegible]
Do you insure your animal (flock) by the index based insurance system?	Yes☐	No ☑	If no why? [illegible] 2014 [illegible]
Do you teach your children or younger herders on livestock herding knowledge?	Yes☑	No ☐	[illegible]
What kind of strategies do you have for coping with dzud disaster?	Good preparation ✓ Knowledge on herding ✓ Financial capacity Others: [illegible]		
How many times did you change your camp sites during a year?	1 жилд 3-4. (1) [illegible] (3) [illegible] 7-8км → 14-15 км (2) [illegible] 14-15км (4) [illegible] 7-8 км - 13-14 км [illegible]		

[illegible] 2-3 км радиуст мал [illegible].
[illegible]

The Government Actions to and Its Effects on Dzud Mitigation and Response in Mongolia
Dzud 2016-2017

Do you have radio, TV, car, motorcycle, tractor?	Radio	Yes☐	No ☑
	TV	Yes☑	No ☐
	Car	Yes☑ Порго	No ☐
	Motorcycle	Yes☑	No ☐
	Tractor	Yes☐	No ☑
	Others		
The depth of snow around your winter camp during 2006-2007 dzud.	25см – 50см		

Name/ Signature of interviewed herder: _____
Date: _____

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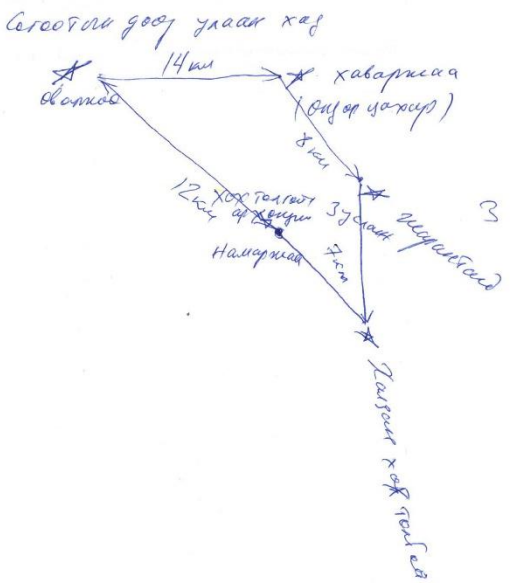
Freq. 5
Arbis 82.



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