DISSERTATION


COMMUNITY-BASED RANGELAND MANAGEMENT AND SOCIAL-

ECOLOGICAL RESILIENCE OF RURAL MONGOLIAN COMMUNITIES



Submitted by

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ABSTRACT

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This research is an attempt to apply a resilience framework to understand how pastoral

social-ecological systems respond to change, and the potential role of formal CBRM

institutions in this process. The resilience principles of Folke, Colding & Berkes (2003):

1) learning to live with change and uncertainty, 2) nurturing diversity for reorganization

and renewal, 3) combining different types of knowledge for learning and 4) creating

opportunity for self-organization toward social-ecological sustainability were assessed in

two pairs of adjacent herding communities with and without community-based rangeland

management (CBRM) experience.

The social-ecological systems in both CBRM and non-CBRM herding communities

demonstrated that their capacities to respond to crisis and disturbances are deeply

embedded in local knowledge, practices, and social networks. Community-based

rangeland management communities have shown potentials to facilitate adaptation and

resilience building if such organizations are based on and further develop existing

cooperation of customary neighborhoods.  Community-based rangeland management

offers structures that contemporary pastoral society needs to have in place to stimulate

new learning for constructive change. As part resilience building for Mongolian pastoral

social-ecological systems, I propose linking the resilience framework to the meaningful

local *nutag* wisdom or framework to inform national and international stakeholders about

locally appropriate or *nutag* appropriate strategies and approaches to natural resource

management and rural development.

# ACKNOWLEDGEMENTS

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# Chapter 1 Introduction

Social-ecological systems in Mongolia have changed dramatically over the past century, undergoing many political and socio-economic transformations. From the 17$^{th}$ to the beginning of the 20$^{th}$ century, the country was under the Manchurian rule. After the people's socialist revolution in 1921, the Mongolian People's Republic was founded in 1924. Following the first unsuccessful collectivization of animal husbandry in the early 1930s, actual collectivization started in 1950s and lasted until the democratic transition in the early 1990s, when all state collective farms were dismantled and the state-owned livestock were privatized. The number of herder households increased from about 75,000 in 1990 to more than 150,000 in 1993. The number of livestock in Mongolia increased from 25 million in 1992 to 33 million in 1999. According to the latest 2010 livestock census the total number of livestock increased up to about 44 million. The rapid increase of the number of livestock has a direct effect on the grazing capacity of the rangeland. Lack of an enabling legal environment that protects pasture resources as well as herders' productive assets and livelihoods, climate change and economic forces threaten the resilience of the social and ecological coupled system of pastoralism in rural Mongolia. Despite all these events and factors, faced with different political regimes and administrative structures, Mongolian pastoral social- ecological systems have survived, demonstrating dynamic and self-organizing adaptive behavior.

To understand the process of adaptation and re-organization, I examine the role of community-based rangeland management in building resilience of the coupled human-natural system in rural herding communities. For the past 10-15 years, a substantial number of international and national projects have seen the formation of organized

herding communities as an essential step in attaining better and more sustainable management of Mongolian pastoral system.  The names, scope, purpose, size, membership and activities of the herder communities or groups under the various projects have varied widely.  Much of this variation has been in response to the technical emphasis featured in the supporting project or program.  This has led to the promotion and formation of herder groups for management of rangeland, water and forest resources, business development groups, risk management groups, etc.  As of 2006, over 2,000 herder organizations were established nationwide (Mau & Chantsallkham, 2006).

This dissertation looks at herder groups that have community-based natural resource management experience and compares them with traditional herding neighborhoods that do not have such exposure and experience.  The comparison is made within the framework of a resilience perspective.  Resilience is defined as "the capacity of a system to absorb disturbance and still retain its basic function and structure," (Walker & Salt, 2006, xiii).  The two types of communities, CBRM (primary research sites) and non-CBRM communities (control sites), are analyzed in the light of the resilience indicators proposed by Folke et al, 2003: 1) learning to live with change and uncertainty, 2) nurturing diversity for reorganization and renewal, 3) combining different types of knowledge for learning and 4) creating opportunity for self-organization toward social-ecologic al sustainability.

This dissertation reports on a four-year research project in which I investigated the elements and components of social-ecological systems using the both qualitative exploratory and quantitative explanatory methods. The result chapters (4, 5, 6 and 7) attempt to answer one broad question while addressing several sub-questions.  The

primary research question that this dissertation addresses is: Does community-based rangeland management build resilience of pastoral social-ecological systems? In Chapter 2 I explore the theoretical background on resilience, coupled human-natural systems, community-based natural resource management (hereafter CBNRM), the historical context of Mongolian pastoralism, and the development of CBNRM in Mongolia. The objective of Chapter 2 is to lay the groundwork for topics I explore throughout subsequent chapters.

Chapter 3 describes the research sites and settings where I selected the both primary and control sites in two different ecological zones. This is followed by a discussion of the methods, providing details on data collection and data analysis. Chapters 4, 5, 6 and 7 are the results chapters and each is devoted to examine one of the four principles of resilience building. In chapter 4 I examine the principle 1 "ability to live with change and uncertainties" by describe the social-ecological pastoral systems and their current states and identifying types of cycles of change and the strategies used to deal with past changes. Chapter 5 explores the range of social and ecological diversity among organized (CBRM herders) and customary groups of herders (non-CBRM). Chapter 6 aims to understand how resilience of pastoral herding communities in Mongolia is determined by their ability to combine different types knowledge for learning. The study will provide evidence of integrating different types of knowledge and applying the integrated knowledge in the practice. Chapter 7 assesses evidence for principle 4, capacity for reorganization and renewal, and synthesizes the contribution this research makes to understanding the relationship between CBRM and resilience building.

This final chapter proposes a native framework as a foundation for resilience building and adaptation in the complex pastoral social-ecological systems in Mongolia.

**Research Questions and Objectives**

**Chapter 4. Learning to Live With Change and Uncertainty**

Research Question 1:

What is the state of social-ecological systems, and types and cycles of change experienced by the study communities and the strategies used to deal with past changes?

Objective 1: Describe important social, ecological and economic components and attributes with its relationships and feedbacks among them that determine the state of social-ecological systems.

Objective 2: Identify types and cycles of change (critical disturbances and historical events), their characteristics and impacts

Objective 3: Describe how the community responded to critical disturbances and shocks in the past and whether this built adaptive capacity (identify knowledge, practices and social institutions that build up the ability to live with change and uncertainties).

Research Question 2:

Are there differences in resilience building among adjacent herding communities with and without community-based rangeland management.

Objective 4: Explore practices and social institutions that build up adaptive capacity towards social-ecological resilience among the herders from CBRM and non-CBRM communities.

**Chapter 5. Nurturing Diversity for Reorganization and Renewal**

Research Question 3:

Does CBRM foster or increase diversity and redundancy in social and ecological

systems?

Objective 5: Explore the range of social and ecological diversity among organized

(CBRM herders) and customary group of herders (non-CBRM)

Objective 6: Assess whether CBRM communities differ from non-CBRM communities in

their capacity to implement diversity enhancing practices.

**Chapter 6. Combining Different Knowledge for Learning**

Research Question 4:

How is resilience of pastoral herding communities in Mongolia determined by their

ability to combine different types of knowledge for learning?

Objective 7: What types of knowledge are available in the community and how they are

integrated for building social-ecological resilience?

Objective 8: To what extent are different types of knowledge generated and applied

among CBRM and non-CBRM herders?

**Chapter 7. Reorganization and Renewal or Peace of Mind about Change**

Research Question 5:

To what extent do CBRM and non-CBRM communities re-organize or renew themselves

in response to changing social-ecological environments?

Objective 9: Reveal social and ecological practices and strategies developed among these

      communities that deal with environmental uncertainty and variability as well

      as with socio-economic upheavals.

      The results chapters of this dissertation (Chapters 4 thru 7) are written in manuscript form in which each chapter includes an introduction, conceptual framework, methods, results and discussion. A manuscript format has advantages in that each chapter stands alone and can therefore be read and understood in the absence of the other chapters. However, as such, the reader of more than one chapter will find some repetition in the introduction, methods, site description, and study groups portions of the chapters.

# Chapter 2  Literature review

This chapter provides theoretical background on resilience, coupled human-natural systems, common-pool resources, community-based natural resource management (CBNRM), the historical context of Mongolian pastoralism, and the development of CBNRM in Mongolia.  A graphic summary of the chapter is presented in Fig 2.1.  The objective of Chapter 2 is to lay the groundwork for topics I explore throughout subsequent chapters.
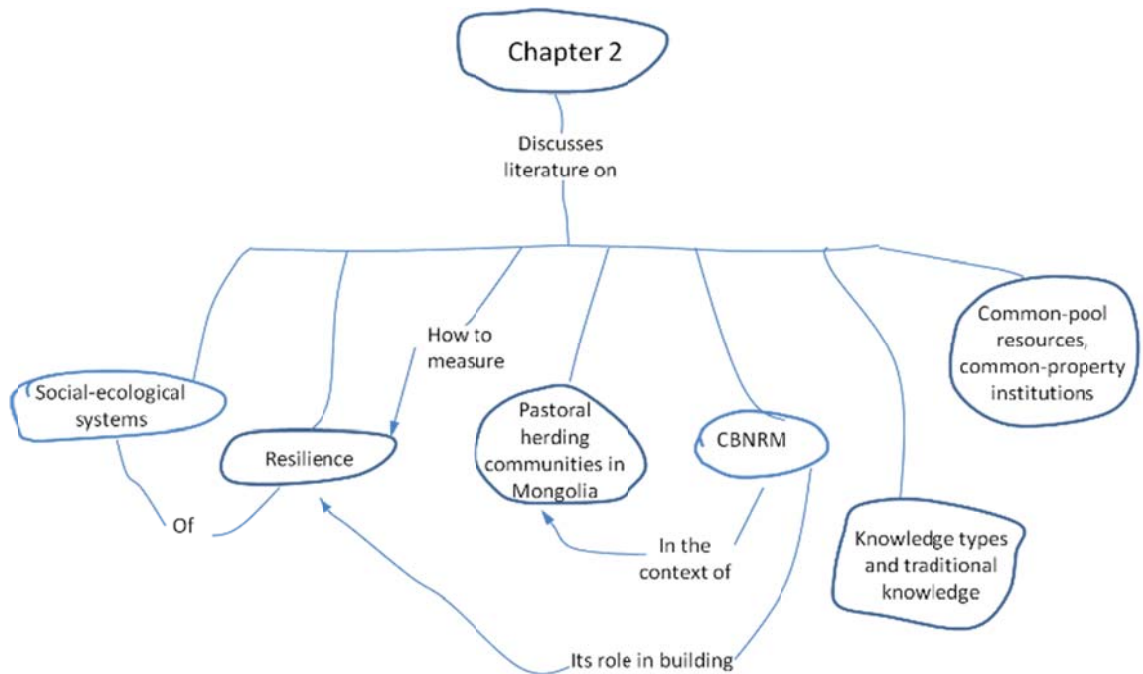


Figure 2.1. A concept map showing a graphical representation
of the content of this chapter

## Social-ecological systems and resilience

Social systems are structures where human live and operate, and these systems are embedded in ecological systems, allowing humans to exist within a coupled social-ecological system (Walker & Salt, 2006). An ecological system can be understood as an

ecosystem, which is made up of biotic (plant, animal) and abiotic components such as water, air, nutrients, etc. (The Resilience Alliance, 2007). Norgaard (1994) explained the co-evolutionary nature of the societies and nature, in which ecosystems are the results of human interventions over millennia, and, in turn, human societies are affected by the ecosystems they depend upon. The social and ecological systems are coupled human and natural systems. In coupled human and natural systems, there is a reciprocal relationship between people and nature, characterized by complex feedback loops (Liu et al, 2007). It is impossible to address these systems separately if we want to understand resilience of the system as a whole, as any dynamics occurring in one part of the coupled system will inevitably affect the other part.

Both natural systems and social systems are considered complex systems in themselves, and their interactions contribute further to making these systems more complex (Berkes et al, 2003). Complexity was described by Gunderson et al (2002) as the variety of structures and processes that occur within a system. For example, any attempt to manage one kind of natural resource would cause surrounding resources to adapt around this management intervention. This event possibly will change the performance of the whole ecosystem and eventually affect people and their communities. As a result, the social-ecological system will re-organize or adapt to the change. In this respect, social-ecological systems are not only complex, but also adaptive. Social-ecological systems are shaped by changes or disturbances that make the system both complex and adaptive (Gunderson et al, 2002).

A complex resource system as a whole system is made up from the numerous interrelated functioning sets of ecological, social and economic systems across a range of

scales (Gunderson et al, 2002). To understand the dynamics of a complex system, a resilience perspective has emerged that focuses on the complex relationships between ecosystem development and social dynamics (Folke, 2006; Gunderson et al, 2002). The concept of resilience includes systems thinking, and systems thinking provide a framework for viewing a social-ecological system as one system continually adapting through cycles of change (Walker & Salt, 2006).

The concept of resilience initially emerged from ecological science with an attempt to explain ecosystem resilience that identified key features of ecosystem structure and dynamics (Holling et al., 1995). Traditional deductive concepts and techniques of ecological theory make the world appear more simple, tractable and manageable than it really is (Holling & Meffe, 1996). More specifically, the argument of ecosystem resilience provided a completely different foundation to policies for natural resource issues by challenging existing paradigm on two main prevailing assumptions: a) ecosystem responses to human use are linear, predictable and controllable and b) human and natural systems can be treated independently (Folke et al., 2002).

However, numerous studies and evidence accumulated in many parts of the world suggest that the behavior of natural ecosystems is unpredictable and non-linear due to destabilizing and stabilizing forces that function with different rates and magnitudes at multiple spatial and temporal scales (Holling & Meffe, 1996; Gunderson et al, 2002).

Resilience has been defined as the capacity of a system to withstand or absorb disturbance and to reorganize while undergoing change, but retain its essential function, structure, identity, and feedbacks (Holling 2001, Walker & Salt, 2006). Contemporary literature on social-ecological systems discusses resilience as a useful characteristic that

determines the health of the system (Cumming et al., 2005), as the degree to which the system builds its capacity to learn and adapt (Carpenter et al., 2001), and as the key to the sustainability of social-ecological systems (Walker & Salt, 2006). Resilience is not always desirable for the social-ecological system, it can also be undesirable, demonstrating characteristics that decrease social welfare (Carpenter et al., 2001) or lead to a degraded environment. For example, when juniper woodland matures and gets established over time it reduces herbaceous species affecting negatively to hydrologic function and increasing soil erosion (Petersen & Stronghim, 2008).

There are two central themes that underlies resilience theory: thresholds and adaptive cycles (Walker & Salt, 2006). The recognition of the dynamic nature of social-ecological systems led to the insight that these systems have the potential to exist in more than one stable state (Gunderson et al, 2002). Stability of states is characterized by the existence of consistent traits over long periods of time with some degree of variation (The Resilience Alliance, 2007). However, if the level of variation exceeds certain limits, it makes the system change its major characteristics, leading it to cross a threshold. Threshold changes force the system to develop a set of other characteristics that were not familiar in the previous state. Because of the complexity of social-ecological systems, these changes are often not predictable, linear or incremental. After surviving threshold changes, the system exhibits qualities of another kind of regime, demonstrating different functions, structures and feedbacks (Walker & Salt, 2006).

Discussion about adaptive cycles is linked to the view that social-ecological systems operate over many linked scales of time and space. Spatial scale is a hierarchy of the multiple regions, levels or units, such as from a small reserve pasture of an

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individual herding family to the range of seasonal pastures of that family and to the entire communal pastureland of several herding families. Studies looking at different scale of lifetimes will provide more detailed findings, for example, it is important to look the dynamics of how livestock numbers are changing in certain area over the span of one year to 10 years or to 50 years.

I have decided to base my research on Holling's adaptive renewal cycles nested across hierarchical scales of social and ecological systems (Figure 2.2) and to test this conceptual framework within the scope of my research.  Holling (2001) suggested four phases in each scale, namely *exploitation, conservation, release* and *reorganization* and I think these concepts deserve more examination by applying them in different contexts. For example, grassland goes through the stages of vegetation growth and maturity, followed by disturbance, such as a steppe fire or herbivore grazing, which releases nutrients on the way to a new cycle of growth.  A local small institution cycle may consist of local students' environmental club starting up and growing.  The club will eventually phase out, while its members and the accumulated experience may combine other sources and reorganize into a new institution.

The four phases of the adaptive cycle illustrates the movement of a system through these phases: a period of rapid growth and exploitation (r) leading into a long phase of accumulation, monopolization, and conservation of structure and resources, during which resilience tends to decline ($K$); a very rapid breakdown or release phase (creative destruction ($\Omega$)) and, finally, a relatively short phase of renewal and reorganization ($\alpha$) (Holling, 2001).
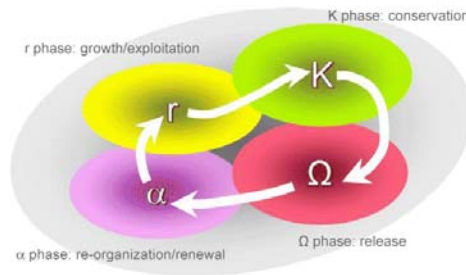
Figure 2.2 The adaptive renewal cycle (Holling, 2001)

Resilience of the system changes as it goes through the adaptive cycles and when

the system has accumulated ample capital in *K* phase, it becomes increasingly vulnerable

to changes and novelties.  During this conservation *K* phase, a small disturbance is

suggested that it can push the system out from the stable domain into catastrophe due to

reduced resilience of the system (Gunderson et al, 2002).  In the last α-phase, if there is

still sufficient level of memory of previous components, the predecessor system pattern

may reassert itself (Gunderson et al, 2002).  But the same time it could also get

introduced to things new to the system, such as new species, new institutions, ideas,

policies and industries, and the emerging system, whether it is in the same or a different

configuration, gains resilience (Walker et al, 2002).  Reorganized social and ecological

systems will be similar, but not identical to the previous ones and will be distinguished by

newer qualities or novelties developed as a result of the response to the particular type of

disturbance (Gunderson et al, 2002).

In a resilient ecosystem these four phases of the adaptive cycles repeat themselves

again and again (Berkes et al, 2003).   Changes anywhere in the lower scale in the social-

ecological system can affect the stability of the system at a lar*ger* scale and will cause

some changes to it (Figure 2.3).  Ecosystems and social-ecological systems across scales

are basically comprised of hierarchies and adaptive cycles forming together a *panarchy*

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(Holling, 2001). The term panarchy describes the interactions between faster, smaller cycles and lar*ger*, slower cycles, and these interactions in a panarchy combine learning with continuity (Holling, 2001).
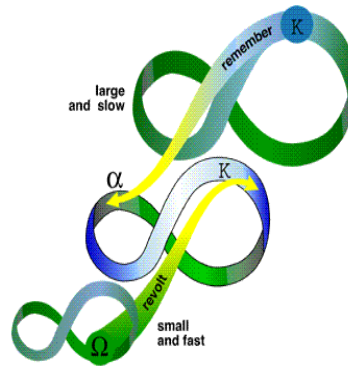


Figure 2.3 Holling's Adaptive Renewal Cycles nested across scales:
Panarchy (Holling, 2001)

As an example of how changes in lower-scale systems in the hierarchy affect higher-scale systems, if a riparian area is grazed during spring and fall seasons in the same year, it can compound negative impacts to riparian vegetation, soil and wildlife. If the grazing is continuous for several years, negative effects will be increased causing irreversible changes in a more extensive scale of riparian ecosystem, in plant communities, changes in soil structure and losing wildlife.

Memory and novelty are the main features that make up adaptive capacity of both social and ecological systems and hence of resilience (Berkes et al, 2003). The ecosystem is reorganized drawing upon the ecological memory of the previous system by utilizing a diversity of species and the existence of species groupings (functional groups) developed as a result of the previous cycle of growth (Gunderson et al, 2002; Folke et al, 2003). The social system reorganization will depend on the number and types of people present after the disturbance that is described as collective social memory of experiences

with resource and ecosystem management, including social capital, traditional knowledge and wisdom (Gunderson et al, 2002). The social memory is shaped by a diversity of individuals, institutions and other actors who have different and overlapping roles in responding to ecosystem change (Folke et al, 2003). In addition to memory, novelty is an essential element of resilience that is defined as the ability to innovate (Berkes et al., 2003). For the social-ecological system to be resilient, it is important this system be exposed to disturbances that play a constructive role in resource management by creating the opportunity for renewal (Berkes et al., 2003). In a resilient social–ecological system, disturbance has the potential to create opportunity for doing new things, for innovation and for development (Folke, 2006).

How can resilience of social-ecological systems be built? The resilience of many social-ecological systems has been eroded, particularly in vulnerable and marginalized societies (Adger et al, 2005). We cannot take for granted any lon*ger* "the capacity of the ecosystems to regenerate after disaster and continue to produce resource and services for human livelihoods" (Adger et al, 2005, p. 1039). Folke et al. (2003) identified four principles of resilience building to enhance the adaptive capacity of social-ecological systems. They suggest that these factors interact across temporal and spatial scales to deal with nature's dynamics in social-ecological systems: 1) learning to live with change and uncertainty, 2) nurturing diversity for reorganization and renewal, 3) combining different types of knowledge for learning and 4) creating opportunity for self-organization toward social-ecologic al sustainability.

Learning to live with change and uncertainty is the first principle of resilience-building, and entails the knowledge, practices, and social mechanisms to accept

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disturbance, surprise and crisis as part of the development and process. Participation,

negotiation, conflict management and other collaborative practices will nurture and

cultivate the capacity and mentality to live with changes (Folke et al, 2003). In addition

to these mechanisms, learning to live with changes requires a transformed way of

thinking and acceptance of different worldviews and practices. Trust and respect in

relationships will further shape the capacity to live with change (Folke et al, 2003).

Having trusting relationships lowers the costs of working together, it facilitates

cooperation and motivate peoples to further develop their relationships to collaborate to

solve common problems for mutual benefits and support (Pretty & Smith, 2004).

The second principle of "Nurturing diversity for re-organization and renewal"

includes diversity and redundancy in the social-ecological systems that build up ability to

persist in the face of change (Folke et al, 2003). Social and ecological memories should

be well maintained and enhanced because they are the repository of diverse and

redundant experiences as well as perspectives. With limited social-ecological memory,

the system will be unable to create the necessary net of overlapping and mutually

reinforcing components that buffer the system from uncertainties and disturbances. This

pool of redundant and reinforcing system components provides necessary resources that

are untapped, but mobilized in case of building new capacities to adapt to changes. Folke

et al (2003) talk about ecological and social memory as a significant framework of

accumulated experience for coping with change. For example, the existence of species

groupings, or functional groups with different, sometimes overlapping functions would

be important element of the ecological memory. In terms of social memory, individuals

and redundant local social groupings that are embedded in lar*ger* jurisdictions provide an arena for information exchange and blending of actors (Low et al, 2003).

The third principle of "Combining different types of knowledge for learning" is about "creating platforms and involving user groups and interest groups for knowledge sharing about complex ecosystem management and for relating to uncertainty and surprise" (Folke et al, 2003, pp. 375). The success indicators for the capacity to mobilize and effectively utilize different perspectives would be set around learning norms and attitudes.  In resilient social-ecological systems, learning encourages system thinking. Fernandez-Gimenez et al. (2006), discussed how traditional ecological knowledge can be combined with science and applied in co-management of natural resources by doing cooperative research that draws on local skills and knowledge.  They concluded that traditional ecological knowledge offers observations and insights that help to develop scientific research hypotheses and interpret results that lead to improved relationships among stakeholders.

Folke et al, 2003, discuss "creating opportunity for self-organization toward social-ecological sustainability" as the fourth and final principle for the resilience building. The key to this principle are the process and outcomes of the interaction between diversity and disturbance, and how they relate to knowledge systems and self-organization capacity.  When a system has sufficient level of memory, any kind of disturbance can generate positive change, but lack of memory for resilience, a similar disturbance may cause severe consequences (Folke et al., 2003).  To turn disturbance into options for renewal and novelty, they suggested a dynamic interplay between social-ecological memory and change (between functional diversity and disturbance) to build

resilience for adaptive capacity in social-ecological systems. For building resilience, it is also crucial to understand how social-ecological systems deal with cross-scale dynamics. Various scales of time, space and human societies have the multiple scales of variables with non-linear interactions that cause the multi-stable behaviors (Gunderson, 2003). For example, assessing what are the adaptive and innovative behaviors, practices and institutions at different scales and how they interact and communicate would be helpful to see how the societies are getting reorganized in the face of disturbances.

These four elements of building resilience and adaptive capacity in social-ecological systems are proposed to be used as the theoretical lens in the current study. As such this study will be an attempt to explore the concept of resilience in the arid and semi-arid rangeland regions. Rangeland ecosystems with their livestock and herders behave as complex adaptive systems that demonstrate resilience dynamics, a nested hierarchical structure, cross-scale interactions, non-linear processes and components that adapt to disturbances (Walker & Abel, 2002). Walker & Janssen (2002) argued that to manage such a complex adaptive system, it is important to "provide the conditions under which the system, as whole, can learn and adapt" (p. 724). Research is needed to obtain better understanding of the rangeland as a coupled adaptive system by exploring: the links between the social and ecological subsystems, the conditions under which the changes occur, and the dynamics of regulatory policies in face of changes in climate, markets and in government (Walker & Janssen, 2002).

**Measuring resilience**

There is a growing literature that discusses various frameworks for assessing resilience. Measuring resilience involves the necessity to assess the entire social-ecological system as a whole, not just by assessing the social or ecological subsystems (Carpenter et al, 2001). Resilience indicators are fluid and flexible, because indicators that are appropriate for the current regime may become useless as ecological and social conditions shift (Carpenter et al., 2001). Resilience measures should not be limited by examining the current state of the system or service, but it is important to focus on variables that indicate the capacity of the SES to provide ecosystem services (Carpenter et al, 2001). Carpenter et al (2001) discussed that understanding the resilience of the system needs to start from defining resilience in terms of resilience of what to what. They proposed to measure resilience in the context of a specific temporal, social and spatial scale.

Walker et al. (2002) proposed a framework for analyzing social-ecological resilience that is based on a participatory approach. They developed a four-step process of resilience analysis, where the first two steps generate information about the past and current state of the system to predict major issues about future states and major unpredictable and incontrollable drivers. Once this information is generated, the third step is designed to do resilience analysis of the system by modeling and non-modeling methods to understand the interactions and identify attributes of the social-ecological system that affect resilience (Walker et al., 2002). The fourth step is about resilience management and how emerging understanding of the system's resilience could impact policy and management actions (Walker et al., 2002).

Cumming et al (2005) described resilience as an abstract and multidimensional concept that makes it difficult to operationalize. They adopted a new definition of resilience to use in empirical studies that is "the ability of the system to maintain its identity in the face of internal change and external shocks and disturbances" (p. 976). The authors discussed that the system identity depends on four major criteria, including 1) the components, 2) relationships between the components, 3) innovation and 4) continuity of both components and relationships to maintain themselves continuously. They provided an example of a quantifiable measure of identity and an example of threshold value that could be used to define when identity changes by conceptualizing the four essential system attributes.

Anderies et al (2004) proposed a framework to analyze the robustness of social-ecological systems from an institutional perspective. They discussed that the institutional configurations affect the interactions among resources, resource users, public infrastructure providers, and public infrastructure. They hypothesized that the link between resource users and public infrastructure providers affect the robustness of social-ecological systems. The concept of robustness was equated to the concept of resilience. They suggested robustness as an appropriate concept to assess how social-ecological systems can deal with disruptions, external and internal disturbances. The proposed framework provides key attributes and key interactions of the institutions that are especially important to enhance the robustness of a social-ecological system. The authors argue that the robustness of SESs could be enhanced if institutional arrangements are designed not as static or persistent institutions, but as ever evolving systems in the face of changes in social and ecological variables. When the ecological dynamics change, the

robust institutions will be able to adapt to this change reinforcing the ecosystems capacity

to produce a desirable set of goods and services. To assess robustness of common-pool

resource institutions, Anderies et al (2005) suggested using Ostrom's design principles of

long-enduring institutions for governing sustainable resources. They argue that robust

systems should not necessarily demonstrate all the principles, but have incorporated a

large number of these principles.

The proposed study will explore potential ways to operationalize resilience for

empirical studies having focused on the resilience of pastoral social-ecological systems in

the arid and semi-arid landscapes in Mongolia.

To understand how resilient herding communities in rural Mongolia are in the

face of social, economic, political and ecological changes, I will study two different

herding communities with (primary research sites) and without community-based

organizations (control sites). The two types of communities will be described and

analyzed in the light of resilience indicators proposed by Folke et al. (2003): 1) ability to

live with change and uncertainties, 2) ability of implementing diversity enhancing

practices, 3) ability to appreciate various types of knowledge and timely utilization of the

knowledge and 4) capacity to employ and retain appropriate and innovative livelihood

strategies and management practices as part of their daily lives. I will use them to

examine whether herder communities who have formally organized community-based

rangeland management experience demonstrate more evidence of building social-

ecological resilience than communities without such experience. The following section

of the literature review will focus on common pool resources and community-based

natural resource management, which are important to understand the natural resource and institutional context for my research.

**Common pool resources and common property institutions**

Any rights that a person holds in or on land maybe considered as property and "property rights are an important class of institutional arrangement" (Feder & Feeny, 1991, p. 136). Feder & Feeny (1991) identified four basic categories of property rights in land: none (open access), communal property, private property and state property. In case of free access, there are no assigned rights and no exclusivity, and therefore it often results in degradation of scarce resources (Feder & Feeny, 1991). Under communal property, a group of individuals are assigned exclusive rights (McKean, 2000, Feder & Feeny, 1991).

The term *common property* (or communal property) captures an understanding that only particular individuals share rights to a resource and that common property is substantially different from open access, the situation where there is an absence of any rights to a resource (McKean, 2000). Communal property has been defined as a resource that is held by an identifiable community of interdependent users (Feeny et al., 1990). These users enjoy formal and informal rights of access to the resource and use it on the basis of some regulatory systems existing within the community. Common-property regimes can be understood as making private the rights to goods without dividing into pieces and it could be created for the management of common-pool resources (McKeen, 2000).

McKean (2000) defined common pool resources as "goods that can be kept from potential users only at great cost or with difficulty but that are subtractable in consumption and can thus disappear" (p. 28). Common-pool resources have two characteristics: subtractability and exclusion. According to Dolsak & Ostrom (2003), subtractability means that "what one person harvests from or deposits in a resource subtracts from the ability of others to do the same" (p.7). By exclusion they mean to exclude potential beneficiaries who didn't contribute to the efforts and costs associated with managing, maintaining and regulating the resource involved. These two characteristics illustrate that common-pool resources are prone to over-use and free riding and therefore, any governance system that manages the common-pool resources has to deal with how to balance demands for both use (harvest) and stewardship of resources. Garret Hardin's (1968) *The Tragedy of Commons* argued that free access to a common pool resource brings ruin to all. He made an effort to illustrate that if the common resource is used without any restrictions, it will become a place of great disorder where people will try to take advantage to build up greater capital on it without thinking about the environmental impact. He emphasized that continued free access to commons will result in something very disastrous that cannot be avoided. To avoid such a tragedy he proposed two solutions -- privatization of the commons or government control.

However, numerous studies have looked at the issue of communal resource use from different angles (Feeny et al, 1990, McKean, 2000). The factors identified by Hardin that contribute to the tragedy are open access, lack of constraints on individual behavior, conditions in which demand exceeds supply, and resource users who are incapable of altering rules (Feeny et al, 1990). Having such a consumer-driven stance, he

overlooked the role of adaptability of local people towards changing environmental conditions and their ability to get organized to manage communal resources. Hardin's theory has been challenged by numerous valid examples where community people were continuously successful in practicing their own communal systems of managing their common resources (Feeny et al, 1990, Ostrom 1990, McKean, 2000). Effective institutions originate locally through the interactions of many individuals involved in common property management (Walker & Janssen, 2002).

Common property has institutional mechanisms to arrange and share their rights over using the resources (McKean, 2000). Absence of the institutional mechanisms will simply result in an open-access resource available to anyone and very difficult to protect and very easy to deplete (McKean, 2000). Institutional arrangements of local people, characterized by recognized past and present strengths, successes and potentials, and knowledge and self-interest of groups of users and communities, are critical to effective management of common resources (Feeny et al, 1990). Management of the resource by the resource users themselves has been understood as community-based natural resource management (CBNRM).

Definition of the community-based management of natural resources is "a process by which landholders gain access and use rights to, or ownership of, natural resources; collaboratively and transparently plan and participate in the management of resource use; and achieve financial and other benefits from their stewardship" (Child & Lyman, 2005). CBNRM is the process that encourages the resource users be responsible not only to exercise the rights of access and use, but also have an obligation of being good stewards

and mana*ger*s of the resource. This process is to be originated locally on self-voluntary basis by those people whose livelihood and culture depend on that resource.

CBNRM is one of many related concepts such as collaborative natural resource management, collaborative monitoring and conservation, participatory environmental policy, consensus-based decision making, and they all have the core principle to include stakeholders in policymaking for "win-win" solutions (Walker & Hurley, 2004, Fernandez-Gimenez et al., 2008, Kellert et al., 2000).  Those who are dependent upon common-pool resources (CPR) may work out a system that achieves regulation over the commons (Ostrom, 1990).  By studying long-standing successful CPR institutions, Ostrom (1990) identified a set of principles for successful common pool resource management.

Ostrom's eight design principles focus primarily on local institutions and relationships within the local context (Agrawal, 2002): 1) clearly defined boundaries, 2) congruence between appropriation and provision rules and local conditions, 3) collective-choice arrangements, 4) monitoring, 5) graduated sanctions, 6) conflict-resolution mechanisms, 7) minimal recognition of rights to organize, and 8) nested enterprises (Ostrom, 1990).  Ostrom speculated that these principles are essential elements or condition to make CPR institutions successful and they provide credible explanation for their persistence over the generations.  However, she emphasized that these principles should not be taken as blueprint and should be utilized with cautions when are considered for resource management, because some principles deserve further theoretical and empirical works before making final claim of necessity.  For example, according to the first principle, social and spatial boundaries should have to be clearly defined and

enforced to develop effective institutions for self-regulation. However, Fernandez-Gimenez (2002) argued that in arid and semi-arid environments pastoral people face with problems of defining spatial and social boundaries. The extent of variability of the environments as well as instable political-economic landscapes entail them move frequently and draw on social networks to access all types of resources (Fernandez-Gimenez, 2002). Strategies employed by pastoralists that help the ecosystem and pastoral society to cope during stress periods allow them to use more distant pasture that left untapped during normal non-stress periods and most of these resources lie beyond of their grazing boundaries (Ellis & Swift, 1988).

Agrawal (2002) discussed that Ostrom's design principles focus on the locality by giving more importance to local factors and having focused so little on external factors that interact with local institutional arrangements and resource management: markets, technology, state policies and population pressures. On the basis of extensive review of common property, Agrawal (2002) described the key accomplishments and deficiencies of common property institutions and identified two problems of existing studies of sustainable institutions around common-pool resources. The first is substantive that many scholars of commons have focused narrowly on institutions around common-pool resources, but less emphasis is made to studies on variations in biophysical, social, economic and cultural contexts that affect resource governance. The second problem is associated to methods that can comprehensively incorporate the large number of factors that are "critical to the organization, adaptability and sustainability of common property" (Agrawal, 2002, p. 45). Agrawal concluded that a theory a yet to be developed that explains what makes for sustainable common-pool resource management. To advance

the understanding of common property institutions and their role in resource management, he claimed that studies on the commons have to go through a new approach of analytical and statistical work. He identified the need for new research that employs more vigilant research design and case selection.

**Role of CBNRM in social-ecological resilience building**

According to the four principles of social-ecological resilience building suggested by Folke et al (2003), there are several key attributes that are vital for building resilience and adaptive capacity, including governance, adaptive learning, knowledge integration, and diversity. Numerous publications discuss how these characteristics could be part of the CBNRM benefits and outcomes.

CBNRM provides an opportunity to exercise elements of the good governance such as participation, representation, deliberation, accountability, empowerment, social justice and organizational features such as being multilayered and polycentric (Lebel et al, 2006). Lebel et al (2006) stated that governance, apart being understood as purview of the state through government, can also emerge from the interactions of many actors such as local communities, local NGOs, private sectors, etc. These interactions could be formally expressed through subtle norms of interaction or by influencing environmental management agendas.

Ostrom and Schlager (1996) discussed CBNRM as a form of local level governance structures that takes into account the nuances of the physical and cultural environment in which they operate. By being organized as CBNRM groups, resource users are capable of cooperating and defining governance structures that address their

shared goals and enhance the resources on which their livelihoods rest. Ostrom and Schlager (1996) also highlight that community-based organizations are not a universal solution, because there are difficult and complex resource problems that local-level organizations are not capable to address on their own. Community-based organizations are purposefully designed and adopted to resolve pressing resource use issues. They are subject to continuous transformation to meet requirements of local-level resource users in exercising their rights and make fundamental decisions about their livelihoods (Ostrom & Schla*ger*, 1996).

Local communities dependent on the natural resources available to them devise management practices that have developed through continuous trial-and-error experiences (Berkes et al., 2003). They have management practices adapted to the characteristics and dynamics of the ecosystem. CBNRM has an advantage of being present closer to the resources and having more accumulated practical ecological knowledge than centralized resource management agencies (Davidson-Hunt & Berkes, 2006). Davidson-Hunt and Berkes (2006) emphasized that common property institutions learn from small mistakes and face less risk, and therefore produce greater opportunities for innovation. Berkes (2008) emphasized that knowledge and continuous learning process is communal, rather than individual. Because of process of learning by doing, community-based natural resource management arrangements create possibilities to nurture adaptive capacity of communities to act collectively in the face of changes (Armitage, 2005). Livelihoods and subsistence of community members are directly and indirectly affected by disturbances of any nature. These direct and indirect effects on livelihoods would motivate community members to develop adaptive practices and

structures that may reduce the impact of disturbance and this dynamic would be more visible in small-scale societies (Colding et al., 2006).

Faced with ongoing small- and large-scale social-ecological disturbances, local resource users possess diverse local experiences in coping with environmental change (Berkes et al., 2003) and these experiences and good practices have a good chance to be quickly disseminated at the community level. For to this reason, CBNRM as a community organization has greater capacity and motivation to absorb a diversity of opinions and practices of local people who face both environmental and social disturbances on regular basis.

The importance of participatory and community-based management of natural resources in relation to traditional ecological knowledge (TEK) was extensively discussed by Berkes (2008). The author argues that traditional systems encourage development of practices and rules based on community-based processes and it provides locally grounded ways of resource management that could serve as alternatives to top-down management. Berkes discussed that the use of traditional knowledge provides an entry point to implement co-management and self-government of the natural resource will help finding "a new balance against an expert dominated positivist science" (pp. 274). The author emphasized that traditional management systems are characterized not only by an extraordinary similarity, but also a remarkable diversity. Because traditional ecological knowledge has been developed over multiple generations, it expands and gets revised on regular basis, providing TEK more legitimacy of not being just knowledge of past, but knowledge of the present. Having such a dynamic nature, it accumulates sufficient level of diversity and unity to adapt to ever-changing circumstances.

Agrawal and Gibson (2001) discussed the importance of considering how diversity and heterogeneity within the communities affect local interactions and institutions. They proposed that there are potential weaknesses in defining community as small-sized, territorially fixed, homogenous and sharing same understanding and identities, because there are multiple actors within communities that have divergent interests and roles that affects to successes in community-based conservation and management.

In terms of challenges and limitation of existing research on CBNRM, Agrawal (2002) argued that it is relatively deficient in considering resource characteristics and the external social, institutional and physical environment. He emphasized that physical characteristics of resources, stationarity and storage, determine the management and institutional solutions to common-pool resources. External factors such as population, market demands and new technologies are worth attention where the studies seek to develop more general arguments. Contextual slow variables that were previously considered as constant could be examined how they got changed as they interact with other fast variables.

Ad*ger* et al. (2005) reported that it is important to advance research that examines the cross-scale nature of resource management systems. He argued that many systems are inherently cross-scale and an understanding of cross-scale linkages is important in managing multiple use resources. Anderies et al. (2004) provided an argument that robustness or resilience of a social-ecological system would be negatively affected if linkages between resources, governance systems and their associated infrastructures fail.

**Mongolian Pastoral Systems**

Longitudinal studies of Ellis and Swift (1988) questioned why pastoral

ecosystems and their inhabitants are relatively stable in response to the major stresses on

the system. The results of their studies contrasted with the dominant paradigm of

equilibrium ecosystems that perceived pastoral ecosystems as potentially stable, affected

by inefficient practices of pastoralists, who exploit and overstock the system. Ellis and

Swift discussed about stabilizing strategies that help the ecosystem and pastoral society to

cope with unpredictable characteristics of the arid non-equilibrium systems. Traditional

pastoral systems have adapted their socio-economic systems to such ecological variability

and uncertainties using several main tactics such as monitoring of their resources using

indigenous classification and evaluation systems, mobility, tracking, dispersion, diversity,

reciprocity, flexibility, key-site management and communal coordination (Niamir-Fuller,

1998; Fernandez-Gimenez & Le Febre, 2006). Having such strategies pastoralists reduce

pressure on the particular ecosystem and take advantage of patch productivity without

destroying the resilience of the environment and endan*ger*ing its sustainability (Niamir-

Fuller, 1998). These strategies are strongly reflected in socio-economic structures such

as communal pastoral institutions, pasture use norms and herding practices, conflict

resolution mechanisms (Fernandez-Gimenez, 2000; Niamir-Fuller, 1998). Such pastoral

strategies were not necessarily focused on regulating stocking rates, but rather

manipulating the temporal and spatial distribution of grazing, as well as the animal types

used (Fernandez-Gimenez & Swift, 2003).

Pastoral institutions informally enforced practices among herding communities

such as mobility, grazing reserves and other sustainable management practices

(Fernandez-Gimenez & Swift, 2003). However, sustainability of such institutions is threatened by the political and economic settings in which they exist (Fernandez-Gimenez & Swift, 2003). The effects of changing pastoral institutions and management practices on rangelands and the roles of the social institutions that support, accommodate or enforce these practices should be well documented (Fernandez-Gimenez & LeFebre, 2006).

In Mongolia, the failure of a centrally administered economy significantly influenced the level of the state interference in the pastoral livestock industry. The current free-market economy system does not provide economic means and political will to provide policy regulations that support sustainable herding institutions and practices. The reduced government support, privatization of livestock and emerging household livelihood needs affected traditional herding practices and human-environmental dynamics (Sternberg, 2008). The sustainability of Mongolia's pastoralism remains uncertain in the face uncertainties of the government regulations, climate change and natural conditions (Sternberg, 2008).

Across Mongolia, the air temperature has increased on average about 1.6 in the past 60 years (Batima, 2005). According to the recent climate trend analysis, the average annual mean temperature increase was 1.73 the period of 1961-2004 in Mongolia for 17 weather stations in Mongolia (Jamiyansharav, 2010). The highest annual and seasonal temperature changes mostly occurred in the forest-mountain region in the north of the country (Jamiyansharav, 2010).

The lack of structure for regulation and direction result in more informal regulations that demand non-state run institutions at the local level, which are beginning

to emerge and poorly developed (Muller & Bold, 1996). For the past ten years, there are a substantial number of international and national projects have seen the formation of organized herding communities as an essential step in attaining better and more sustainable management of Mongolian pastoral system. The names, scope, purpose, size, membership and activities of the herder communities or groups under the various projects have varied widely. Much of this variation has been in response to the technical emphasis featured in the supporting project or program.

The current study is designed to understand how community-based natural resource management influence human adaptation to climate change and changes in socio-economic and political systems. The study will examine causal links between CBNRM organizations and resilience of social-ecological systems by comparing pastoral communities in Mongolia that practice community-based rangeland management with those without such practices. My research takes an advantage of an opportunity to conduct a study that focuses on these institutions and on interacting effects of climate and socio-economic changes on herders' adaptation strategies and feedbacks between local management practices and national environmental and socio-economic changes. In this way, the study makes some attempts to understand the role of CBNRM in building social-ecological resilience by exploring the role of community-based rangeland management in building resilience of the coupled human-natural system in rural pastoral communities.

**Historical and geographical context of Mongolian pastoralism and the development of CBNRM in Mongolia**

*Traditional institutions of nomadic communities*

Historically in Mongolia, collaborative management of the pasture and formation of close neighborhood communities had several fundamental political, social and economic reasons. The Mongolian herder's lifestyle has been constantly shaped and regulated by the highly variable natural and ever-shifting political-economic environment (Fernandez-Gimenez, 2002). The family and the community have been distinguished as two major forms of social groups in nomadic societies (Khazanov, 1984). According to Khazanov, pastoral community in Mongolia are more than a group of people living in close face-to-face relationships, but have distinct differences in social relationships from other similar groups.

Various scholars recorded practices of Mongolian nomadic people early 1930s that provide some historic illustration of local institutions and common resource utilization. The hierarchy of the social structure of pastoral Mongolian communities was characterized by the space and landscape being occupied by the nomads. Those herding households whose livestock had pastureland that was collectively used, camped and made seasonal movements together. These types of social grouping constitute *khot-ail* of 2-12 households or *urukhs* (Fernandez-Gimenez, 1999). Incentives to be a *khot-ail* member were associated not only to rangeland access, but also to socio-economic reasons. The *khot-ail* was the traditional social and economic unit of livestock production represented by a group of herding families mutually supporting each other's herding and livelihoods (Mearns, 1996). *Khot-ails* were characterized by their dynamic nature, as households

could seasonally join and leave the *khot-ail,* such that the *khot ail* composition changed seasonally and interannually (Mearns, 1996, Fernandez-Gimenez, 1999).

Sneath (2003) identified the two major types of pastoral community development and resource utilization in pre-revolutionary Mongolia: domestic subsistence and yield-focused production. For moderate and poorer herders, the primary reason for settling as a *khot-ail* was related to the possibility for joint grazing management, where individual households' herds would be gathered as one big herd to graze on common pasture under the supervision of an adult from those households who own the individual herd (Simukov, 2007, Fernandez-Gimenez, 1999, Mearns, 1996). By this method herder households were able to share the labor force, reduce associated transaction costs (Mearns, 1996), and support each other's domestic subsistence requirements (Sneath, 2003). By having such type of community structure, these herding households were able to collectively process their livestock products, hunt, herd the stock of horses, and learn the wisdom of herding, ironsmithing, carpentry, etc. from elders (Simukov, 2007). For wealthy households, who were mainly pastoral elites, there were other reasons for forming *khot-ails,* more focused to yield production. The *khot-ail* structure provided them good possibilities to recruit additional, efficient and economical labor force for maximum production of their livestock industry. This form of cooperation was one form of community mutual support system or safety net that allowed both types of households to secure their requirements-- domestic needs for the poor and effective management of the large herd for wealthier ones (Sneath, 2003).

Several *khot-ails* who share the same landscape such as a valley or one part of the mountain or a watershed was called "*neg nutgiihan*" or "people from one place or

homeland" (Mearns, 199; Fernandez-Gimenez, 1999; Bazargur, 2005). While *neg nutgiihan* refers to a broader community, two *khot-ail*s refer each other as *saahalt-ail,* or neighbors (Bazargur, 2005). *Neg nutgiinhan* naturally accept the surrounding landscape as a background of their everyday life and culture and share the same values and belief systems. Simukov (2007) recorded that in the past as a defense strategy against potential enemy attacks, *khot-ails* gathered together as a big broad community and the size of this community could reach a few hundred of households, yet it was not a favorable situation for pasturing of livestock. Presumably, *neg nutgiinhan* gathered together to survive through the critical periods. When political stability was strengthened, the large community of *neg nutgiinhan* collapsed into the original *khot-ails* (Simukov, 2007).

Khot-ails* being nested in the larger community of *neg nutgiinhan* used to hold many individual households together (Bazargur, 2005) forming hierarchical scales of nested social institutions across space and time scales (Berkes et al, 2003). A lar*ger* scale of social institution that embedded the scales of *urukh, khot-ail* and *neg nutgiinhan*, was the *khoshuun*, the largest administrative unit formed by the Manchu colonial period (Bazargur, 2005). This structure was formed out convenience of the colonial government to rule over the country and it was more an administrative divide rather than social (Fernandez-Gimenez, 1999).

### Land tenure and property rights in Mongolia

In the section above on common pool resources and common property institutions, I have discussed about theoretical background on common property regimes and building on this section I now address land tenure and property rights in Mongolia. In Mongolia, all land is constitutionally the property of the state, but herders have use

rights over the pastureland and they have possession rights of an area of their winter campsites equaled 0.07 ha. To understand current pastoral land use patterns and policies it is important to have good knowledge and awareness of historical relationships among land use, land tenure and political economy of Mongolia (Fernandez-Gimenez et al., 2006). Two important dimensions constituted the economic relations existing in nomadic societies: private ownership of livestock and communal ownership of pastures (Khazanov, 1984). However, during the period of collectivization in 1960-1990, both the ownership of livestock and pasture were under the state control. Before Mongolia's socialist revolution in 1921, pasture allocation and use was regulated in many areas by a combination of formal rules enforced by the ruling nobles and informal norms and custom enforced by local herder communities (Fernandez-Gimenez, 1999). Pastoral resources including seasonal grazing areas, campsites, water sources, and hay-cutting areas were subject to customary and formal tenure regimes enforced through both formal and informal means (Fernandez-Gimenez, 2000). Each herder community within the society was responsible for regulating and controlling their division and use (Khazanov, 1984). These functions were carried out by the ruling strata of nomads, as most of the livestock was owned by them. Local nobles used to allocate their pastureland to nomads under their authority and this practice was their most powerful tool to keep the nomad people under their rule (Batnasan, 1973). The land boundaries of nobles were delineated from each other and it was almost impossible to graze on other noble's area, and migration outside would bring some kind of punishment for the herder and possibly his prince (Batnasan, 1973). However, it was an accepted norm in times of drought and harsh winters for herders move out into another noble's pastureland (Batnasan, 1973). Living

in highly variable arid and semiarid environments made is practically difficult or

impossible for pastoral peoples to define and strictly follow spatial and social boundaries

(Fernandez-Gimenez, 2002). As part of the adaptation strategies developed over

millennia, to ensure the sustainability of the livestock production pastoralists have to rely

on diverse rangeland resources, because characteristics and dynamics of the ecosystem

demand greater level of flexibility and mobility to withstand the stresses and challenges

inherent to semiarid and arid rangeland ecosystems (Lkhagvajav, 1998; Fernandez-

Gimenez, 2002). Reliance on social networks has been one of the primary approaches for

pastoralists to access all types of resources (Fernandez-Gimenez, 2002).

During first decades after the people's revolution in 1921, there were two phases

to collectivize animal husbandry in Mongolia: 1928-1935 and 1940-1990 (Baljinnyam &

Shagdar, 1979). As a result of the 7th great assembly of the Mongolian People

Revolutionary Party in 1928, decision was made to support formation of people

cooperatives specialized in certain types of activities (Baljinnyam & Shagdar, 1979). The

period of 1928-1940 provided good lessons and experiences of how to support further

formation of herder groups or cooperatives appropriate to Mongolia, the pastoral

livestock economy based country (Baljinnyam & Shagdar, 1979). After starting the

process of economic and agricultural reconstruction, the second collectivization took off

in 1940s (Muller & Bold, 1996). During the collective period of 1950-1990, the

collectives played a significant role in allocating pastures and campsites and directing

seasonal movements, often respecting pre-existing customary rights, but seasonal

movements between *soums* and *aimags* were regulated and tightly controlled by

collectives (Fernandez-Gimenez, 2001). Because each collective had a defined territory

for which it was responsible, and the collective allocated grazing areas within its territory to herder work teams, such a system did not result in open access. Pastoral land use practices remained mobile and herding families were generally supported by trucks and deliveries of hay, thus limiting negative impacts on the landscape (Sneath, 1998).

National level structural changes in Mongolia began immediately following the democratic elections in 1990 and privatization of collective assets, including livestock, took place over the period of 1992-1993. A herder household received a herd of livestock mostly based on the number of household members. In addition to the distribution of livestock to herders and the new level of responsibility and risk acquired by herders, the dismantling of collectives also meant the loss of the formal institution responsible in collective times for organizing and regulating pasture use (Fernandez-Gimenez, 2001). Wealth differentiation increased among herding households, because assets were distributed only to members of the cooperatives and distribution between members was inequitable with several groups (Nixson & Walters, 2006). Initial increase of in number and well-being of herding households suggested several potential impacts on pastoral land-use patterns and land tenure, and there are also recorded inequalities in access to resources (Fernandez-Gimenez, 2001). The number of herder households increased from about 75,000 in 1990 to more than 150,000 in 1993, because dismantling of the state cooperatives and privatization of livestock in 1992-1993 led many rural non-herding households to move out to the steppe to raise their own stock of animals. The number of livestock in Mongolia simultaneously was increased from 25 million in 1992 to 33 million in 1999. According to the latest 2010 livestock census the total number of livestock increased to about 43 million.

During the collective period, pastoral movement was regulated by the collective directorate and with the dissolution of the collectives individual herding households were not able to maintain seasonal movements over a wide territory (Sneath, 1998). Dismantling of collectives left herding households without clear directions about their rights to use pastureland, and this lack of clarity might have influenced in decreased movements around seasonal pastures (Avarzed & Sodnoi, 2008). In the central region closer to the central market system, competition for and conflict over grazing land increased and to guard their winter-spring camps from trespassing, herders preferred staying there all year around without having seasonal movements (Mearns, 2004).

During early phases of livestock privatization, Mongolian agricultural scientists were in serious debate about how to implement privatization of livestock in Mongolia. Jugdernamjil emphasized that the *khot-ail* structure has to be the main basis for developing household-scale livestock production, as it embeds traditional features and unique social settings to develop such household based livestock industry in the future (Zandansharav, 2006). Shagdarsuren discussed two options for livestock privatization. One is an individual household based privatization to develop small-scale livestock production industries and other one is to privatize it as a collective to develop large-scale industries (Zandansharav, 2006). Tumurjav highlighted the importance of developing a household-based pastoral livestock production system respecting traditional practices and carefully considering its ecological impact to preserve intactness of Mongolian rangeland to ensure that its continuous production of ecologically natural products (Zandansharav, 2006). Namjim argued that it is not recommended to influence directly how

transformation process will go, because herders will get spontaneously and naturally re-organized into some cooperative structure by joining their efforts.

Communal rights may represent the best arrangement for situations in which the opportunities to invest in the quality of the land are limited and the community is small to bear some more additional costs to exclude outsiders from using it (Feder & Feeny, 1991). But with market liberalization and technology development, there might potentially be large benefits produced and in this case communal rights may no lon*ger* provide sufficient incentives for herders to land efficiently (Feder & Feeny, 1991). However, most of Mongolia's rangelands are classified as steppe, deserts-steppe, and desert. These are semi-arid and arid pastoral ecosystems with prolonged droughts, high variability in rainfall patterns and spatial and temporal variability in resource quality and production. Such uncertain and unpredictable character of climate leads to "pulsed and independent plant growth, rather than the constant or at least predictable growing conditions" (Ellis & Swift, 1989, p. 454). In light of this, it is unlikely that herders will invest in rangeland, but rather they prefer to maintain their flexibility and rights to move to other areas when climate dictates this necessity (Fernandez-Gimenez et al, 2008). Thus a system of group tenure rights or a "common property rights regime" has been recommended, which would give groups of herders use rights over their traditional seasonal pastures (Ickowitz, 2003). However, due to the strategies such as mobility, flexibility and reciprocity that pastoralists employed over millennia (Fernandez-Gimenez & Le Febre, 2006), access to resources to maintain social and spatial flexibility is more important to many herders than tenure security (Fernandez-Gimenez, 2002). Fernandez-Gimenez (2002) recommended that "regulation of seasonal movement represents a

revitalization of an historical institution in Mongolia and when coupled with co-management allows for a high degree of local involvement and preserves the social and ecological flexibility essential to the success of a nomadic lifestyle in highly variable natural and ever-shifting political-economic environment" (p. 74).

**Development of community-based natural resource management in Mongolia**

In Mongolia collapse of state collectives in the early 90s triggered formation of variety types of herder community organizations and groups at local level. The process of privatization and acquiring a stock of livestock as property was a big shift in their paradigm (Avarzed & Sodnoi, 2008). People who used to tend the state livestock and used to be directed, tightly controlled, and bound to socialist ideology had to suddenly face extreme shifts without any clear survival instructions in newly emerging social, economic and political systems (Avarzed & Sodnoi, 2008). Herders realized that loss of institutions that support their access to and use of the pastoral resources would make pastoral systems unsustainable (Fernandez-Gimenez & Swift, 2003). Customary groupings among herders such as *khot-ails and saahalt-ails* have been revived after de-collectivization, however, they were small and weak (Griffin, 2003) to serve as an institution to keep proper practices in pasture management. Revival of traditional self-organized and self-help groups was one way of lessening the effects of the lack of structure for regulation and direction (Muller & Bold, 1996).

International donors and non-governmental organizations such as World Bank, United Nations Development Programme, GTZ, IDRC, Food and Agriculture Organization, International Fund for Agriculture Development, World Wildlife Fund,

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World Vision International, USAID, etc. started to support community-based resource management practices throughout the country by promoting formation of herder groups and associations.  The sense of urgency for a community-based resource management was greatly stimulated after the 1999-2002 natural disaster *dzud*.  *Dzud* in Mongolian describes the cumulative consequences of natural hazards that results in mass destruction of livestock due to poor forage available to livestock and extreme cold temperatures that undermine the livelihood security of the herders (Farkas & Kempf, 2002).

 The *dzud* of 2000-2002 was the most devastating for the past forty years and 1999 to 2003 statistics suggest that approximately 8.5 million or 25% of the national herd perished as a result. *Dzud* conditions seriously affected every single herding household's livelihood and wellbeing leading some to move to urban areas for employment opportunities.

For the past 10-15 years, many international and national projects have seen the formation of organized herding communities as an essential step in attaining better and more sustainable management of Mongolian pastoral system.  As of 2006, donors allocated US$77.5 million to 14 projects utilizing herders groups to varying extent, in 19 out of 21 aimags in Mongolia (Mau & Chantsallkham, 2006). As of June 2006, there were about 16,0000 rural families organized into approximately 2000 donor supported herder groups active in Mongolia that were commonly disaggregated into (i) informal groups, (ii) non-government organizations and (iii) business cooperatives (Mau & Chantsallkham, 2006).

The names, scope, purpose, size, membership and activities of the herder communities or groups under the various projects have varied widely.  Much of this

variation has been in response to the technical emphasis featured in the supporting project or program. This has led to the promotion and formation of herder groups for management of rangeland, water and forest resources, business development groups, risk management groups, etc. With community-based management or co-management gaining popularity as a method for managing natural resources in Mongolia, there is a need to evaluate the outcomes of these processes.

Mau & Chantsallkham (2006) reported that international donor-funded projects relied on existing rural community structures for establishing herder groups in Mongolia. Schmidt (2004) recorded achievements of herders in the southern desert-steppe region of the country who achieved concrete results in managing common pastureland through strengthening their community institutions (Schmidt, 2004). Upton (2008) reported that formation of organized groups in this region was fostered by third party involvement that acted in the capacity of a "catalyst" and "facilitator" of local initiatives and successful practices. External resource mobilization and resource utilization capacity was gradually enhanced while communities continued to put forward their trust and willingness to institutionalize their collaborative efforts (Upton 2008). She argued that gradual increase in bonding social capital within the herder communities eventually was leading to development of bridging social capital, and the presence of the third party was stimulating the community to use their mobilized external resources by the processes of regular communication and interpersonal interactions. Hess et al. (2010) reported about impacts of the donor (in this case GTZ) supported project on formation of community organizations of local herders to attain better natural resource management. The project had an impact on all three dimensions of poverty: openness of mind with which the

project approached the herders, lasting empowerment and relationship and commitment/empowerment of all local stakeholders.

There are wide range of reasons and motivations to conduct evaluation of collaborative efforts. Evaluation of collaborative efforts is important to understand whether the time and effort the stakeholders invest in collaboration is likely to produce tangible results (Leach et al., 2002). From the funding agency or management perspectives, evaluation will help them to make necessary adjustments on their funding and management policies and strategies (Conley & Moote, 2003). From evaluation we can get better understanding about the potential and the limits of collaborative natural resource management (Conley & Moote, 2003). There is a gap existing in our knowledge about the outcomes of community-based rangeland management in Mongolia that actually leads to main purpose of this research.

**Traditional and scientific knowledge**

This section describes about different knowledge types and its relationship to community-based management. The third principle of resilience framework emphasize on combining different types of knowledge for learning that talks about "creating platforms and involving user groups and interest groups for knowledge sharing about complex ecosystem management and for relating to uncertainty and surprise" (Folke et al, 2003, pp. 375).

Scientific or Western knowledge and indigenous or non-Western knowledge that are two different paradigms built on different background and with different purposes. Mongolian pastoralists share a common knowledge base with its set of norms, attitudes

and practices (Fernandez-Gimenez, 2000). The herders' traditional ecological knowledge and perceptions reflect their pasture use norms and herding practices and this knowledge system persisted over centuries being modified by flexible local institutions and management practices (Fernandez-Gimenez, 2000).

Indigenous knowledge could be understood as the local knowledge held by indigenous peoples or local knowledge that is only specific to a given culture and society (Berkes, 2008; Warren & Pinkston, 1998). Whereas western knowledge is based on a whole system of classification and representation of ideas that determine the wider rules of practice (Hall, 1996). Hall (1996) stated that the West established its own sense of itself by creating "western identity" and western form of knowledge to relate to "The Other" or the rest of the west.

Agrawal (1995) discussed fundamental distinctions and relationship between traditional science and Western science. He describes that the two types of knowledge systems could be distinguished by substantive, methodological, epistemological and contextual matters. In terms of substantive matters, western science has greater intellectual content by being systematic, objective and analytical and it gets advanced on the achievements of previous research, whereas indigenous knowledge could be equated to common sense, as it doesn't need to be rigorously objective, systematic and conceptual (Agrawal, 1995). Berkes (2008) highlighted that in "traditional systems, morality and ethics are explicitly a part of the management system; in Western scientific systems they are merely implicit" (pp. 126). Local knowledge has memory that spans over space and time (Berkes, 2008) that makes it overstretched temporally and spatially and without perfect match with the timeframe and units of analysis of scientific research. It could be

assumed that scientific research provides insights from a selected scale of a local

knowledge and therefore it has to refer to a broader indigenous knowledge system that

has lar*ger* spatial and temporal scales of existence.

Methodological and epistemological distinction is very particular, because

Western science has more objective and deductive logic, whereas indigenous knowledge

is based on subjective and inductive logic.  Indigenous knowledge is orally

communicated, largely functional and is embedded in the culture of the people (Ellen &

Harris, 2000).  Western science is a systematically documented and peer-reviewed

knowledge derived from the application of predetermined design and methods.  This

contrasts with indigenous knowledge as it is considered "closed, non-systematic, holistic

rather than analytical, advances on the basis of new experiences, not on the basis of a

deductive logic" (Agrawal, 1995, p. 4).

In terms of context, indigenous knowledge systems have greater moral and ethical

context by being attached to a particular social group in certain time and space, whereas

Western knowledge, on the other hand, has been divorced from an epistemic framework

in the search for universal validity (Berkes, 2008).  Sillitoe (1998) argues that indigenous

knowledge is kept and maintained by local people to manage their resources and,

therefore, it has localized relevance.  In contrast to scientific knowledge, indigenous

knowledge is empirical rather than theoretical that makes it more localized, repetitive and

fluid (Berkes, 2008; Ellen & Hariss, 2000).  Sillitoe (1998) asserts that it is risky to

compare and contrast scientific information with the local people's interpretation of their

activities and livelihood practices.  Ellen (2007) reports that the traditional/folk

knowledge and instituted scientific knowledge can be modeled as "two interacting and

mutually reinforcing streams: hybridizing through mutual borrowing while maintaining permeable boundaries for social and professional reasons" (pp. 65). All these characteristics of indigenous knowledge make it almost impossible to epitomize it as being part of a dominant Western scientific knowledge (Berkes, 2008; Ellen & Hariss, 2000).

From the local people's perspective, debate about comparing and contrasting scientific information with the local people's interpretation of their activities and livelihood practices is quite sensitive (Sillitoe, 1998), because local knowledge is a *knowledge of how* and it is orally and cross-generationally preserved in "living memories of individuals but also within the textures of local songs, stories and other performance traditions" (p. 34) (Ross et al., 2011). It is also important to recognizing geographic scales that determine the way how local communities learn (Cheng & Daniels, 2003). As for small scale places stakeholders have particularistic approach of knowing and they depend on personal experiences and features in the surrounding place, whereas stakeholders in large scale have approach of learning that is aesthetic and rely other secondary experiences and information (Cheng & Daniels, 2003).

Potentials to combine scientific knowledge with local knowledge are demonstrated in a process of adaptive co-management (Gadgil et al., 2003), a process of sharing management power and responsibility between government and local resource users (Pinkerton, 1989). Fernandez-Gimenez et al. (2006) discussed how traditional ecological knowledge can be combined with science and applied in co-management of natural resources by doing cooperative research that draws on local skills and knowledge. Canadian arctic co-management cases inform that a long-term co-management institution

building, a favorable policy environment and diverse forms of communication, deliberation and social interaction are highlighted as important for knowledge co-production, social learning and adaptation (Armitage et al., 2011).

The continual engagement model was proposed by Reid et al. (2009) to better integrate knowledge from diverse stakeholders with the goal to improve impact of science on local and national decision making.  The continual engagement model has a core team of diverse stakeholders committed to cross-scale linking a wide range of actors from local to national and to global levels.  Authors call this team as a core boundary-spanning team.  Ross et al. (2011) examined epistemological and institutional barriers to the integration of indigenous knowledge into western construction of knowledge. They argue that although many barriers are related to the epistemological difference between these two knowledge systems, "the practical manifestation of the barrier is often institutional" (p. 112). Despite numerous attempts and practices involving indigenous people in resource management, bureaucracy of modern institutions are still remain as obstacles to cooperative management of natural resources (Ross et al., 2011).

Novak's theory of education could be an important reference and application tool in creating and combining knowledge types (1998). Union of our actions, feelings, and conscious thought constructs a knowledge that we have learned meaningfully and thus makes human empowered to make commitments and accept responsibilities (Novak, 1998).  Meaningful learning facilitates integration of new knowledge into knowledge the learner already knows in some no-trivial way (Novak, 1998). Armitage et al. (2011) emphasized that meaningful ways of knowledge co-production in co-management institutional arrangement can trigger learning and adaptation. On the basis of pastoral

communities in Kenya, Robinson and Berkes (2011) illustrated mechanisms how meaningful participation at multi-level scales may lead to increasing adaptive capacity in the face of social-ecological changes.

The dissertation research explores potential ways to operationalise resilience for empirical studies having focused on the pastoral social-ecological systems in the arid and semi-arid landscapes in Mongolia. The emphasis of the research is to examine pastoralists who have community-based rangeland management experience and compare them with traditional neighborhoods of herders that do not have such exposure and experience. The comparison is made within the framework of a resilience perspective to explore application of resilience thinking concept to the management of coupled human-natural pastoral systems in Mongolia.

# Chapter 3  Methods

**Study sites**

This study focused on two provinces of Mongolia, particularly Uvurkhangai *(pronounced as Uvr-han-ga)* located about 500 km west of the capital city of Ulaanbaatar and Bayankhongor *(pronounced as Bain-hon-gr)* which is about 650 km southwest to Ulaanbaatar (Figure 3.1).  Two pairs of sub-provinces (*soum*s) selected in each of the provinces that represent two ecological zones.  Uvurkhangai *soum*s are Khujirt *(pronounced as Hu-ji-rt*) and Kharkhorin (*pronounced as Har-ho-rin*) in the mountain steppe and Bayakhongor *soum*s are Jinst and Bayantsagaan (*pronounced as Bain-tsa-gan*) in the desert-steppe.



Figure 3.1 Location of research sites

The research sites have been grazing grassland for over several centuries for various types of pastoral livestock such as sheep, goats, cattle, camel, horses and yaks.

The type of livestock varies one site to another.  Jinst and Bayantsagaan *soum*s are dominated by sheep and goats, with camels, horses and a few cattle, whereas in Khujirt and Kharkhorin a herd composition will be more diversified by having yak and a greater proportion of cattle, but there is no camels.

Research sites include two pairs of *soum*s: Bayantsagaan *soum* adjacent to Jinst and Kharkhorin to Khujirt.  Primary sites, Jinst and Khujirt, are herding communities with community-based rangeland management (CBRM) organizations.  Control sites are Bayantsagaan and Kharkhorin, which do not have such organizations, but instead have traditional neighborhoods of herding communities (Table 3.1).

Table 3.1 The research field sites

| Province | Ecological zone | Paired sites | |
|---|---|---|---|
| | | Primary sites: with CBRM | Control sites: without CBRM |
| Uvurkhangai | Mountain steppe | Khujirt | Kharkhorin |
| Bayankhongor | Desert steppe | Jinst | Bayantsagaan |

The unit of analysis in the primary sites was a herder group practicing CBRM, and in the control sites were the traditional neighborhoods of herders.  Having paired sites supports my research as it provides results for comparative analysis and conclusions. But, because I only worked in two pairs of soums (and thus had a limited sample size), the quantitative results will only apply to these soums and do not allow me to statistically infer the results to other areas.  Selection of the *soum*s was first based on the presence and absence of herders who have some community-based rangeland management experiences.  Other criteria such as availability of social and ecological data and previous scientific research history were important considerations for the selection of the sites. Past disaster and drought experiences, geographic location and land use pressure were some other factors influenced the selection.

Both primary and control sites were dramatically affected by *dzud* in 2000-2002. In terms of proximity to central road and infrastructure development, Khujirt and Kharkhorin are close to the central roads, markets and are connected to permanent electricity, whereas Jinst and Bayantsagaan are more isolated and don't have as favorable infrastructure as other two. Only in 2010, Jinst *soum* center was connected to central electricity and Bayantsagaan *soum* use renewable energy source that provide electricity for three hours a day. In addition, sufficient ecological and social data were available in Jinst *soum* from longitudinal studies done by my advisor, Dr. Fernandez-Gimenez.

In Jinst and Khujirt *soum*s the UNDP-funded Sustainable Grassland Management (SGM) project was implemented by the Ministry of Food and Agriculture in 2003-2007 (UNDP, 2008). The project facilitated formation of herder community-based organizations with the purpose of improving pastureland ecological status in parallel with improving the herders' livelihoods. In this study, I included 8 community-based herder groups of Khujirt and Kharkhorin. There are at least three traditional neighborhoods larger than herder groups in number of households included in the research and these group and non-group herder communities ranged in size from 7-70 households (Table 3.2).

Table 3.2 The research field sites and names of herder groups and
traditional neighborhoods

| Province | Ecological zone | Paired sites | | | |
|---|---|---|---|---|---|
| | | CBRM herders (group herders) | Approx. no of households | Non-CBRM herders (non-group herders) | Approx. no of households |
| Uvurkhangai | Mountain steppe | Khujirt CBRM group names and year established:<br>– Olonburd, (2003)<br><br>– Ikhburd (2003)<br>– Hangimust (2003) | <br><br><br>12<br><br>8<br>9 | Kharkhorin Traditional neighborhood place name:<br>– Shankh | <br><br><br>70 |
| Bayankhongor | Desert steppe | Jinst CBRM group names and year established:<br>– Orgil (2003)<br>– Bodi (2003)<br>– Sharkhad (2003)<br>– Devshilt (2003)<br>– Sar-Uul (2006) | <br><br><br>8<br>10<br>8<br>7<br>10 | Bayantsagaan Traditional neighborhood place name:<br>– Tsetsen Uul<br>– Bayantsagaanii Uvur | <br><br><br>20<br>20 |

**Combined sequential and concurrent exploratory design**

The research problem for my study is exploratory in nature and it is focused on
discovering if there is social-ecological resilience-building as a result of community-
based natural resource management. The resilience of social-ecological systems is an
emerging perspective that deserves more research in order to test resilience concepts and
develop a broader and more robust body of theory (Cumming, 2005). Social-ecological
systems or coupled human-natural systems are not static (Liu et al, 2007) and as they
change over time it deserves rather more exploratory qualitative approach to understand
the dynamics of social-ecological systems and its resilience in the face of various
disturbances and changes. With this assumption, I consider that the nature of the
phenomenon may not be best suited to quantitative measures, but more qualitative
measures. Therefore, I started with qualitative data collection and analysis on this
relatively unexplored topic and using the results I designed a subsequent quantitative

phase of the study (Tashakorri & Teddlie, 1998). Since the research explores potential

ways to operationalize resilience for empirical studies, I tested some quantitative

measures to track resilience-building of the social-ecological systems in arid and semi-

arid landscapes in Mongolia. Thus, my research has taken a mixed methods approach.

Creswell (2003) presented several different strategies for inquirers, including

sequential and concurrent strategies. Figure 3.2 presents a sequential exploratory design

that is conducted in two phases, with the priority given to the qualitative phase. The

initial phase is a phase of qualitative data collection and analysis, which is followed by a

phase of quantitative data collection and analysis, giving more priority to the qualitative

aspect of the study. During interpretation, the findings of these two phases are integrated

using the quantitative data and results to assist in the interpretation of qualitative findings

(Creswell, 2003).



Figure 3.2 Sequential Exploratory Design (Creswell, 2003)

For my research, I based my strategy of inquiry on Creswell's sequential

exploratory design, but modified it by creatively combining the two approaches (Figure

3.3). The first phase was qualitative research and the second phase had the both

quantitative and qualitative data collection and analysis and I used the findings of these

two phases to support each other when drawing inferences and conclusions. I completed

the first phase of my research in the period of June 2008 to May 2009 using a qualitative

case study approach. Results of this case study helped me to develop and refine

additional quantitative and qualitative measures implemented in June 2009 - September

2010.
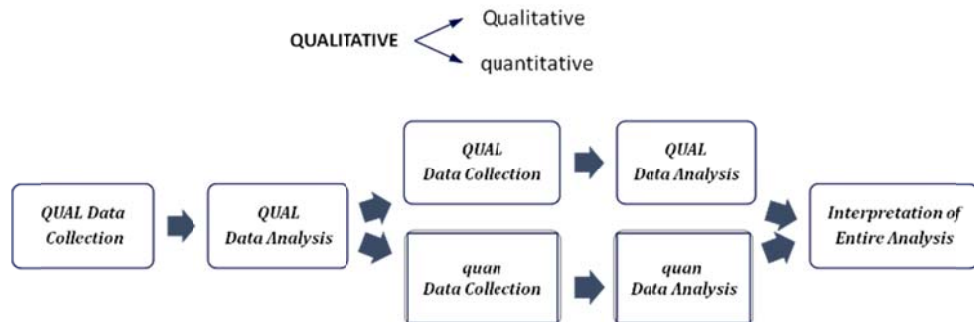


Figure 3.3 Combined sequential & concurrent exploratory design
(modified from Creswell, 2003)

By combining two methods of data inquiry and two forms of data collection

(simultaneous and concurrent), created a comprehensive approach to answer the research

questions.  Using at least two methods, qualitative and quantitative, that addresses the

same research problem, allowed me to use the methodological triangulation technique

(Morse, 1991).  Morse (1991) discussed that methodological triangulation can be

classified as simultaneous or sequential.  Simultaneous triangulation is the use of the

qualitative and quantitative methods at the same time. In this case, there are limited

interactions between the two datasets during the data collection, but the findings

complement one another at the end of the study.  Sequential triangulation is used if the

results of one method are essential for planning the other method.  The qualitative

method is completed before the quantitative method is implemented or vice versa.

Creswell (2003) reported that the sequential exploratory strategy is easy to implement

and straightforward to describe and report, and it is particularly useful for research that

aims to explore a phenomenon by expanding on qualitative findings.  He also mentioned

that this model is appropriate to build a new instrument. Since there is a combination of both ethnographic and numeric data, it could make a the study stronger having both components. In terms of disadvantages, Creswell (2003) reported that time-wise it requires a substantial time-frame to complete both data collection phases. In addition, it might probably be challenging for the researcher to construct from the qualitative analysis the subsequent quantitative data collection (Creswell, 2003).

The first part of the method section is devoted to qualitative mode of inquiry, which is a case study, in which I qualitatively explore several related research questions. The second part talks about quantitative survey methods as an alternative mode of inquiry for the research. This approach will provide numeric description of relationships of a set of variables that were derived from the qualitative data.

On one hand, the case study was an appropriate strategy to use in my research because it provides broader learning opportunities (Creswell, 2003), and facilitates exploring relationships between key concepts of the research, social-ecological resilience and community-based natural resource management. On the other hand, survey research provides me with a good opportunity to develop a methodology that is broader in scope in covering topics and involving more people. A survey helps me to describe the characteristics and reported behaviors of CBRM and non-CBRM communities and identify possible causal variables of a given situation or event.

### Case studies

The strategy of qualitative inquiry for my research is a case study, in which I qualitatively explore several related research questions. A case could be understood as a thing, a single entity or a unit that is bounded by a kind of "fencing" (Merriam, 1998;

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Miles & Huberman, 1994). A case could be a person, a community and a problem, but if the studied phenomenon is not bounded, it can not be considered as a case (Merriam, 1998). However, the boundary should not be a rigid expectation and there will be some level of fuzziness in defining it (Miles & Huberman, 1994). For the current study I had spatial and thematic boundaries that justified the selection of such a strategy. The research is focused on four different administrative units, *soum*s, that belong to two different provinces. Within in each *soum* I selected with smaller herding communities (herder groups) with and without community-based rangeland management as units of analysis.

The case study is an appropriate strategy to use in the research as it provides broader learning opportunities (Creswell, 2003). The research aims to reveal relations of key factors of a phenomenon; therefore I trust that the case study helped me to obtain a holistic description and explanation of the phenomenon (Merriam, 1998). Recognizing the exploratory nature of my study that aims to examine how resilience of social and ecological systems of herding communities relate to community-based rangeland management practices, case studies would be the most desirable strategy of inquiry since it is impossible to separate the phenomenon's variables from their context (Merriam, 1998). Case studies allowed me to explore the development of herder community-based rangeland management practices, and associated group activities and outcomes in order to contrast them with practices and outcomes in communities where herders are not members of CBRM groups.

*Data collection*

Note that I did not collect data directly from the ecological sub-system of the

social-ecological system through direct measurements of vegetation or soils or wildlife.

Instead, I used interviews to understand the attributes of the ecological sub-system

through local herders' experiences and observations.

The qualitative methods included interviews, focus groups, workshops,

observation and document review.  I conducted 39 in-person interviews and nine focus

group discussions and three workshops, which were attended by 121 people. Out of total

160 informants, were males and 8 were females.  Informants included herders,

government and agency officials and the "Sustainable Grassland Management" project

former staff and advisors (Table 3.3).  I took four fieldwork trips in the summers of 2008

and 2009 to collect the field data.  In 2008, I made a one-week trip in June and a second

trip from July 10-25.

Table 3.3 The number of informants of each gender

| | Informants | Date | Male | Female |
|---|---|---|---|---|
| *Focus groups:* | | | | |
| 1. | Jinst – Sharhad herder group | 7/17/2008 | 2 | 3 |
| 2. | Jinst – Sar-Uul herder group | 7/17/2008 | 4 | 5 |
| 3. | Jinst – Bodi herder group | 7/16/2008 | 0 | 5 |
| 4. | Jinst – Sharhad herder group | 6/24/2009 | 2 | 5 |
| 5 | Bayantsagaan – in Erdene's *ger* | 7/13/2008 | 3 | 3 |
| 6 | Bayantsagaan – Idermunkh | 7/14/2008 | 4 | 5 |
| 7 | Khujirt – Ikhburd (Batbold) | 6/23/2008 | 2 | 3 |
| 8 | Khujirt – Olonburd (Dorj) | 6/22/2008 | 4 | 3 |
| 9 | Kharkhorin – Bileg-Urnukh's *ger* | 6/25/2008 | 3 | 2 |
| *Workshops:* | | | | |
| 1 | Jinst | 6/25/2009 | 15 | 19 |
| 2 | Bayantsagaan | 7/30/2009 | 9 | 7 |
| 3 | Kharkhorin | 6/14/2009 | 8 | 5 |
| *Interviews:* | | | | |
| 1 | Bayantsagaan | 7/10-16/2008 | 5 | 6 |
| 2 | Jinst | 7/17-22/2008 | 3 | 4 |
| 3 | Khujirt | June-July, 2008 | 7 | 3 |
| 4 | Kharkhorin | June-July, 2008 | 5 | |
| 5 | UB | June-August, 2008 | 3 | 3 |
| | Total | 159 | 79 | 81 |

*Key-informant interviews*

In the two primary research sites (Jinst and Khujirt), in-person interviews were conducted mainly with key informants, such as local government officials, herder group leaders, herder group facilitators, and elderly and women members of herder groups. All interviews with herders were conducted in the *ger*s (traditional felt yurts) of informants, but interviews with local government officials were conducted in their respective offices. All interviews were conducted in the native Mongolian language, which I speak fluently. In some places we camped overnight with herding households, which allowed more time for additional dialogue, follow-up questions or observation. An interview protocol approved by CSU's Institutional Review Board, was translated and carefully followed during each interview. Before starting interviews, we intentionally set aside some time for greetings and informal introduction. Each interview continued for more than one hour. The questions asked during interviews aimed to identify the important social, ecological and economic components and their characteristics and roles in respective herding communities. In addition, another set of questions was focused on identifying critical disturbances and historical events, their characteristics and impacts. As an interviewer, I took notes during all interviews and focus groups that were also audio-recorded and later transcribed.

*Focus group discussions*

Focus group discussions were organized with eight different groups of herders and in total 36 participants were involved in the meetings. There were two focus groups in each of the study sites. On average there were 4-5 people in each focus group. All meetings were also organized in the respective communities and we conducted the

meeting in one herder's *ger*. Participants were not informed beforehand about the meeting, but they were spontaneously invited on the previous night or sometimes even few hours before the meeting. Since the discussions were organized in the community and within close neighborhood, it seemed that herders did not have trouble coming even on short notice. In addition, the familiar settings and environments enabled participants to speak up and feel comfortable to express their thoughts and answer the questions. One focus group lasted on average about 1 hour 30 minutes and in a few cases it lasted even more than two hours, because some participants, especially women, became more engaged as the focus group progressed.

Questions asked during focus group discussions were directed to get responses on herders' capacity to adapt to changing socio-economic and ecological environments. I have tried to get as many details as possible on how individual households and communities cope with or overcome changes affecting them on a regular basis, and what adaptive strategies and practices they devise or rely on. In addition to interviews and focus group discussions, field data were supplemented by reviewing documents and other secondary source of information.

*Workshops*

In addition to interviews and focus group discussions, in 2009, I organized three workshops with representatives of the herding communities and local government involved in my interviews and focus groups in 2008 to present them preliminary conclusions and interpretations of the data. These workshops were organized in the participatory, but locally appropriate manner, where elders will be sitting on the floor in the "upper" side of a *ger* and women and children on the left and all others sitting in the

remaining spots around the *ger*. One local elder first provided a short introduction and I

presented them my research findings using user-friendly posters. First elders provided

their constructive feedback, clarification and then younger men and women got

eventually involved in the discussion. As a result, I got ideas for necessary improvements

and corrections to my research findings and hopefully, to improve my knowledge about

some of the underlying causes and effects of my research objectives. This kind of talk

was helpful for me to motivate local people to provide them more detailed information

and get their support in conducting my survey and additional interviews. This was a very

helpful exercise which had an advantage of constructing a more detailed and accurate

knowledge base about the social and cultural contexts of the study sites (Arnold &

Fernandez-Gimenez, 2007).

*Document review*

Several types of documents were reviewed as part of data collection, including

local government documents, donor project reports, brochures and leaflets. Most of the

collected information represented secondary materials that were secondhand accounts of

the people and accounts written by others (Creswell, 2003). To find relevant materials, I

approached mainly local government officials, the donor project staff and herders

themselves. Only a few materials, such as herder group brief reports, were found from

herders that could be considered as primary information obtained directly from herders.

While collecting my qualitative data, it was possible to start initial interpretation

and analysis of the data. Preliminary data analysis is an ongoing process which was

undertaken every time data were collected (Grbich, 2007). Right after each interview or

observation exercise, some distinctive patterns of meaning were noticed, but I was careful

not to draw any final conclusions until data collection was over.

*Data analysis*

There are a broad range of approaches to qualitative data analysis available that

allow qualitative researchers to reveal systematic patterns and meaning in their datasets.

For my data analysis, I followed three flows of data analysis that were stipulated by Miles

and Huberman (1994).  They defined data analysis as a process that consists of three

components that happen in parallel or concurrently to each other: data reduction, data

display, and conclusion drawing/verification (Figure 3.4).
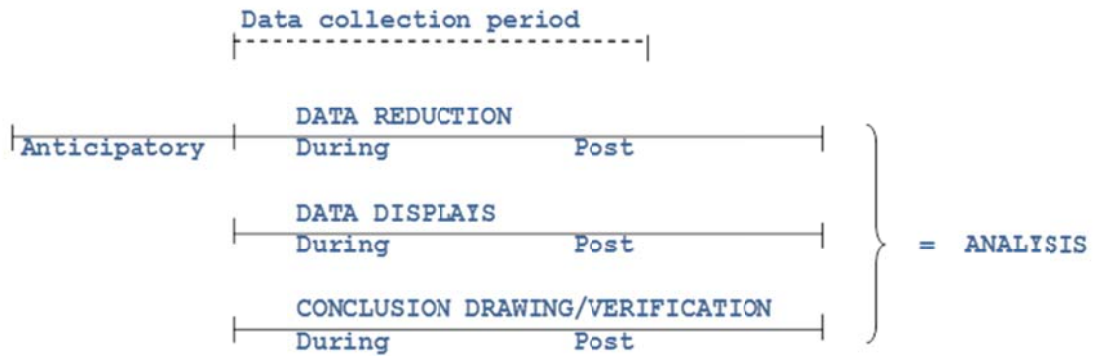


Figure 3.4 Components of Data Analysis: Flow Model (Miles & Huberman, 1998)

The first flow is data reduction, the process that helps to transform extensive field

notes and transcriptions into a more focused and organized set of data.  A reduced dataset

becomes more manageable to work with and enables the researcher to draw some initial

conclusions and inferences.  Data reduction strategies include writing summaries, coding,

teasing out themes, making clusters, writing memos, and others (Miles & Huberman,

1998).

The second flow is data display, which includes matrix and network displays, graphs and charts. This process produces user-friendly data summaries that allow the researcher to see relationships between meanings, concepts and attributes. The third flow of analysis is conclusion drawing and verification, which entails deciding what things mean by identifying regularities, patterns, explanations, possible configuration, causal flows and propositions (Miles & Huberman, 1998).

### *Data reduction*

From my interviews, focus group discussions and field journals, I generated more than 400 pages of data in native Mongolian language. After transcribing interviews and focus group discussions, I reduced my data by coding them using Nvivo qualitative analytical software. Coding is often the first step in organizing the data in a meaningful way that condenses the bulk of data into analyzable units by creating categories (Coffey & Atkinson, 1996). However, coding is not only data reduction or data simplification process, but it also a process of data complication that calls for data expansion and reconceptualization (Coffey & Atkinson, 1996).

Prior to the field work, I developed an initial list of codes using the research questions and sub-questions. Codes could be defined as "tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study" (Miles & Huberman, 1996, p. 56). There were 14 codes and over 100 sub-codes in the start list and using them I coded my data in Nvivo. As a result of coding, I was able to pull together evidence and systematically categorize it under related themes or codes. This more organized set of data helped me to start drawing concrete inferences and some preliminary conclusions. However, since the initial codes were predefined based on the

theoretical framework, some codes were too rigid, redundant or unused. Some codes were used too much and this required breaking them down into several subcodes. Therefore, after coding one third of my data, I revised my codes by dropping some of them, combining several codes in one and renaming some codes into easy readable ones. I did not re-label all my data I had coded before, but using the revised codes I analyzed the rest of my data. In parallel to coding, a number of data analysis methods were used such as research memos, content analysis, domain and taxonomic analysis, constant comparative analysis and poetic analysis.

Memo writing can be used as an analytical strategy that permits the researcher to achieve "abstraction while remaining true to the data" and it enhances the research process and outcomes in all qualitative approaches (Birks, Chapman & Francis, 2008). My research memos varied in lengths and were taken in different times and places. Especially, memo writing was helpful and more efficient when it was done in parallel with coding.

Domain and taxonomic analysis was a helpful analytical approach that resulted in data categorized into domains and sub-domains, and showed taxonomic relationships between them. Domains are categories of meanings and they are organized by taxonomic analysis that shows the relationships among all domains and all the included terms in a domain (Spradley, 1980). For example, for research question 1, I have my data falling into three main domains - social, economic and ecological components. Each of these domains is further broken down into several smaller sub-domains. For example, the social component is broken down into collaborative informal organizations, government organizations, NGOs, private sectors, etc. Under each of these sub-domains, I have listed

responses from informants that created a good list of evidence that support existence of above-mentioned social organizations in my study sites.

I used poetic analysis approach to analyze some of my herder interviews. For this I first structured the narrative transcript as a poem and coded it. When I did my coding I didn't used my preliminary set of codes, but I coded them naturally according to the meanings the phrases attach to. This resulted in a set of data clustered in several domains. To generate meanings out of these sets of data I formed patterns and themes, made comparisons, looked at the contrasts and relationships to build a coherent understanding (Miles & Hiberman, 1994). To evaluate evidence in support of or in contradiction to my propositions, I triangulated different data sources of information (Creswell, 2003).

These analytical approaches structured my data in a more working style to conduct more in-depth analysis and interpretation of my data. Having multiple data analysis techniques provided me with flexibility in choosing the right approach for analyzing various types of data and led to greater levels of description, interpretation and elicitation throughout the research process (Creswell, 2003). With the help of these analytical approaches, I reduced, focused and organized my data, allowing me to present and display them to further enhance analysis and draw conclusions.

### Data display and translation

Data display means a user-friendly visual format of the systematic data presentation that allows the user to draw valid conclusions and take needed action (Miles & Huberman, 1994). There are many styles of data display and the researcher can choose them in accordance with the audience to which the results are targeted and the researcher's position in the research study (Grbich, 2007). Styles of display include

graphic summaries, quotes, case studies, interactive approaches, hyperlinks, vignettes, poetry, visual displays, and others (Grbich, 2007). In my analysis, I decided to generate graphic summaries, such as matrices and flow charts, to provide a quick summary of considerable chunks of data as an overall snapshot which can then be more fully explained and illustrated with other forms of qualitative display such as quotes or poems (Grbich, 2007).

All my qualitative data were in Mongolian and I translated them into English in different times during data reduction and data display phases. I used translated data to developed matrices and diagrams, and used quotes, vignettes and poetry in my dissertation. Translation took considerable amount of time and in many instances it was challenging for me to find an appropriate word in English that would convey direct meaning of the Mongolian word. For example, direct quotes used in the dissertation come from 1-2 hour of interview or focus groups discussion transcription notes and I translated only those sentences that were used as evidence for my results. Direct translation of these selected quotes may sound too direct and in some cases even rough, but I decided to use them without making any edition.

### *Conclusion drawing/verification*
Miles and Huberman (1994) describe this phase as the phase to draw meanings from the particular configuration of data in a display and to verify whether the meanings are valid and repeatable. Using reduced the set of the qualitative data, I used some helpful tactics to form patterns, themes, clustering, making comparisons, looking at the contrasts, clarifying relationships, and building a coherent understanding (Miles & Hiberman, 1994). Initial findings and conclusions were partly verified by using these

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tactics. To evaluate my evidence in support of or in contradiction to my hypotheses, the workshops, interviews and visits in the second year were useful to find disconfirming evidence and explanations. Triangulation of different data sources of information was used to examine evidence from the sources to build a logical justification for themes (Creswell, 2003).

### *Household Survey*

A survey provides a quantitative or numeric description of trends, attitudes, or opinion of a population by studying a sample of population (Creswell, 2003). Survey research involves administering questionnaires to a sample of respondents selected from a particular population (Vaske, 2008). The survey was in four communities that were not randomly selected, so we can not generalize beyond them. We also cannot generalize because the sample size of communities (2 pairs) is too small. So the purpose of the survey is to generalize from a sample of CBRM and non-CBRM herding communities to other herders within these communities and the study applied to the soums I studied.

A survey is the second preferred type of data collection procedure for the study, because it helps me to develop some quantitative measures of resilience in addition to my qualitative data. Qualitative findings and inferences from data analysis of my preliminary field study informs me about potential quantitative measures of social and ecological resilience, based on which I developed the survey questionnaire. The data was collected at one point in time and the form of data collection was face-to-face structured interviews. A rationale for this type of data collection is related to the sample to be surveyed. Since the survey was administered to herders, who might vary in terms of education and literacy, structured interviews were conducted that were orally presented

and provided "the opportunity for the interviewer to interpret questions, clear up misunderstandings, or even gather data from those not fully literate in the designers' language" (Black, 1999, p. 238). The disadvantage was that structured interviews are labor intensive and require one-to-one interaction between interviewee and interviewer. In terms of limitations, different interviewers may interpret questions and responses differently and therefore, inter-interviewer reliability can be checked giving an appropriate training and guidance to the team (Black, 1999).

The units about which information collected were households from four different *soum*s: Jinst, Bayantsagaan, Khujirt and Kharkhorin. A stratified random sample was used to select individual households, in which each individual in the population had an equal probability of being selected. The study involved stratification of the population based on three criteria: 1) membership and non-membership to CBRM groups, 2) wealth stratification and 3) ecological regions (desert-steppe and mountain-steppe) (Table 3.4).

There are two *soum*s (Jinst and Khujirt) with herders groups organized as CBRM communities and two *soum*s (Bayantsagaan and Kharkhorin) without such communities.

Table 3.4 Stratification plan based on group membership

|  | | *Soum*s | CBRM membership/nonmembership |
|---|---|---|---|
| Primary sites | 1. | Jinst | Members + Non-members |
|  | 2. | Khujirt | Members + Non-members |
| Control sites | 3. | Bayantsagaan | Non-members only |
|  | 4. | Kharkhorin | Non-members only |

A pair of CBRM and non-CBRM *soum*s are locatedin the desert steppe and another pair in the mountain-steppe. Wealth levels are identified using a participatory wealth ranking method (Grandin, 1988) that was conducted together with community representatives. Based on those ranks I randomly selected from each of the CBRM

*soum*s (Jinst and Khujirt), 36 households that are members of the herder groups and 36

households that are non-members.  In non-CBRM *soum*s (Bayantsagaan and

Kharkhorin), I selected only 36 herders in each *soum*.  In total 216 households were

surveyed that represent two different herding communities from two ecological regions

(Table 3.5).

Table 3.5 Sample households surveyed

|  | Non-group herder in non-CBRM *soum* | % of total population | Non-group herder in CBRM *soum* | % of total population | Group herder in CBRM *soum* | % of total population |
|---|---|---|---|---|---|---|
| Desert-steppe | Bayantsagaan 36 households | 8% | Jinst 36 hhs | 7% | Jinst 36 hhs | 7% |
| Mountain-steppe | Kharkhorin 36 hhs | 5% | Khujirt 36 hhs | 5% | Khujirt 36 hhs | 5% |
| Total  216 hhs: | 72 hhs | | 72 hhs | | 72 hhs | |

The randomly selected herder households were located with the help of local

people and when some moved to different campsites, I randomly choose another

household within the same wealth strata.  To ensure a spatially unbiased sample of

households across the *soum*, 2 trained research assistants worked with me to administer

the survey.  Three researchers traveled to each of the selected households regardless of

time and distance required to get to there.

The content of the survey was comprised of sections on household demographics,

seasonal movements, land and water tenure, knowledge, attitudes and practices about

rangeland management and protection, social relationships, household production and

income, and social capital.  The section on seasonal movements asks questions related to

the seasonal movement patterns of the herders.  The section on the rangeland

management is designed to understand where herders get information about pasture and

livestock, what is the herder's knowledge about the causes of pasture degradation and household's practices of rangeland management. The section on social relationships includes questions to reveal more about the herder's community, local organizations, and how people get along together in the community. The last section on social capital is designed to learn more about the relationships and activities of herder groups.

The quantitative data analysis used statistical analyses depending on type of data (categorical or continuous), type of variable (independent or dependent) and levels of measurement. The both descriptive and inferential statistics was used during the analysis. For all independent and dependent variables data descriptive statistics described a relationship between two (bivariate) and among several variables (multivariate) using statistical techniques such as frequency distribution, correlation, chi-square and multiple regression (Newman, 2006). For independent samples, for example, a t-test was used to explore the relationship between "group membership" (a dichotomous variable) and "knowledge index", "diversity index" and "community network index" (recorded as indexes measures). An index is a combination of items into a single numerical score, where various components of a concept are each measured and then combined into one measure (Neuman, 2006). There were four indexes that each had items that were measured with at least one indicator. SPSS was used to analyze the data (Statistical Program for the Social Sciences), because it is extensively used by the social scientists and has many ways to manipulate data and it contains most statistical measures (Neuman, 2006).

# Chapter 4  Learning to Live With Change and Uncertainty

**Introduction**

Resilience is the capacity of a system to withstand or absorb disturbance and to reorganize while undergoing change, but retain its essential function, structure, identity, and feedbacks (Holling, 1973, Walker et al, 2004).  Folke et al. (2003) identified a framework of four principles of resilience building to enhance the adaptive capacity of coupled human-natural systems: 1) learning to live with change and uncertainty, 2) nurturing diversity for reorganization and renewal, 3) combining different types of knowledge for learning and 4) creating opportunity for self-organization toward social-ecologic al sustainability.

Learning to live with change and uncertainty entails the knowledge, practices, and social mechanisms to accept disturbance, surprise and crisis as part of the development and process of social-ecological systems (Folke et ., 2003).  Frequent disturbances, for example ecological surprises, that happen in social-ecological systems should be accepted as the rule, not the exception (Gunderson, 2003). Rangeland ecosystems are characterized by high interannual variation in rainfall, grazing intensity and fire that determine dynamics of plant production (Walker, 2002). For example, in arid and semi-arid rangelands, disturbances that affect these ecosystems are not predictable in terms of severity and magnitude (Ellis & Swift, 1988) and herd management and micro-mobility techniques practiced by pastoralists help them to cope with such variability and unpredictability of the ecosystem (Niamir-Fuller, 1998).  Nomadic herding strategies

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demonstrate how herders' perceptions of spatial and temporal variability in their environment play a vital role in making their seasonal movements and the use of alternative grazing areas and campsites (Fernandez-Gimenez, 2000). Pastoralists who are closely connected to a resource system are in a better position to adapt to signals from the ecosystem and to successfully manage it over an extended period of time (Carlsson, 2003). Such adaptive capacity of the resource users determines success of their institutional arrangements (Carlsson, 2003) and serves as a vital component of resilience building (Carpenter et al., 2001).

This study posed major two research questions:

Research Question 1: What is the state of social-ecological systems, and types and cycles of change experienced by the study communities and the strategies used to deal with past changes?

Research Question 2: Do differences exist in resilience building among two adjacent herding communities with and without community-based rangeland management?

To answer them, first I describe important social, ecological and economic components and attributes, and their relationships and feedbacks, which determine the state of social-ecological systems. Secondly, I identify types and cycles of change (critical disturbances and historical events) their characteristics and impacts. Thirdly, I attempt to describe how the community responded to critical disturbances and shocks in the past and whether this built adaptive capacity. Finally, I discuss what practices and social institutions build the adaptive capacity for social-ecological resilience among the herders from CBRM and non-CBRM communities.

**Study Sites**

This study was conducted in two provinces of Mongolia, particularly

Uvurkhangai *(pronounced as Uvr-han-ga)* located about 500 km west to Ulaanbaatar

capital city and Bayankhongor *(pronounced as Bain-hon-gr)* is about 650 km southwest

to Ulaanbaatar (Figure 4.1).  One pair of sub-provinces (*soum*s) selected in each of the

provinces that represent two ecological zones.  Uvurkhangai *soum*s are Khujirt

(*pronounced as Hu-ji-rt*) and Kharkhorin (*pronounced as Har-ho-rin*) in the mountain

steppe and Bayakhongor *soum*s are Jinst and Bayantsagaan (*pronounced as Bain-tsa-gan*)

in the desert-steppe.



Figure 4.1 Location of research sites

The research sites have been grazing grassland for over several centuries for

various types of pastoral livestock such as sheep, goats, cattle, camel, horses and yaks.

The type of livestock varies one site to another.  Jinst and Bayantsagaan *soum*s are

dominated by sheep and goats, with camels, horses and a few cattle, whereas in Khujirt

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and Kharkhorin a herd composition will be more diversified by having yak and a greater proportion of cattle.

Research sites include two pairs of *soum*s: Bayantsagaan *soum* adjacent to Jinst and Kharkhorin to Khujirt. Primary sites, Jinst and Khujirt, are herding communities with community-based rangeland management (CBRM) organizations. Control sites are Bayantsagaan and Kharkhorin, which do not have such organizations, but instead have traditional neighborhoods of herding communities. The unit of analysis in the primary sites was a herder group practicing CBRM, and in the control sites were the traditional neighborhoods of herders (Table 4.1).

In Jinst and Khujirt *soum*s the UNDP-funded Sustainable Grassland Management (SGM) project was implemented by the Ministry of Food and Agriculture in 2003-2007 (UNDP, 2008). The project facilitated formation of herder community-based organizations with the purpose of improving pastureland ecological status in parallel with improving the herders' livelihoods. In this study, I included 8 community-based herder groups of Khujirt and Kharkhorin. There are at least three traditional neighborhoods larger than herder groups in number of households included in the research and these group and non-group herder communities range in size from 7-70 households (Table 4.1).

Table 4.1 The research field sites and names of herder groups and traditional neighborhoods

| Province | Ecological zone | Paired sites | | | |
|---|---|---|---|---|---|
| | | CBRM herders (group herders) | Approx. no of households | Non-CBRM herders (non-group herders) | Approx. no of households |
| Uvurkhangai | Mountain steppe | Khujirt<br><br>CBRM group names and year established:<br>– Olonburd, (2003)<br>– Ikhburd (2003)<br>– Hangimust (2003) | <br><br><br>12<br>8<br>9 | Kharkhorin<br><br>Traditional neighborhood place name:<br>– Shankh | <br><br><br>70 |
| Bayankhongor | Desert steppe | Jinst<br><br>CBRM group names and year established:<br>– Orgil (2003)<br>– Bodi (2003)<br>– Sharkhad (2003)<br>– Devshilt (2003)<br>– Sar-Uul (2006) | <br><br><br>8<br>10<br>8<br>7<br>10 | Bayantsagaan<br><br>Traditional neighborhood place name:<br>– Tsetsen Uul<br>– Bayantsagaanii Uvur | <br><br><br>20<br>20 |

**Methods**

The research problem for my study is focused on describing and explaining the phenomena of social-ecological resilience-building in relation to community-based natural resource management. The resilience of social-ecological systems is an emerging perspective that deserves more comprehensive research design in order to test resilience concepts and develop a broader and more robust body of theory (Cumming et al., 2005). Social-ecological systems or coupled human-natural systems are not static (Liu et al, 2007) and as they change over time it deserves more exploratory qualitative approach to understand the dynamics and resilience of social-ecological systems. Therefore, the strategy of inquiry for my study is a case study, as it provides broader learning opportunities (Creswell, 2003), and holistic description and explanation to the phenomenon (Merriam, 1998).

A case could be a person, a community and a problem and if the studied phenomenon is not bounded, so it could not be considered as a case (Merriam, 1998). However, the boundary should not be rigid expectation and there will be some level of fuzziness in defining it (Miles & Huberman, 1994). For the current study I had spatial and thematic boundaries that would justify the selection of such a strategy. The research is focused on four different administrative units, *soum*s, that belong to two different provinces and within a particular *soum* smaller herding communities (herder groups) with and without community-based rangeland management were selected as units of analysis.

I did qualitative data collection and analysis on this relatively unexplored topic, using the results I designed a subsequent quantitative phase of the study (Tashakorri & Teddlie, 1998). The research explores potential ways to operationalize resilience for empirical studies and tests some quantitative measures to track social-ecological resilience-building in arid and semi-arid landscapes in Mongolia.

### *Qualitative data collection*

The qualitative data, comprised of interviews, focus groups, workshops, observation and document review, were collected over the consequent three years from 2008-2010. I conducted 39 in-person interviews and nice focus group discussions and three workshops, which were attended by 121 people. Out of total 160 informants, 79 were males and 81 were females. In terms of occupational engagements, there were herders, government and agency officials and the "Sustainable Grassland Management" project former staff and advisors (Table 4.2). I organized four field trips in two

consequent summers of 2008 and 2009 to collect the field data.  In 2008, first field one-week field trip was in June and the second trip was more than 2 weeks from July 10-25.

In the primary research sites, I conducted in-person interviews with key informants, such as local government officials, herder group leaders, herder group facilitators, and elderly and women members of herder groups.  Focus group discussions were organized with nine different groups of herders and on average there were 6-7 people in each focus group.  Questions asked during focus group discussions aimed to get response on ability and adaptive capacities of herders to changing socio-economic and ecological environments.  I have tried to get as much as possible details on how as an individual household and as a community they cope with or overcome changes affecting them on regular basis, and what are the adaptive strategies and practices they devise or rely on.

Table 4.2 The number of informants of each gender

|  | Informants | Date | Male | Female |
|---|---|---|---|---|
| *Focus group:* | | | | |
| 1. | Jinst – Sharhad herder group | 7/17/2008 | 2 | 3 |
| 2. | Jinst – Sar-Uul herder group | 7/17/2008 | 4 | 5 |
| 3. | Jinst – Bodi herder group | 7/16/2008 | 0 | 5 |
| 4. | Jinst – Sharhad herder group | 6/24/2009 | 2 | 5 |
| 5 | Bayantsagaan – in Erdene's *ger* | 7/13/2008 | 3 | 3 |
| 6 | Bayantsagaan – Idermunkh | 7/14/2008 | 4 | 5 |
| 7 | Khujirt – Ikhburd (Batbold) | 6/23/2008 | 2 | 3 |
| 8 | Khujirt – Olonburd (Dorj) | 6/22/2008 | 4 | 3 |
| 9 | Kharkhorin – Bileg-Urnukh's *ger* | 6/25/2008 | 3 | 2 |
| *Workshops:* | | | | |
| 1 | Jinst | 6/25/2009 | 15 | 19 |
| 2 | Bayantsagaan | 7/30/2009 | 9 | 7 |
| 3 | Kharkhorin | 6/14/2009 | 8 | 5 |
| *Interviews:* | | | | |
| 1 | Bayantsagaan | 7/10-16/2008 | 5 | 6 |
| 2 | Jinst | 7/17-22/2008 | 3 | 4 |
| 3 | Khujirt | June-July, 2008 | 7 | 3 |
| 4 | Kharkhorin | June-July, 2008 | 5 | |
| 5 | UB | June-August, 2008 | 3 | 3 |
| | Total | 159 | 79 | 81 |

In addition to interviews and focus group discussions, I organized three workshops with representatives of the herding communities and local government involved in my interviews and focus groups in 2008 to present them preliminary conclusions and interpretations of the data. Having community people actively participating in the workshops allowed me to use some elements of participatory research, which has an advantage of constructing a more detailed and accurate knowledge base about the social and cultural contexts of the study sites (Arnold & Fernandez-Gimenez, 2007).

Apart from interviews, focus groups and workshops, field data was supplemented by reviewing local government annual plans and reports, relevant decrees and resolutions, donor project documents, training materials, official reports and brochures. I also used documents available from herder groups, such as sketch maps, bylaws and meeting minutes. Old books and newsletters available in the local and central library were significant sources of information a well.  Quantitative information related to climate, demographics, and livestock census, were also utilized for this study. These sorts of information were available from the National Statistics Office, National Agency of Meteorology, Hydrology and Environmental Management and local government office.

*Qualitative data analysis*

There are a broad range of approaches to qualitative data analysis available that allow qualitative researchers to reveal systematic patterns and meanings in their datasets. For my data analysis, I followed three flows of data analysis that were stipulated by Miles and Huberman (1994)  that consists of three components that happen in parallel or

concurrently to each other: data reduction, data display, and conclusion

drawing/verification (Figure 4.2).

While collecting my qualitative data I did a preliminary analysis and

interpretation of the data.  Preliminary data analysis is ongoing process which could be

undertaken every time data are collected (Grbich, 2007).  Almost after each interview,

focus group or observation exercise, some distinctive patterns of meaning were noticed,

but I used to hold these kinds of conclusions light until data collection is over.

```
                    Data collection period
                    -----------------------------|

                    DATA REDUCTION
Anticipatory        During          Post                    ⎫
                                                            ⎬
                    DATA DISPLAYS                           ⎪
                    During          Post              =  ANALYSIS
                                                            ⎪
                    CONCLUSION DRAWING/VERIFICATION         ⎭
                    During          Post
```
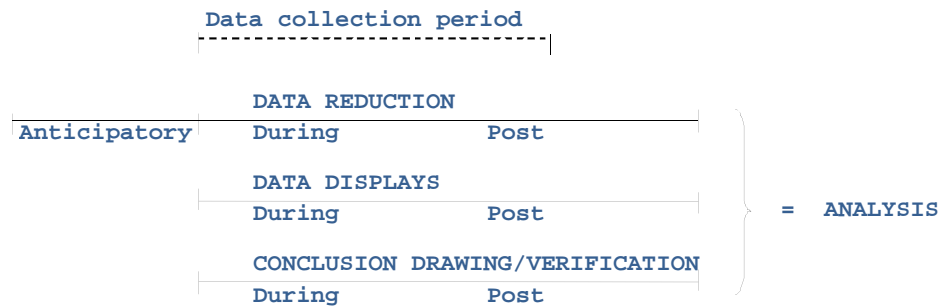
Figure 4.2 Components of Data Analysis: Flow Model
(Miles & Huberman, 1998)

From my interviews, focus group discussions, workshops and field journals, I

have generated more than 400 pages of data.  After transcribing interviews and focus

group discussions, I started to reduce my data by coding them using Nvivo qualitative

analytical software (QSR International, 1999-2000).  Coding is often the first step in

organizing the data in a meaningful way that condenses the bulk of data into analyzable

units by creating categories (Coffey & Atkinson, 1996).  Prior to the field work, I

developed a preliminary list of codes using my research questions and sub-questions.

Codes could be defined as "tags or labels for assigning units of meaning to the

descriptive or inferential information compiled during a study" (Miles & Huberman,

1994, p. 56). There were 14 codes and over 100 sub-codes in the initial list and using

them I coded my data in Nvivo. Since the initial codes were theoretically designed and

predefined, I found some level of rigidity, redundancy and irrelevance in codes list.

Some codes were used too much and some codes were broken down into several

subcodes. Therefore, after coding about one third of my data, I have slightly revised my

codes by dropping some, combining several codes in one, and renaming some into more

easily readable codes.

In parallel to coding, a number of data analysis methods were used such as

research memos, content analysis, domain and taxonomic analysis and constant

comparative analysis. Having multiple data analysis techniques provided me with

flexibility in choosing right approaches in analyzing various types of data and led to

greater level of description, interpretation and elicitation throughout the research process

(Creswell, 2003). With help of these analytical approaches, my dataset become much

reduced, focused and organized allowing me to present and display them to further

enhance analysis and draw conclusions. In my analysis, I generated graphic summaries,

such as matrices and flow charts, to provide a quick summary of considerable chunks of

data as an overall snapshot (Grbich, 2007). To generate meanings out of the various set

of data I formed patterns and themes, made comparisons, looked at the contrasts and

relationships to build a coherent understanding (Miles & Hiberman, 1994). To evaluate

my evidences in support of or in contradiction to my propositions, I did triangulation of

different data sources of information (Creswell, 2003).

**Descriptive Results**

The findings are organized as follows. First, I describe states of the social-ecological systems by looking at the important ecological, social and economic components across all study sites. Second, I describe critical disturbances and historical events experienced by the study communities and the impacts of these changes. Third, I describe the strategies herder communities used to deal with past and present changes. Finally, I report about differences in resilience building between two adjacent herding communities with and without community-based rangeland management.

*The state of social-ecological systems*

To explore the state of the social-ecological systems, I identified important social, ecological and economic components across all study sites. System components are the pieces of the system that include such things as human actors, particular ecosystem or habitat types, resources, goods and materials, and abiotic variables (Cumming et al, 2005). Having identified the above components in all four sites, I used this information to develop a sketch system diagram to depict the relationships among these components (Figure 4.3).

This diagram illustrates the relationships between the socio-economic and ecological components that together make up the current state of pastoral social-ecological systems in the study sites. Each component within both natural and social systems interrelates with others across space adding to the complexity of social-ecological systems (Berkes et al., 2003).

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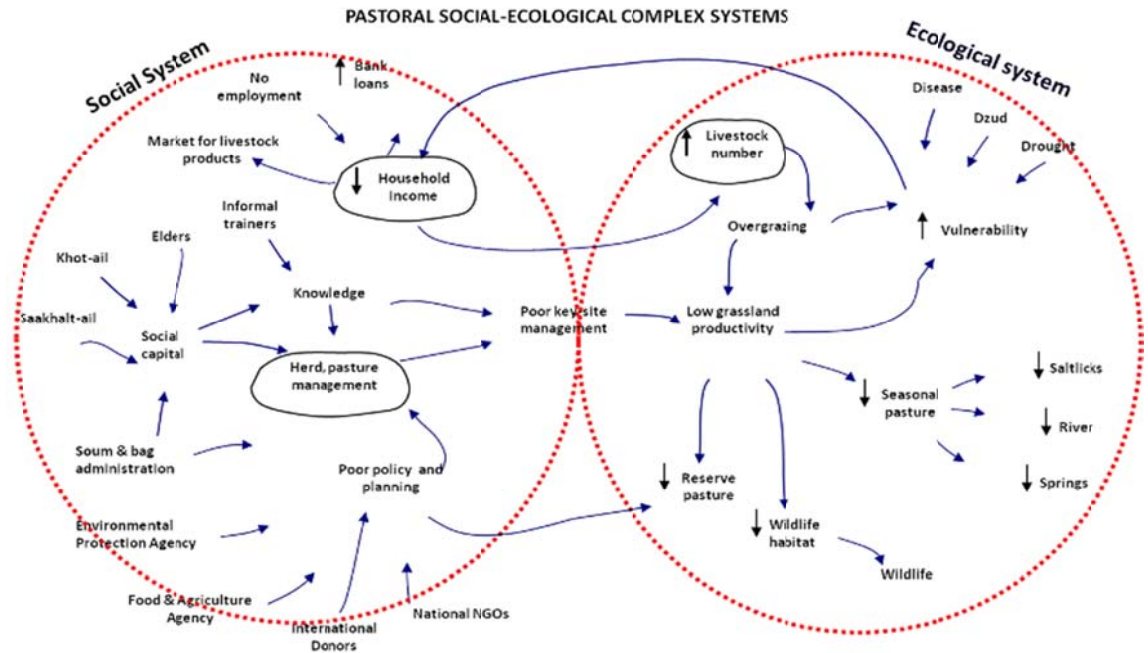
Figure 4.3 Rural pastoral social-ecological systems diagram in Mongolia

For example, a few key variables, such as household income, livestock number, herding and pasture management capacity and productivity of pastureland, could provide a general illustration of complex interactions and feedbacks that facilitate a reciprocal relationship between people and nature. The interactions of these variables illustrate that distant events and decisions made by people two decades earlier can have a powerful influence on ecological functions and processes.

Since livestock privatization in 1992, rural households' income was primarily based on private livestock production.  Across all study sites the total number of livestock in each of the study sites gradually was growing from year to year until 2000 and Figure 4.4 illustrates change in livestock number from 1970-2010 in Bayantsagaan and Jinst.
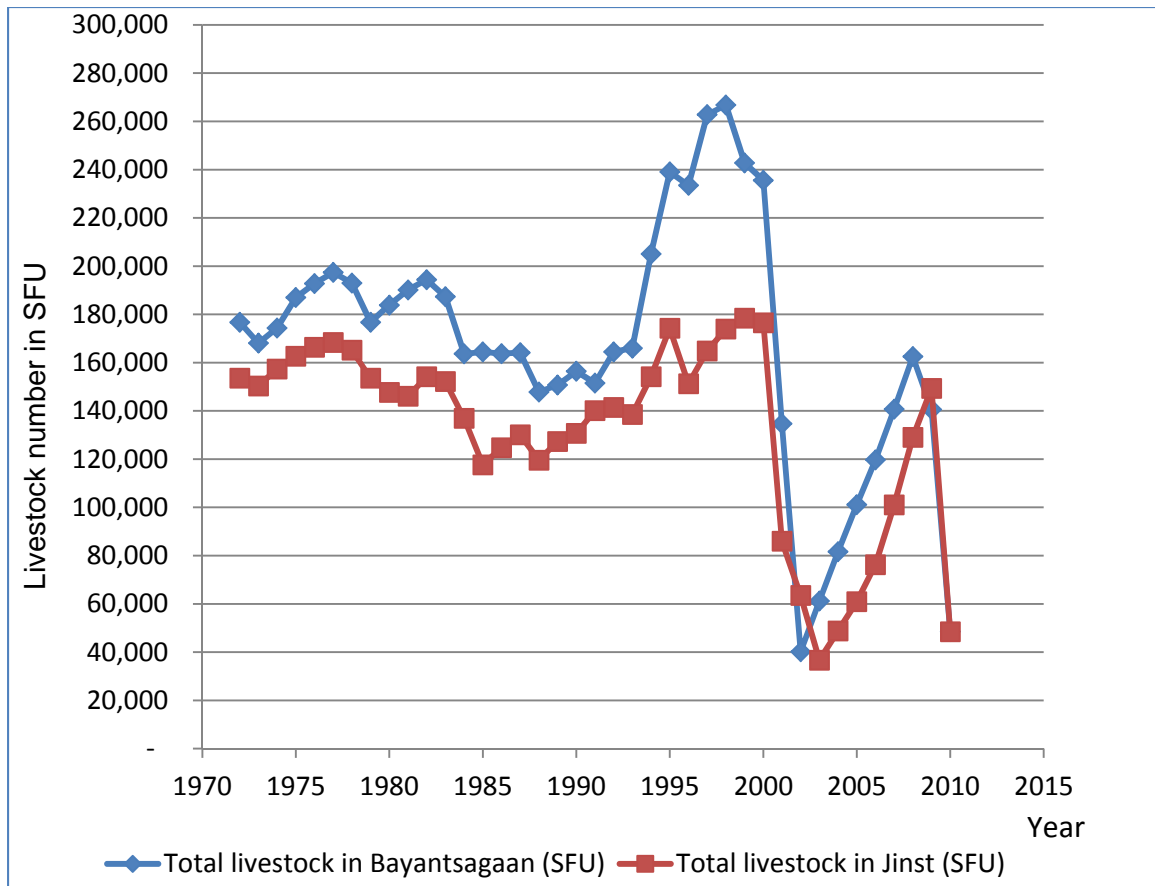
Figure 4.4 Livestock in Sheep Forage Units from 1970-2010 in Bayantsagaan and Jinst, Bayankhongor
*(source: Statistical Yearbooks of Uvurkhangai and Bayankhongor Aimags, 2002, 2011)*

An unprecedented increase in the number of goats significantly contributed to the overall growth in livestock numbers. Goats are raised for cashmere for its permanent market demand. For example, according to the Jinst 2009 livestock census, out of 149,349 sheep forage units in total, goats account for 66.4 % (99,154 SFU), sheep 14% (21,486 SFU), horses 10.6% (15,862 SFU), cattle 4.6% (6,912 SFU) and camels 4% (5,935 SFU).  Figure 4.5 shows changes in composition of goats in the overall number of livestock in Jinst and Bayantsagaan *soum*s in the period of 1990-2010.
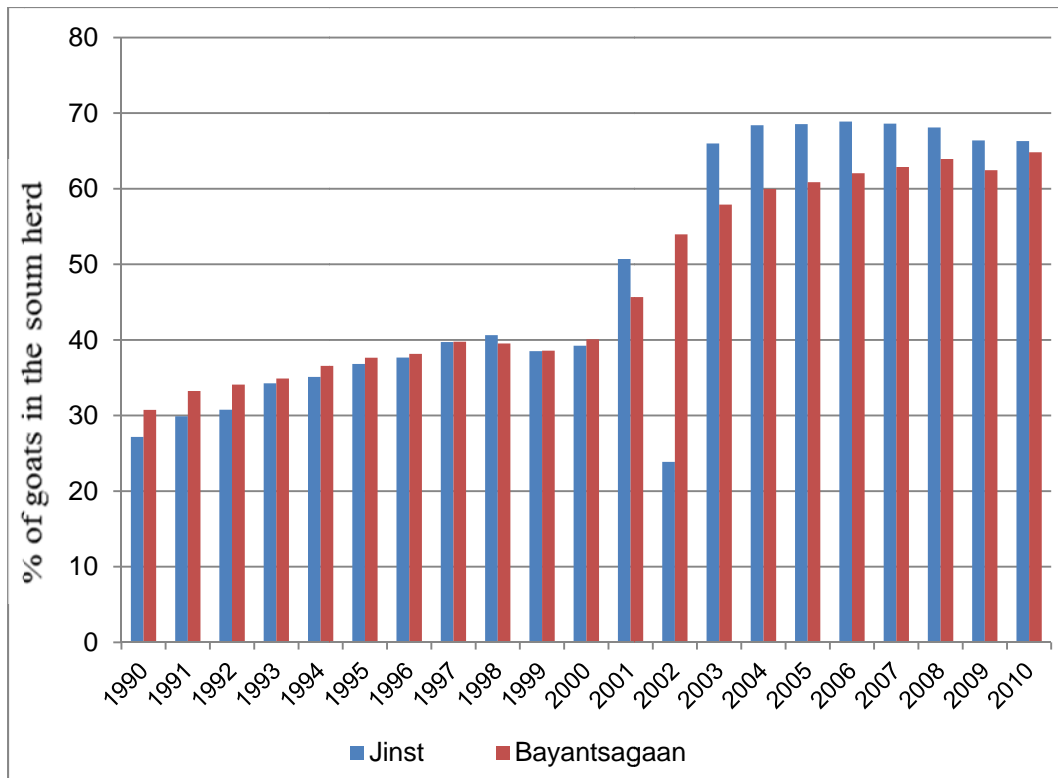
Figure 4.5 Changes in composition of goats (SFU) in the overall number of livestock (SFU)
in Bayantsagaan and Jinst *( Statistical Yearbook s of Uvurkhangai and Bayankhongor Aimags, 2005-2010)*

Key-informant interviews with government officials and donor projects staff

informed that the rangeland management capacity of the Mongolian government at both

national and local levels has been weakened as a result of fragmentation of

responsibilities and management over the land resources among several government

agencies. An official from the Ministry of Food and Agriculture stated in his presentation

during the consultative workshop organized in June 2009 in Ulaanbaatar: "There are

several government agencies are responsible for land use and management, such as land

agency, office of food and agriculture, environment protection agency and these agencies

have separate plan of action and reporting structures." This statement has been also

confirmed during the interviews with local government officials and project officers. The

informants emphasized that lack of coordination and communication among government officials and professional agencies, such as land management agencies, agriculture office and environmental protection agencies resulted in a poor legal environment to encourage sustainable rangeland management practices.

For example, local planning and policy development failed to focus on managing key sites, resources such as riparian pastures that are of relatively limited geographic extent, but of great importance to the production system (Niamir-Fuller, 1998). Areas with important forage, salt-licks, and hay-cutting fields, were left out of the national and local policy agenda. Thus, with absence of government intervention individual herders were the primary decision makers who focused their herd and pasture management practices towards increasing the number of livestock rather than fostering productivity of key sites and sustainable resource utilization.

From statistical data provided by the soum government, the only limiting factors that regulated livestock numbers since 1990 were *dzud* that happened in 2000-2002 and 2009-2010 (Figure 4). *Dzud* in Mongolian describes the cumulative consequences of natural hazards that results in mass destruction of livestock due to poor forage available to livestock and extreme cold temperatures that undermine the livelihood security of the herders (Farkas & Kempf, 2002). More about *dzud* characteristics and impacts will be discussed later in the Section 5.2.

### Social, ecological and economic components

To understand the system dynamics, social, ecological and economic domains were analyzed to see how individual components influence and interact with each other within and between domains. Table 4.3 shows ecological, social and economic

components that are common in the system. These example components are the social,

ecological and economic resources available for mobilization in the face of the ongoing

changes and uncertainties.

Table 4.3  Important social, ecological and economic components of Jinst, Bayantsagaan, Khujirt
and Kharkhorin soums based on focus group discussions and key-informants interview

| Ecological components | Social components | Economic components |
|---|---|---|
| Key-sites or key resources:<br>  – Drainages and gullies for reserve pasture<br>  – Lowland used for winter pasture (warmer during winter being protected from open winds, have permanent water wells, etc)<br>  – Mountainous area used for summer pasture (cooler, more perennial bunch grasses, forbs and shrub vegetation)<br>  – Water wells<br>  – Rivers, streams, river banks, riparian areas<br><br>Plants:<br>  – *Allium* species (wild onions)<br>  – *Achnatherum* spp. pasture<br>  – Perennial bunch grasses (*Stipa spp*)<br>  – Shrub communities<br>  – Saxaul tree<br>  – *Glycyrrhiza uralensis* (Liqorice)<br><br>Livestock:<br>  – Livestock adapted to high weather variability, different landscapes/topography, and to forage on different types of plants<br>  – Herds composed of multi-age classes and different types of livestock<br><br>Fuel for cooking and heating:<br>  – Reserves of accumulated dung<br>  – Saxaul tree<br>  – Pine tre | Social groups and informal collaborative institutions:<br>  – Winter camping neighborhood (neighborhoods of water points/wells; within the radius of 5-10 km)<br>  – Summer camping neighborhood (within the radius of 1-5 km)<br>  – Hot ail (households sharing one camp site within the radius of 10-100m)<br>  – Extended family<br>  – Herders that  belong to one *bag*<br><br>Government organizations:<br>  – Local *soum* government<br>  – Local *bag* governors<br>  – Local weather station<br>Other organizations:<br>  – Local private vets<br>  – NGOs and donor projects<br>  – Homeland associations<br>Knowledge carriers:<br>  – Elders who have herding experience in the period of collectivization and privatization<br>  – Local informal trainers<br>Bonding social capital:<br>  – Community mutual support system that collectively assist families who face hardship of one type or another through restocking, assisting with or lending cash, etc.<br>Social gatherings:<br>  – Traditional holidays such as Tsagaan sar, Naadam, local "*ovoo*" ceremonies | Main sources of income:<br>  – Cashmere production<br>  – Pensions, benefits<br>  – Day labor<br>  – Small-scale buying and selling<br>  – Artisanal mining<br>  – Sewing, crafting, wood-work<br>Employment opportunity:<br>  – The government is the only significant employer in the area<br>  – Well-off herders occasionally employ other herders to help them during slaughtering period<br>  – Wool washing and cleaning plant<br>  – Temporary road construction work<br>Food security:<br>  – Food production is primarily limited to meat, dairy, and some animal by-products<br>  – Cereal grains are imported, as are sugar and salt<br>  – Non-commercialized dairy production only for the subsistence purposes<br>  – Mini-scale kitchen gardening run by few families<br>Financial and market services:<br>  – Local banks such as KHAAN Bank<br>  – Local lending practices (herders lend each other)<br>  – *Aimag* and UB markets to sell products<br>  – Local middle-men to sell cashmere and meat market<br>  – Livestock insurance private companies<br>Forage:<br>  – Fodder (hay) is produced locally by herders themselves in small scale, but to cover need it must be imported from the northern part of Mongolia<br>  – Hand-made supplementary feed made with *Allium* spp.<br>Construction:<br>  – Winter shelters (corrals) for livestock<br>  – Permanent small houses<br>Communication and information technology:<br>  – Use of cell phones<br>  – Radio continues to be the most important source of useful information<br>  – TV programs |

| | | |
|---|---|---|
| | | – Roads, electricity line<br>Technology:<br>  – Use of solar panels across all herders (for light, to charge cell-phones and watch TV)<br>  – Small-scale portable wind generators |

*Important ecological components*

From focus group discussion and key-informant interviews, herders mentioned that they depend on various landscape features at different elevations.  They describe as part of ecological resources, elevation and topography of landscapes play an important role in pastoral livestock management practices across all four target *soum*s.

In Bayantsagaan and Jinst *soum*s, some herders I interviewed said they use lowland valleys for winter pasture, as it keeps them protected from open wind and has permanent water wells.  They describe how they use mountainous areas for summer camping, as they are cooler and have greater forage diversity that includes perennial bunch grasses, forbs and shrubs. Herders said that each of the seasonal pastures has a different landscape with different topography, relief and small drainages or gullies. Herders consider all these parameters as key resources that are important for livestock and pasture management practices. Mountains such as Bayantsagaan (in Bayantsagaan *soum*), Ikh Bogd (Jinst) and Dulaan (Khujirt and Kharkhorin) were all recognized by my interviewees as an important natural resource as well as a sacred place for the herders with statements like: "this mountain (Ikh Bogd) is our sacred place… very beautiful mountain…"; "my family camps during the summer in the ravines of Ikh Bogd mountain and in winter we move lower."

An elder female herder I interviewed described that they have specific plants in their summer pasture that is located up in the mountains: "here we have *erkhug*

(*Agropiron cristatum*), and *hyalgana* (*Stipa krylovii*) which are very good for livestock to gain meat weight and in the early fall we move lower land with *taana* (*Allium mongolicum*) growing, where our livestock gain fat weight." According to herders' practices in Bayantsagaan and Jinst different landscapes and geography determine the diversity and type of seasonal pastures.  They explained that each type of pasture provides different diet for livestock and diversity of forage on a seasonal basis.  Most herders identified several plant communities essential for the livestock and they consider *Stipa spp*. perennial bunch grass the most important forage throughout a whole year and herders think that this plant is the best diet in spring and early summer, as it builds muscles of the livestock.  A female herder shared, *Allium spp*. (onions) are perennial forbs that are essential forage for late summer and fall grazing to accumulate fat layers and she also mentioned about another pasture type with *ders* (*Achnatherum splendens*) where they move in during the winter period: "Last winter forage was scarce and we moved to Untaagin river's *ders* (*Achnatherum splendens*)." Pasture patches with *Achnatherum splendens,* a tall grass, are strategically important during winter and spring, as they shield livestock from the wind, providing thermal cover during cold and forage during critical times.

When all forage plants have been utilized by the end of winter, *Artemisia spp* shrubs are well browsed by the livestock and deeply appreciated by the herders: "At this time of the year, livestock is not interested in those bushes … they go for small grasses and forbs.  But in late winter and early spring, livestock like to browse on these bushes called *shavag (Artemisia spp),* because they thaw earlier and livestock that browse on it will not easily die from starvation and cold, they digest it well."

Herders across all sites share that natural water sources and water wells are part of their key ecological resources, as they determine the seasonal movements and livestock management strategies of herders. The Khujirt and Orkhon rivers run across Khujirt and Kharhorin *soum*s respectively. In Jinst, the Tuin river is part of the eastern landscape and crosses the *soum* across from the north to the south. The lake Tsagaan nuur and several small lakes lie to the south of Jinst. In contrast to the other three *soum*s, Bayantsagaan *soum* doesn't have large river, but it has small streams in the mountains.

Elderly herders I interviewed in Bayantsagaan and Jinst pointed out that they have local breeds of livestock that are adapted to seasonal variations and different diets. I think such local herd could be considered as an important ecological component. Experienced herders let their herd to adapt to different diets and one elder mentioned: "Herders from lowland areas such as Bayan-Undur and Shinejinst, they can't use pasture on the hills and uplands, as they are not suitable for these herders and their livestock and therefore when they move here they use pasture in the valley". Across all herders in the study sites it was evident that almost all herding household's herd is normally comprised of at least three types of livestock depending on the geographical region. There is a combined herd of small and big animals such as sheep, goats, cattle/yak, horses and camels and each herd is normally comprised of different age animals. Seasonal movements among customary winter, spring, summer and autumn pastures meet dietary requirements of the herd (Fernandez-Gimenez, 2000). Sheep and goats that are considered small animals (*bog-mal*) graze in close distance from the campsites, whereas camel and horses are long-leg livestock (*bod-mal*) and normally graze in the distance that lessen competition for the forage. In Khujirt and Kharkhorin, summer pastures are mainly near to rivers and

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springs dominated by perennial forbs and grasses.  During winter and spring herders normally move towards mountain valley with forests.  In the desert steppe, some herders have summer pastures on the mountain and near rivers, because of its diverse plant species and it is called "cool" pasture and in the winter and fall they prefer "warm" pasture located in the waterless steppe pasture (Fernandez-Gimenez, 2000).

### *Important social components*

Case studies done in all four soums show that there are two main actors with respect to policy, management and use of natural resources are local government and herders.  The *soum* governor's office is the formal local organization that comprises from the officers, representing different ministries and agencies with important responsibilities over the land and natural resource management and planning.  *Soum* land officer is responsible for the *soum* land tenure and planning and reports to the Land Agency that operates in the province center under the Ministry of Construction and Urban Development.  The *soum* agriculture officer is in charge of livestock, water and forage management and reports to the Food and Agriculture Office in the province center.  The environmental inspection officer is responsible for natural resource protection and management and reports to the Environmental Agency in the province center.

A *soum* is administratively divided into smaller units, *bag*s.  The *bag* governors are the primary government officials who interact with herders and address rangeland related issues on a daily basis.  In terms of human resources, each studied *soum* faces a real shortage of qualified and well educated people with expertise specifically in livestock production, rangeland management and monitoring.

Customary social groups of herders are an important part of the social system in all sites. Herder families whose livestock have common pasture and who camp together in the radius of about 10-100 meters, together constitute *khot-ail* that normally comprise 2-4 households or urukhs (Fernandez-Gimenez, 1999; Bazargur, 2005). Each family becomes part of *khot-ail* and it is the traditional social and economic unit of livestock production, where families mutually support each other's herding and livelihood practices (Mearns, 1998). *Khot-ail*s are dynamic in nature, as households seasonally join and leave the *khot-ail* (Mearns, 1998; Fernandez-Gimenez, 1999).

In general, there are social networks that are mainly formed seasonally as temporal and spatial neighborhoods. Most herder families are affiliated with at least 4 social groups: a winter camping neighborhood, a summer camping neighborhood, relatives and extended family, and a group of herders belonging to the same administrative territorial unit called the *bag*. Most of these social groups overlap in terms of functions and play an important role in absorbing various disturbances and spreading risks (Folke et al, 2003). For example, winter camping neighborhoods depend on each other's support during winter, such as jointly herding and watering their herds, helping during lambing period, and sharing knowledge and practices.

Within these groups, some individuals hold prominent roles, such as local elders or educated herders, who used to teach or work in the administration during collective period. Elders are the main source of knowledge to the rest of the community and they informally transfer their herding practices and experience to their children and relatives. Herders describe how they normally just follow the practices of the elders, "I tell my children where to herd today the herd, what would be weather like today and I remind

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them some herding practices." "Our elders in our family are my uncle and auntie. They are experienced and their ages tell us a lot.  For any matter, firstly we visit them to get some advice and hear their words."

Another social component is the community mutual support system.  Herders in close neighborhoods collectively assist those families who face hardships of one type or another by contributing some livestock, collecting cash for donations or loans or temporarily looking after their livestock.  Customary gatherings (felt-making, foal dedication, weddings), traditional holidays (Lunar New Year, Naadam festival) and rituals (local "*ovoo*" ceremonies) are elements of the social system in the study sites.

This field study took place during the Mongolian parliamentary election campaign in the summer of 2008 and there were party directorates temporarily formed in every *soum* to influence herders' decision making.  Because of this event in June 2008, herders had an unusual number of visitors almost every day and a lot of verbal communications with various parties' representatives.  Herders received a lot of brochures, newspapers and books that summarized the main ideas of parties and candidates involved in the campaign.  Herders put their trust in the elected Parliament members and expected that the elected Member of Parliament would provide needed support and advocate for their rights and concerns.

In each studied site, there is a homeland association that informally and distantly operates in Ulaanbaatar and Darkhan cities.  These councils were established by people who are originally from the *soum*, but currently live in urban areas.  The councils are supposed to support local government in organizing *soum* naadam festivals, raising funds for constructing monasteries or publishing books about history and biographies of famous

people originated from the *soum*.  In the years of emergencies, homeland associations mobilize cash and in-kind assistance to support affected herders and local government.

The Sustainable Grassland Management (SGM) UNDP project was implemented with the Ministry of Food and Agriculture during the period of 2003-2008 in Khujirt and Jinst.  One of their overall objectives was to increase the welfare of herding families through strengthening institutions at the grass roots level and building herder capacity in sustainable management of rangelands.  The SGM project aimed to address socio-economic goals in parallel with ecological goals.  Higher herder incomes, reduced vulnerability to risks, and increased social cohesion required sustainable grassland management, and grassland utilization will not be sustainable unless herder welfare is improved and poverty is reduced (UNDP, 2008).

The SGM project operated at two levels: herder community and the national levels.  Activities at herder community level and upwards were designed to identify existing types of cooperation among herders and encourage them move toward more formal institutional structure in pasture management using participatory methods and appropriate training among herders and local government officials.  Six herder groups were established in Jinst *soum*, comprised of about 90 herder households--about 20% of all herding households in the *soum*.  Formation of herder groups was voluntary, where those who lived in a close neighborhood agreed to formalize their traditional customary organizations by re-organizing into more formal group structure.  Customary forms of cooperation exist among households, such as *khot-ail* and saahalt-ail.  The *khot-ail* is a type of social grouping consisting of 2-12 households who camp seasonally together and whose livestock graze on common pastureland (Fernandez-Gimenez, 1999).  Incentives

to be a *khot-ail* member were associated with rangeland access as well as socio-economic benefits. Two *khot-ail*s that are close neighbors would refer each other as saahalt-ail. The SGM project aimed to strengthen and formalize such existing customary herder community institutions, as the project was based on the belief that the pastoral livestock economy has a key role to play in Mongolia's medium term economy (UNDP, 2002). Main mechanism that the project employed was to mobilize herders themselves through local community associations, based on the ways herders already collaborate to manage natural grasslands (UNDP, 2002). These herder organizations had explicit objectives to improve rangeland condition in parallel improving the livelihoods of the member households by strengthening linkages between herder groups and formal governance structures and the private sector.

*Important economic components*

The important uses of ecosystem goods and services across all herder communities are mainly related to grazing of various types of livestock for meat, dairy and cashmere production. Herders raise goats mainly for cashmere, as it has a permanent market demand. In the summer of 2008 across all study sites when I collected my qualitative data, herders shared how price for goat cashmere suddenly dropped down. As they stated that the price for cashmere was relatively stable until 2007, but in the spring of 2008 it significantly dropped up to 40-50%, which later rose again starting from early spring in 2009.

Sheep and cattle are raised primarily for meat and milk production, however, the local prices for meat and milk are significantly lower than for cashmere. For places

(Khujirt and Kharkhorin) close to main roads and infrastructure, the meat and milk market is more favorable than in remote *soum*s (Bayantsagaan).

Across all study sites, interview and focus group informants expressed that food production is primarily limited to meat, dairy and some animal by-products, and cereal grains are imported, as are sugar and salt. Apart from selling cashmere and occasionally meat, they mentioned that other sources of income are pensions, day labor and small-scale buying and selling. The government is the only significant employer in the area. Some bank branches, such as KHAAN bank, Zoos bank and XAC bank operate in *soum* centers and offer credit to herders who use their livestock as collateral.

To cover needs for cash herders explained that they can access small-loans from the local banks with monthly rate of about 2.3-2.5%. Herders shared that they depend on the bank loans and as soon as they repay the first loan, they need to apply for the second one. Several informants claimed that it would be hard to find someone in the soum who doesn't have a bank loan and they described this situation as a "chain of debts" exist among herders.

Sometimes herders informally lend cash to each other without any interest fee and one wealthy herder from Bayantsagaan soum described: "People from our neighborhood come and request me to lend them some cash. We know each other well and I tell them when I need my money give me back in the full amount."

Local government official interviews inform about index-based livestock insurance services introduced with support of World Bank and which become available in 2008. This program is run by private insurance companies who have their own representatives in the *soum*. In Khujirt and Kharkhorin soums this program was not as

popular as in Jinst and Bayantsagaan.  For example, the agriculture officer from Jinst

*soum* informed that there were 84 herder families got insurance from this program in the

summer of 2009, which is before the 2009-2010 *dzud*, and he described that "The

insurance paid these families in the following summer and in total these families got

about 36 million tug (about USD 30,000) as an insurance payment."  In Jinst and

Bayantsgaan *soum*s, the herders who insured their livestock and got paid were

appreciative of such program and during the interviews they shared that this money was

used to repay bank loans.

### Changes: novel and cyclical changes
The four herding communities studied perceive several events and disturbances

that significantly affected their livelihoods over the past half century (Figure 4.6).
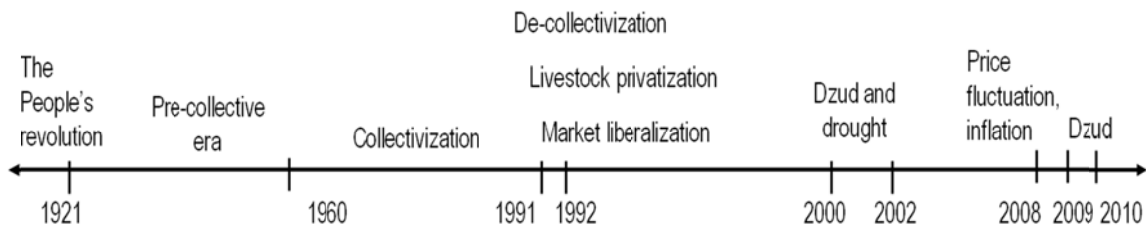


Figure 4.6 Events and disturbances affected pastoral social-ecological systems in Mongolia
since 1921

#### Pre-collective era and collectivization
During the first decades after the Mongolian Revolution in 1921, there were two

attempts to collectivize animal husbandry in Mongolia.  The first attempt in early 1930s

did not succeed and only after starting the process of economic and agricultural

reconstruction, the second collectivization took off in late 1940s (Muller & Bold, 1996).

Collectivization was a major socio-economic transition where all herders were wage-

based workers and were responsible to the collective administration to raise its livestock and meet certain norms and deadlines. During interviews with elderly herders and government officials, they emphasized that during the collective period, everyone had greater sense of responsibility towards each other and to the local administration. Apart from developing responsible attitudes and behaviors, the collective administration provided herders with all necessary services related to livestock management, such as veterinary services, fodder provision, herd improvement, provision of extra labour during critical times and assisting to construct robust corals. Table 4.4 shows a list of management practices that were implemented in collective and post-collective periods and an assessment of whether these practices were stronger or wicker in each period. This assessment comes from the analysis of qualitative data that was validated by herders and officials during the workshops in the following year.

During the collective period of 1960-1990, the collectives played a significant role in allocating pastures and campsites and directing seasonal movements, often respecting pre-existing customary rights, but seasonal movements between *soums* and *aimags* were regulated and tightly controlled by collectives (Fernandez-Gimenez, 2001). Because each collective had a defined territory it allocated grazing areas within its territory to herder work teams, such a system did not result in open access. Pastoral land use practices remained mobile and herding families were generally supported by trucks and deliveries of hay, thus limiting negative impacts on the landscape (Sneath, 1998).

Table 4.4 List and assessment of management practices that were implemented in collective and post-collective periods

| Practices | Collective period (all services were state subsidized) | Post-collective period |
|---|---|---|
| Mandatory veterinary services | Strong: the cooperative vets were responsible for providing mandatory vet services | Weak: veterinary services privatized, herders must pay to get vet. services |
| Herd and breed improvement | Adequate: zootechnicians were responsible | Inadequate: herders themselves are responsible |
| Fodder and hay provision | Adequate: the cooperative and central government supply reserves of hay and fodder, especially during *Dzud* herders receive additional amounts | Weak: state reserve occasionally provide hay on subsidized rate during *Dzud* |
| Provision of extra work forces during critical times | Adequate: provided as required to those families who had few people | Inadequate: herders use their family members |
| Construction and renovation of corrals at the winter camps | Adequate: the cooperative provided adequate supply materials, workforce and technical advice | Inadequate: herders themselves are responsible |
| Training of young herders | Adequate: collective directorate organized special activities to transfer knowledge and skills of elders to youn*ger* herders | Inadequate: local government doesn't organize such events |
| Formal seminar/training organized by collective administration | Adequate: there was regular seminars organized by the administration to educate people on various issues and policies | Weak: local government organize very few events specifically focused for herders |
| Herder-to-herder training | Adequate: informal discussion and talk were given by leading herders | Weak: informally within relatives or close neighborhood |
| Communication and dialogue between herders & administration | Adequate: regular visits to herder camps and meetings were organized | Weak: local government officials come once a while for census, and organize 2-3 times a year a *bag* meeting |
| Development strategy and policy focused on livestock and rangeland management | Strong: since pastoral livestock was main economic sector, each cooperative's mission was to develop this sector along with developing herders livelihood | Weak: *soum*, *aimag* government have shortage of budget and resources, but there are some support of donors in the sector |
| Incentive systems | Strong: best performing herders used to get good recognition and respect | Inadequate: honor those herders who have more than 1,000 head of livestock |
| Utilization of machinery and technology | Strong: collectives planted fodder and cut hay and had machinery to harvest them | Weak: herders use cars or motocycles for private use |

*Democratic transition, de-collectivization and privatization*

National level structural changes in Mongolia began immediately following the democratic elections in 1990 and privatization of collective assets, including livestock, took place over the period of 1992-1993. A herder household received a herd of livestock mostly based on the number of household members. The distribution of livestock to herders brought a new level of responsibility and risk to herders (Fernandez-Gimenez, 2001). The dismantling of collectives also meant the loss of the formal institution responsible in collective times for organizing and regulating pasture use (Fernandez-Gimenez, 2001). Wealth differentiation increased among herding households, in part because assets were distributed only to members of the cooperatives and distribution between members was often inequitable (Nixson & Walters, 2006). The initial increase in the number of livestock and herding households suggested several potential impacts on pastoral land-use patterns and land tenure, and there are also recorded inequalities in access to resources (Fernandez-Gimenez, 2001). The number of herder households increased from about 75,000 in 1990 to more than 150,000 in 1993 and 170,000 in 2006 (NSO, 2000), because dismantling of the state cooperatives and privatization of livestock in 1992-1993 led many rural non-herding households to move out to the steppe to raise their own stock of animals (Avarzed & Sodnoi, 2008). The number of livestock in Mongolia simultaneously increased from 25 million in 1992, 33 million in 1999 and 44 million in 2009 (NSO, 2000, 2009). However, according to the 2010 livestock census the total number of livestock decreased to 31.8 million due to the *Dzud* of 2009-2010 (NSO, 2010).

During early phases of livestock privatization, Mongolian scientists were in serious debate about implementing the privatization of livestock in Mongolia. Some Mongolian scientists proposed options for livestock privatization (Zandansharav, 2006). One is a household-based privatization to develop small-scale livestock production industries and other one is to privatize as a collective to develop large-scale livestock industries. Another group of scientists emphasized importance of promoting the *khot-ail* structure as the main basis for developing household-based livestock production, as it embeds traditional practices, features and unique social settings. A third group recommended not to influence directly how transformation process goes, because herders will get spontaneously and naturally re-organized into some cooperative structure.

During the collective period, pastoral movement was regulated by the collective directorate and with the dissolution of the collectives individual herding households were not able to maintain seasonal movements over a wide territory (Fernandez-Gimenez, 2001). Experienced herders who used to tend livestock during the collective period mentioned that dismantling of collectives left herding households without clear directions about their rights to use pastureland, and this lack of clarity might have influenced in decreased movements around seasonal pastures (Avarzed & Sodnoi, 2008). In the central region closer to the central market system, competition for and conflict over grazing land increased and to guard their winter-spring camps from trespassing, herders preferred staying there all year around without having seasonal movements (Mearns, 2004).

Informants across all study sites refererred collapse of collectives and privatization of collective properties in 1991 and 1992, namely livestock, was the critical event that brought up dramatic changes in the social-ecological systems of the herder

communities since 1990. Essential facilities, such as water wells, animal shelters and corals, tractors and storage, developed by collectives to promote the livestock economy left without control and privatization of these amenities were rather chaotic and unregulated.

*Price fluctuations and inflation*

The critical disturbances that significantly affect the communities are decrease in prices of livestock products and increase of consumer goods price that bring real hardship for the livelihoods of herders: "When our household income has declined it was tough for all of us. We didn't have any cash, didn't get any pension like elders and the only source of income was livestock. Children were growing and about to go to school, and I was badly concerned how to raise my kids and secure their future." A herder from Jinst described that the price of cashmere was stable until the end of 2007 and one kilogram of raw cashmere was about 35,000-45,000 tugrug and in spring 2008 the price went down to 25,000 tugrug. Most herders felt stressed and insecure by the price fluctuations and they expressed that they will fail to pay back on time the bank loans or if they can pay it, it will hit hard on their livelihoods. During the focus group discussion herders were concerned: "Recent price increases is really affecting us. The products produced by herders still have very low value, but prices for the goods that we consume are getting very high. This year price of cashmere was very bad, last year we used to buy 2 sacks (25 kg/sack) of wheat flour by one kg of cashmere, but this year we buy only one bag of flour. Now one kg of cashmere is sold by 27,000-28,000 tug and one sack of wheat flour is also 27,000-28,000 tug. The price of gas has also gone up. Nowadays every family has to use gas, because each has some kind of motorized means of transportation."

Herders 55 years and older are entitled to pensions, which is a very crucial income for herding households. This age people used to work for collectives and paid social insurance and other related deductions, but younger generation totally depend on their livestock for cash income. "For elders like us who are entitled to pensions we are fine with even few number of livestock, but these younger people seems are getting torn into pieces. They are having tough time, because the price of goods is going up and up, while livestock products are getting more and more devalued."

*Dzud as critical disturbance*

A critical disturbance that severely affected the community since privatization was the *dzud* of 2000-2002. *Dzud* is a winter disaster with minimum supply of forage, very cold temperature and most time caused by heavy snowfall. The repeated *dzud* and droughts killed over 8,6 million animals nationwide (UNDP, 2003). During the *dzud* of 2000-2002 many herder households suffered from tremendous losses of their livestock and Table 5 illustrates changes in the total number of livestock in Bayantsagaan and Jinst in the period of 2000-2002. Herders shared that the consecutive *dzud* 2000-2002 caused mortality amongst adult and juvenile livestock and females that were often miscarrying resulting in a poor breeding season that affected herd size and prevented recovery of livestock assets. According to the local *soum* statistics of Bayantsagaan and Jinst *soum*s, the total number of livestock has dropped down from 188,220 in 2000 to 36,027 in 2002 and from 125,185 to 24,104 respectively (Table 4.5). The governor of Bayantsagaan *soum* informed that before the *dzud* the average ratio of humans to livestock was 1:50, but after the disaster it dropped down to 1:9.

Table 4.5 Changes in the total number of livestock after 2000-2002
*dzud* in Bayantsagaan and Jinst *soum*s (*source: Statistical Yearbook of Bayankhongor, 2005* )

|  | Year | Total | camels | horses | cattle | sheep | goats |
|---|---|---|---|---|---|---|---|
| Bayantsagaan | 2000 | **188,220** | 1,702 | 6,458 | 2,737 | 72,431 | 104,892 |
|  | 2001 | **116,211** | 1,083 | 2,709 | 939 | 43,149 | 68,331 |
|  | 2002 | **36,027** | 465 | 651 | 150 | 10,693 | 24,068 |
|  | % survived | **19%** | 27% | 10% | 5% | 15% | 23% |
| Jinst | 2000 | **125,185** | 1,522 | 6,984 | 2,203 | 37,554 | 76,922 |
|  | 2001 | **71,702** | 1,129 | 1,974 | 462 | 19,757 | 48,400 |
|  | 2002 | **24,907** | 549 | 296 | 113 | 4,265 | 19,684 |
|  | % survived | **19%** | 36% | 4% | 5% | 11% | 26% |

During the field trip in June of 2008 to Khujirt and Kharkhorin herders and government officials talked about of another small and fast emergency situation they experienced in March 2008. They were suddenly hit by the spring snow storm and they described that it snowed continuously for five days, building up a thick snow cover. In some areas in the mountain it was nearly 1 meter deep snow layer on the ground. It took additional 10 days for snow to melt and during these days some of the herd, specially lactating females and offspring, starved and froze to death. Herders shared that large animals such as horses and cattle also perished. In the Khujirt case, a herder described that each family in his neighborhood lost an average of 50% of their offspring and weak female animals were not able to survive as well. Many families were left with only 3-4 baby animals out of 50-150.

Herders from the mountain steppe sites recalled in the spring of 2004 a bad spring dust-storm occurred in the area that continued for one day and blew away the *gers* (yurts) of several families. After this dust storm, herders observed that topsoil was blown away resulting in growth of less palatable forbs (*Artemisia spp*), but less of perennial grasses and forbs. Herders described it as a rapid short event that didn't affect their livelihoods,

but resulted in the growth of less-abundant plant species, "In comparison with *dzud* or other prolonged disasters, this one was a less risky."

In 2009-2010, herders experienced another bad winter of devastating *dzud* disaster, where 15 out of 21 provinces were declared as disaster affected zones by the Government of Mongolia in March 2010 (UN Mongolia Country team, 2010). As of May 2010, over 8.4 million livestock had perished, which is 19% of national herd of 44 million as of Dec 2009 (NEMA & UNDP, 2010). According to the Mongolian National Statistics Office (2010) reports, end of year 2010 livestock number is 31.8 million that is 12.2 million less (28%) than it was at the end of 2009. In the study sites, the *dzud* of 2009-2010 was characterized by extended period of freezing cold temperatures in the period of December 2009 – March 2010. Figure 4.7 shows winter three-month (December, January and February) mean temperature in four sites. Winter temperature trend shows that in 1995, 2000, 2005 and 2010 years were the coldest which indicate occurrence of *dzud* in those years. According to informants the most severe ones were in years of 2000-2002 and 2009-2010. It also shows that the winter average temperature in these study sites fall below -10 degree Celsius. The coldest *soum* is Khujirt that locates in the mountain steppe region.
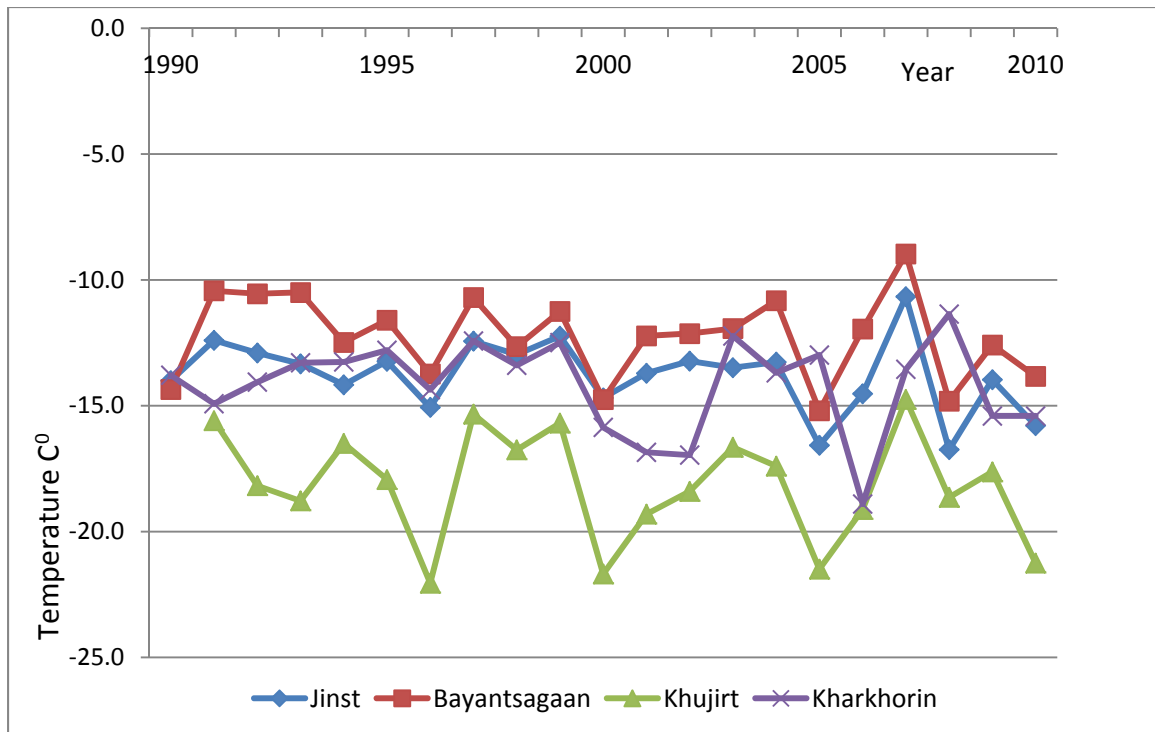
Figure 4.7 Mean temperature of winter three-months in four study sites (source: NAMEM data)

## Discussion

Drawing on details and specific examples from the qualitative data, this section describes how individual households and communities coped with and recovered from past shocks, what they learned, what were their adaptive strategies and practices and how that affected the impacts of subsequent shocks.

### *Strategies during democratic transition and privatization*

After rapid privatization of livestock, herders developed different strategies to cope with sudden changes happening in the socio-economic and political systems. Herders' main goal was to increase the number of livestock, as it was only source of their livelihoods. One old herder told me that "my family got a few livestock during the privatization and raised them to more than 2,000 and then we distributed them among our

children after they got married." As a result of the transition to a market economy herders obtained economic benefits: "When livestock became private, herders were entitled to utilize all the livestock products for their own use and therefore this privatization event significantly improved herders' livelihoods. But herders were not able to manage their household economy wisely. They aimed to raise livestock numbers and rushed to buy a vehicle."

As some elder herders shared with me during key-informant interviews, after privatization they started to raise a mixed herd in the new market economy, as it was too risky to tend single-species herd that was emphasized in the collective period. However, a herder identified some challenges associated with raising mixed herd, "people have different types of animal that raise concerns who will herd horses, who will herd sheep, goats and cattle, should we split the household…" However, herd composition was more towards the production of cashmere goats, which have reliable cash markets for their fiber.

Another strategy to overcome challenges of rapid transition was movement to urban areas, where herders had better access to markets, consumer goods, better education and employment opportunities. An old herder recalled that "due to poor infrastructure and services those who were more competent and smart moved to the city to search better employment opportunities or to initiate some kind of business, and later some of those who left became very wealthy entrepreneurs in the city."

During the socialist period, the compulsory secondary education was free, but right after the privatization herders had to drop their children from the school. A retired *soum*-school teacher mentioned, "many children were interrupted from their school,

somehow herders thought now it is a time to live on their livestock and no need to send their children to school." Financial difficulties to provide school books, supplies, clothes and dormitory fees were one of reasons for dropping out and the necessity for extra labor to herd livestock was priority for herding families in new market economy.

Abolishment of the pastoral collectives in 1991 and 1992 and privatization of livestock brought substantial changes in the lives of herders across all study sites. These events were accomplished in a very short period of time that broke down local structures and institutions leaving "newly" established herders on their own to adapt to the uncertainties and changes of the transition period. Without collective administrations that were formerly very powerful in regulating pasture and water usage, herders had no formal institution to answer their questions that arose during the change processes (Avarzed & Sodnoi, 2008). With strong dependency on the state-subsidized services and facilities during collective period, it took years for herders to change their attitude and realize that the services and facilities were not available for free anymore (Avarzed & Sodnoi, 2008).

***Strategies in the market liberalization and price fluctuations***

During the transition period lack of cash, little savings, undeveloped market and high inflation rates caused herders to sell their products cheaply or accept bartering through middle-traders who often charged high prices for their goods in return for the livestock products. Women from Jinst *soum* shared, "… middle-men do not want to estimate the labor cost of herders and they drop the value of livestock products by offering a very low price and herders must agree with their proposed price due to need for

cash..." The lack of local markets for meat and dairy products generated middle traders who were often mobile and who served as a bridge between producers and markets.

A local *soum* governor described challenges associated with existing livestock products market: "For herders the key issue is the price of livestock by-products. The price of livestock products doesn't increase, but price of consumer goods, such as wheat flour, rice, millet and gas, are relatively high, which reduce herder's income. In response to this challenging condition, we recommend that herders sell their products when the market price goes up at certain times of the year and to start ro produce end-products and add value to their products." After *dzud* 2000-2002, informants from focus group and interviews shared that soum economy based on an extensive livestock industry has significantly declined and herders had to search for some alternative ways to generate income and food production.

In the study sites local government officials interviews and local records show that international and national non-governmental and donor organizations, such as UNDP, World Bank, World Vision and ADRA, implemented a number of relief and rehabilitation projects to improve livelihoods of rural families through the sustainable management of natural resources, including pastureland. In the study sites, UNDP implemented "Sustainable Grassland Management" project, World Bank "Sustainable Livelihoods" project, World Vision various development and relief projects and ADRA a project to develop vegetable gardening and production.

*Strategies in dzud*

During the *dzud* of 2000-2002 herders mobilized all the practices, knowledge and

networks to survive through the hardship that differed across the herders (Figure 4.8).

| Disturbances | | Strategies |
|---|---|---|
| Beginning of Dzud | ↑ | Sale of livestock before the winter |
| Fall 1999 | | Inter-soum agreement for accessing distant pasture |
| 2000 | | Distant otor movements |
| | | Keep weak animals indoor |
| 2001 | | Sale skins and hides of frozen animals to buy fodder and hay |
| | | Get some assistance and aid from international and national donors |
| 2002 | | Move closer to each other to jointly protect and herd the remaining herd |
| | | Those who lols all livestock moved to urban areas |
| | | Go for artisanal mining |
| End of Dzud | | Small scale gardening |
| 2003 | | Formation of groups |
| | | Felt making, wool processing vocational training |
| | | Establishment of group reserve pasture |
| 2004 | | Production of silage, fodder and hay harvesting by herder groups |
| | ↓ | Herder groups initiated rotational grazing and seasonal movements |
| After Dzud period | | Raising back livestock numbers |

Figure 4.8 Diversity of social strategies during and post *Dzud,* based on qualitative data from interviews and focus group discussions across all study soums.

Interview and focus group informants data reveal that major survival strategies

were distant movements, sale of the livestock before the winter and creating reserves of

fodder and supplementary feeding. According to the interviews made with local

government officials, s*oum* administrations made inter-*soum* agreements to allow herders

to make distant movements to other *soum*s and provinces, which in some cases were

more than 200 km away from the *soum*. Those herders who moved to the north benefited

and had a minimum loss of livestock, though it was a very risky and costly move: "Our livestock survived, because we moved to the north, to Gurvanbulag *soum*. I love herders in Gurvanbulag who accepted us even when it was hard for them too and I also appreciate our governors, Bayanjav and Jadamba, who negotiated access to pasture in Gurvanbulag for many of us. Every family who moved there did fine."

As a result of combined actions between local government and herder families, the entire *soum* obtained benefits in the short-time and in the long run. Those families who had less livestock mortality explained that they could recover their original herd size within couple of years and started to support other families by restocking their relatives or selling the livestock. Those herders who couldn't make distant movements described that they utilized various methods to keep alive even few livestock. For example, focus group informants listed several measures they took, such as they sold skins of frozen animals to buy some fodder and kept weak animals inside of their own *ger* (traditional yurt). According to one elder, she could have mobilized all her knowledge and practices to keep some of her livestock survived through the *dzud* 2000-2002, but since she was sick and wasn't there next to her livestock during that time it was hard for her children to get through *dzud* and they lost more 90% of the herd.

Focus group informants shared: "During and after *dzud* many herders from our *soum* moved to the *aimag* center. A few got jobs, but most were unemployed and went for digging "the yellow thing" (gold). Herders obviously do not have relevant skills that qualify them and only become cleaners if they can find such job." The most promising occupation after being hit by *dzud* was mining, where an estimated 100,000 Mongolians working as informal miners nationwide, many of them are herders who have left their

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families and livestock behind (MNEC, 2011). Young people became "ninja" miners, who are illegally doing artisanal mining activities. According to interviews with herders, in the period of 2000-2005, almost every family in Jinst and Bayantsagaan sent at least one family member to work in gold mining or panning. Some of them did this for a short period of time, others worked on a seasonal basis, and a few decided to stay with this business.

After overcoming extended *dzud* season of 2000-2002, herders learned that they should neither trust nor rely on the government, but rather themselves. Multiple evidences from key-informants interviews and focus group discussions reveal that attitudes of dependence are disappearing, and herders are learning to be responsible for their own livelihoods and actions. Within this extended period of hardship herders employed various coping mechanisms and adaptive strategies. Herders used a diversity of social strategies to overcome and adapt to difficulties and Figure 8 illustrates common strategies employed by herders across all study sites.

It is common that spring brings challenges that livestock and herders face every year as it has late snow falls and can have periods with extremely low temperatures. In some years spring is less challenging, but some years, like the spring of 2008, require extra efforts and resources to overcome with minimal losses. Though every winter and spring is hard to predict accurately, experienced herders will have rough predictions about the severity of wintering. A herder from Khujirt who was badly hit by the spring snow storm in 2008 asked his relatives to look after his few remaining livestock and moved to the *soum* center searching for an employment. According to his recollection, herders in his place suffered from huge losses, some losing more than 80% of current

year offspring and some losing almost all of them. Loss of one year's offspring results in sudden decline in cash income as well as household food security.

The *dzud* of 2009-2010 brought herders as well as local government different experiences and lessons than the *dzud* of 1999-2002. The desert-steppe *soum* herders in Bayantsagaan and Jinst, described this *dzud* as a "black *dzud*". In contrast to the *dzud* in 2000-2002, it had less snow fall and very thin snow cover. The reasons for large livestock mortality were related to consecutive droughts in the past few years and extreme cold temperature.

According to key informants, the weather was freezing cold, after the first snow fall it got frozen and animals had nothing to graze on, "because of freezing temperatures animals couldn't move themselves to pasture and were deeply frozen from the inside". Both *soum*s received many herders for *otor* during the winter who had moved into the territory of Jinst and Bayantsagaan starting from summer until spring of 2010.

### Herders' challenges in the face of combined socio-economic and ecological changes

Herders across all study sites suffered through repeated severe *dzud* in three consecutive years of 2000-2002 and 2009-2010. In addition to *dzud*, ongoing effects of transition to market economy and instable market price have overwhelmed traditional coping mechanisms. These events appear to teach herders lessons to be independent and re-organize their livelihoods and herd management practices on the basis of eventually evolving "market" mentality under high risk of climate related stresses.

Based on interviews and focus group discussions the noticeable constraint for re-organization is that herders face challenges to speak up and discuss common issues and problems in wider scale beyond their community. This ability is constrained by having

no opportunities to get engaged in more deliberate discussion with each other and local government to produce something innovative, constructive and collaborative. Across all *soum*s there are a few evidences I observed where negotiation skills are cultivated, but still not enough to manage conflict and disputes in sufficient way (win-win). More non-CBRM community incidents reveal a tendency to address problems within the closed circle of neighborhood that reduces the herders' possibilities to raise their voice and provide comments to local authorities. After *dzud* herders realized that the crises come suddenly and livestock is not a secure source of livelihood. Focus group informants shared that when livestock declined in number they moved closer to each other. Herders noticed that during *dzud* the population of wolves increased, livestock theft was very common and the herders agreed to camp together for winter and spring to help each other and jointly raise and protect the remaining livestock. This was the beginning of their joint action. Herders from Jinst *soum* shared: "After *dzud* of 2000-2002 families in our neighborhood fell below the poverty line, because we lost most of our animals and since most of us relatives and people who share the same pasture in August 2003 we agreed to form a group and there were nine families with the total livestock number of 371 joined to the group. The lowest number of livestock our families had left with was 4, 8, 14 and those who had the largest numbers were 34, 54, 74."

Group herders realized that the traditional system of extensive grazing that they maintained before *dzud* is no longer sustainable under severe conditions of climate and overgrazing. Jinst *soum* governor said he recognized that the fundamental requirement is to improve livestock and pastureland management and adopt a more diversified food production and income generation strategy. An immediate need was to support more

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effective winter preparation to enable herders to cope with the prevailing extreme weather conditions.

Herders from different sites had almost similar opinion that increase in livestock number cause pasture degradation: "After privatization the livestock number has increased and the pasture got trampled and it become very sensitive to overgrazing…" Another old women herder mentioned that "Nowadays pasture carrying capacity is decreasing a lot due to large herd size." Herders are concerned with diminishing productivity of the pastureland, but unfortunately they seem unable to deal constructively with this complex and potentially dangerous phenomenon. Herders mentioned: "Herders more trust to their livestock than anything else, because nobody there who can help you, but you can rely only on your livestock that serve the main source of living and food for herders."

### Differences in resilience building between formally organized (CBRM) and customary herding communities (non-CBRM)

The qualitative results of comparing adjacent communities with and without community-based rangeland management show presence of outcomes achieved through CBRM activities. The four communities with and without CBRM were assessed focusing on social and ecological outcomes, process outcomes and outputs (Table 4.6).

Outcomes could be demonstrated in social, ecological and economic terms. For the ecological outcome, improvement in vegetation and production of rangeland were the variables to evaluate. In terms of socio-economic outcomes, variables such as capacity building, knowledge development, changes in attitude and communication networks were examined. Process outcomes were measured by looking at the process of inclusiveness, appreciation of diversity of opinions and experiences and governance related indicators.

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Process outcomes help to understand the degree of success and failure of collaboration

(Blaikie 2006). Outputs are more tangible results that could be assessed by looking on

the produced agreements, policy documents and resources mobilized.

Table 4.6  Outcomes of CBRM communities contrasted to non-CBRM communities based on interview data.

| Categories | Criteria | CBRM | Non-CBRM |
|---|---|---|---|
| Socio-economic outcomes | Capacity building and knowledge | • Rangeland and risk management<br>• Relevant legal knowledge<br>• Various income-generation skills<br><br>*"I've participated in many trainings like wool and milk processing, and felt making. I will show you some of my samples of felt products…"*<br>*"Six herders from our group participated in pasture management training"*<br>*"Herders got on-site training on rangeland monitoring and they were very interested. It was important for them to know about monitoring to improve their pasture"* | • Occasional informal training organized by local government<br>• Rely on personal knowledge and experience as well as on relatives<br><br>*"Except the Bag governor who comes occasionally nobody comes to meet us"*<br><br>*"I receive helpful advice from the radio program led by Daima"* |
|  | Attitude | • Learning attitude<br>• Understand that collective action can make improvements in grassland resources<br>• Recognition of their responsibilities over the health of pasture<br>• Recognition of long term benefits vs short-term gains<br>• Greater sense of responsibility and trust<br>• Have greater interactions with outsiders and other herder groups<br>• Local leadership recognized and promoted<br><br>*"It makes a lot of difference when you frequently attend training and some other educational activities. We become more innovative afterwards. It provokes creating new ideas worth testing.  After hearing good helpful information, it enriches our knowledge and practices."* | • Not formally assigned roles and responsibilities<br>• Concerns are at the individual level<br>• No collective actions to improve pasture<br>• Traditional collective actions<br>• Low awareness and urgency to improve their pastureland |
|  | Communication networks | • Herder-to-herder<br>• Group-to-group<br>• Cross *soum* interaction<br>• Herder-to-experts (trainers) | • Herder-to-herder<br>• Occasional cross *soum* interaction<br>• Herder-to-local government |

| | | | |
|---|---|---|---|
| | | • Herder-to-local government<br>• Herder-to-donor<br>• Herder-to-NGO<br>*"Our soum environment inspector came to us and told that our group could qualify for community-based conservation of "Havtsai hundii", because this mountain was just taken under the soum protection."* | |
| Ecological outcomes as perceived by herders | Vegetation | • Improvement in range productivity as a result of protecting for three consequent years the winter and autumn range from grazing during the growing season<br>• Established reserve pastures<br>• Established monitoring plots | • No organized protection of winter pasture<br>*"It seems that organizing as a group is quite beneficial. It won't hurt if the few of us who live closeby and who are relatives come together and organize the group. The key benefit is to collectively sell the livestock products in the market"* |
| Process outcomes | Inclusiveness/ Diversity | • Involvement of all herders who use the same pasture<br>• Equal opportunities to attend training & exposure<br>• Participation and engagement in the group meetings and activities | • Less knowledge about group and group activities<br><br>*"I think the governor receives information from his officers about the pasture …"* (but not from us) |
| | Facilitation and leadership | • Active group leadership and management | *"We don't have good leaders who organize meetings. If the Bag Governor or the vet informs us about good practices, the herders are willing to follow.  We face a serious shortage of information here"* |
| | Rangeland management practices | • Established group reserve pastures<br>• Well rehabilitated and managed<br>• Monitoring of rangeland<br>• Rotational grazing of seasonal pastures<br>• Frequent movements | • Individual herder families have their small reserves |
| | Governance | • Certain set of rules was established at a group level<br>• Access to local knowledge and feedback from others<br>• Organize group meetings<br>• Frequent interaction with local government<br><br>*"Herders conserve the pasture and herd their livestock over the many years and I have an approach to make decision based on  this tradition"  Governor of Jinst* | • Meeting limited to *bag* khural meeting<br>• No constructive feedback to the local government<br><br>*"Local governor is supposed to be our government representative, but we never see him around checking on us.  I feel a little disappointed about this, because I would like to discuss our concerns and share our ideas with him".* |
| Outputs | Agreement | • Group pasture management plan<br>• Group revolving fund operation regulations | |

| | | • Group risk management plan<br>• Pasture Co-management Committee rules & regulations at *soum* level | |
|---|---|---|---|
| | Policy outputs | Jinst Sustainable Rangeland Management Program<br>*Soum* pasture management program that supports collaborative actions<br>• Local government plan of action integrated actions about rangeland management and conservation | |
| | Resource mobilization | • Obtained matching grant to the group revolving fund<br>• Grants were mobilized to build reserve pastures and monitoring plots<br>• Income generation equipments and tools were obtained on subsidized rates<br>• Wells were rehabilitated<br>• Skill training participation<br>*"We made a request to "Gobi Initiative" to train us to make boots using new technology and we obtained this training as a group, we plan to start producing the new type of boots in September, we have already bought the materials".* | *"We do not have the structure and institution to organize herders like we had before. The soum governor is busy traveling here and there. He never shows up to meet families. The herders are left on their own"* |

### *Socio-economic outcomes*

In terms of socio-economic outcomes, CBRM-communities demonstrated capacities and knowledge in rangeland and risk management that were developed as result of regular awareness and training activities (Table 4.6). Having more access to the external inputs from the SGM project, CBRM-communities were able to build up capacity and awareness that served as incentives to act as a group in rangeland management and livelihood development activities. Before the project began, the local government and herders seldom talked about rangeland condition, its management and utilization. After being organized as a group, herders mapped and planned their pasture utilization and seasonal movements on the basis of their customary pasture utilization

patterns.  When herder groups developed plans and sketch maps it enabled them to have more meaningful dialogue and discussion with each other, local government officials and with other herders.  In contrast, non-CBRM herders had limited possibilities to benefit from specialized training programs in pastureland and risk management.  Non-CBRM herders were less aware about fundamental causes of pastureland deterioration, whereas CBRM herders perceived their roles as pasture users and had a strong perception that rangeland condition will be improved with improved range management practices.

### *Ecological outcomes*

According to plant monitoring and demonstration activities that was conducted for the management and decision making purposes by the SGM, plant species richness, biomass and foliar cover was monitored for the period of 2005-2007 (UNDP, 2008). Three monitoring plots were selected along the water (Tuin River) gradient of 50 m (summer pasture), 2 km (spring pasture) and 12 km (winter pasture).  SGM project officer who was in charge of the rangeland management issues emphazised that the purpose of the monitoring was not to make any statistical analysis to draw conclusions for publications, but only to demonstrate herders visible differences between grazed and ungrazed (2 ha of fenced land) pastures in species richness, biomass and cover. According to the monitoring done for three years average species richness of the summer ungrazed pasture was 19 species, whereas grazed pasture 13 species. Three years average biomass was 1,181 kg/ha for the ungrazed summer pasture and 564 kg/ha for the grazed pasture.  Overall plant cover was 46% for grazed summer and 18% for grazed spring pastures, whereas 88% for summer and 36% spring ungrazed pastures.  The group herders used ungrazed/fenced pastures as reserve that allowed them to harvest hay in the

fall and use them during times of emergencies.  In contrast, while non-group herders

mentioned the necessity to protect the reserve of *Achnatherum spp.,* a tall grass that is

considered one of key sites in time of emergencies, lack of organization and collaboration

prevented them from agreeing and jointly acting to protect these strategic pasture sites.

In terms of winter pastures dominated by *Allium polyrrizhum - Stipa gobica* and *Stipa*

*gobica - Caragana korjinskii*, the monitoring results demonstrated no difference between

grazed and ungrazed pastures in species richness, biomass and foliar cover.

### *Process outcomes*

Process outcomes were measured by several indicators, including participation

and engagement, leadership and facilitation, governance, rangeland management

practices, etc.  For example, facilitation and mana*ger*ial capacity was revealed to be one

of the driving factors of successful collaboration of herders.  The fact that community-

based herder groups in Jinst and Khujirt have their recognized leaders induced some

change in their social structure.  Active group leadership and management play an

important role in initiating organizational change and developing adaptive practices

(Folke et al., 2003).   Being selected as group leaders, they were given some power to act

on behalf and represent interests and concerns of wider group members.  In contrast to

CBRM-communities, in non-CBRM communities mostly elders would be informally

recognized as leaders.  However, in some CBRM cases in Khujirt it appeared that group

leaders used their power and connections to influence the community's resources that

reduced motivation and drive among the members of the herder group.

The level of mutual interaction or herder-to-herder interaction was more evident

in CBRM communities, as they are usually invited to different activities organized by

local government and donor-funded projects. Consequently, mutual knowledge and experience sharing practices were far greater in CBRM communities. Herders in non-CBRM communities had more interactions with each other and less or almost none with people and organizations beyond the community. They had an observed lack of networking with government, non-governmental and other professional organizations. Non-CBRM communities have experiences that are limited to local perspectives and local practices and there is not much of access to the government and other upper scale organizations to mutually share their knowledge, concerns and interests.

*Outputs*

Outputs of CBRM-communities were noteworthy, as there are several instances of the herder groups' work with other donor projects and NGOs mobilizing independently small grants and technical assistance for well rehabilitation, development of common reserve pastures and alternative income generation activities. A *soum* level pasture co-management committee was temporarily established as a forum for open debate among herder groups and local authorities on matters of common interest and concern. The matters of common interest include the allocation of grazing rights (under local bye-laws and/or under national legislation, both as that legislation presently exists and as it may develop during the lifetime of the SGM project). The matters of common concern include availability of water and ownership of water points, resolution of disputes, provision of technical advisory services, regional negotiation during times of drought or *dzud*, etc. Through the co-management committees, the SGM project sought to strengthen the ability of local government officials to respond to the new demands coming from the herder groups. Herder groups' experiences and lessons learned in

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rangeland management influenced Jinst government officials to devise the Jinst pasture

management plan of action for the period of 2006-2012. This document aimed to have at

least 50 percent of herders organized as groups, as more sustainable approach for pasture

and risk management.

### *Role of CBRM in building resilience of social-ecological complex systems*

Figure 4.9 illustrates a system diagram where social and ecological components

are linked through community-based rangeland management practices. For example,

customary social groups such as *khot-ail* and saahalt-ail jointly formed a community-

based herder organization that improved management of rangelands' key-resources,

created reserve pastures, encouraged seasonal movements, improved knowledge and

social capital of herders.
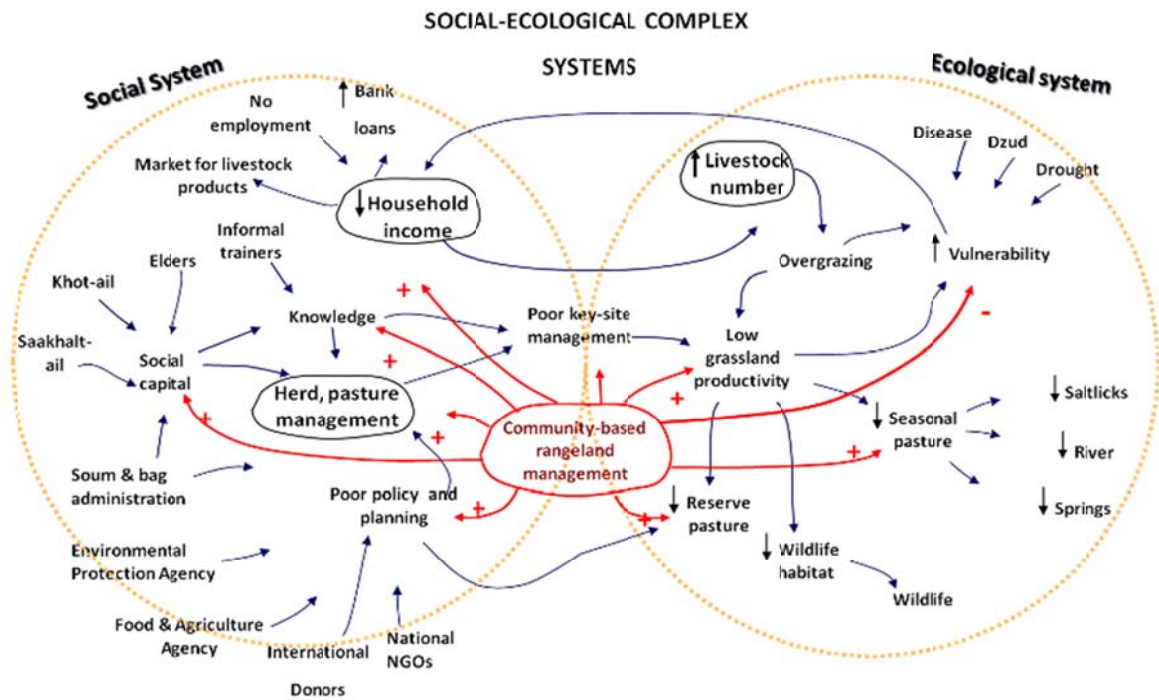


Figure 4.9 Rural pastoral social-ecological systems diagram with CBRM for 2 case soums in
Mongolia

In terms of policy development, CBRM study sites served as a policy implication case and provided opportunities as well as lessons learnt for experiments in community-based natural resource management. The CBRM initiatives informed not only local government, but also provincial- and national-level policy makers to review the existing policy in rangeland and herd management in Mongolia. In 2006-2007 Khujirt and Jinst *soum* government developed "*Soum* pasture improvement program" in consultation with CBRM and non-CBRM herders and the governor of Jinst soum described the process: "we developed pasture management plan of action for the *soum* in May 2006 that was issued as the Governor's decree. We included strategies to improve rangeland and who will implement this plan… When the plan is implemented, we will have at least 50 percent of herders organized as groups, who will have own pasture and risk management plan of action and strategies." As part of the implementation of the above program was experience sharing and herder-to-herder training: "within the scope of this program, herder groups shared their experiences and good practices to non-group herders."

In May 2010 the Government of Mongolia approved National Mongolian Livestock Program that emphasized sustainable pastureland management by supporting the initiatives of herders and herders organizations (National Mongolian Livestock Program, 2010).

**Conclusion**

Changes faced by the pastoral social-ecological system were both novel and cyclical. Novel changes were associated with the transition to a market economy and novel events such as market liberalization and globalization were not common in the history of Mongolian pastoralists. Cyclical events such as climate-driven vegetation

dynamics is part of the experience of the herders (Fernandez-Gimenez, 2006).

Pastoralists have built up sufficient memory to live with and adapt to negative effects of drought and *dzud* as well as major socio-economic and political transitions happened in the 20th century. However, the combined effects of novel and cyclical disturbances over the past two decades hit hard on the resilience of the pastoral communities in Mongolia overwhelming their adaptive capacity. Newly established government organizations under the struggling transition economy system didn't have appropriate policy framework and experience to realize and address evolving effects of such changes.

Two general types of herding communities, CBRM (formally organized herder groups) and non-CBRM (customary) emerged during the past 10-15 years in Mongolia as a result of donor-induced projects that were supported later by Government policy. CBRM and non-CBRM herders have common strategies to cope with the change processes and these strategies are rooted and embedded in the pastoral traditions and customs such mobility, flexibility, reserve, diversity and reciprocity (Fernandez-Gimenez and LeFebre 2006 ). These strategies served as cornerstones for the resilience of pastoral human-natural coupled system that demonstrated dynamic and self-organizing adaptive behavior over long history of Mongolian pastoralism.

However, there were observed differences in resilience building between CBRM and non-CBRM that support the research hypothesis. CBRM communities initiated practices by capitalizing and developing the traditional adaptive rangeland and livestock management practices in combination with innovative practices. They established local-level institutions that serve as an improved and renewed form of regulating access and use of pastureland in space and over time. By being part of formally established groups,

herders have made joint efforts to make improvements in pasture management. They assigned tasks and roles to each other and had frequent interactions with each other, local government and other external organizations, such as donors and non-governmental organizations. The commitment of the group leaders and their enthusiasm served as channels for ordinary herding families to get connected to the local government, donors, trainers and other herders. CBRM herders mobilized internal as well as external inputs, skills and knowledge to respond to disturbances. The most importantly, joint efforts between herders and local government officials enabled CBRM herders to undertake alternative and innovative ways to cope with combined effects of social-ecological changes.

External inputs and resources available to support community-based efforts introduced the concepts of community-based natural resource management into practice, but also influenced establishment of a simplistic understanding and definition of "success" of collaborative efforts. These definitions emphasized the importance of obtaining tangible and visible benefits as result of CBRM, which made herders prioritize material outputs and visible practices and initiatives, such as fencing, well rehabilitation, non-livestock products, increase in income etc. These activities were considered tangible and the outcomes easily measured and observed. If the success of collaborative efforts is measured by adaptive capacity (Carlsson, 2003), intangible and implicit incidents that are difficult to measure and observe, contribute to building social-ecological resilience in the study sites. For example, adaptive strategies represented by access to diverse networks, increase in mutual responsibility, mobilization of local and external resources evolved as a result of collaborative solution and action. Focused analysis of differences in

knowledge, attitude and diversity of practices between CBRM and non-CBRM communities are described in the following three chapters of the dissertation.

The social-ecological system in the both CBRM and non-CBRM herding communities demonstrates that its capacity to respond to crisis and disturbance is not only embedded in local knowledge, practices and social networks (Berkes, 1999, page 31), but also influenced by combining novel and traditional practices and knowledge. The methods herders employed in the face of changes are not simple, but rather complex, demanding greater human labor, local networking, mutual support, mobility, innovative skills of herding, presence of reserve pasture, availability of support system, learning attitude and access to knowledge and networks that contributed to the resilience of the pastoral social-ecological system.

Main actors such as local government, development agencies, policy and herders devalue and not appreciate the intellectual and social capital existing among herders, which results in marginalization of pastoralists and the knowledge and strategies associated with pastoralism. Such perceptions somewhat undermine the competitiveness of pastoral culture and knowledge and prevent the shaping and adaptive modification of rural development policy in the face of social-ecological changes. Adaptive traditional practices, knowledge and skills are implicitly surviving within the realm of changes and transition.

# Chapter 5  Nurturing Diversity for Reorganization and Renewal

**Introduction**

Social systems are structures where human live and operate, and these systems are embedded in ecological systems, allowing humans to exist within a coupled social-ecological system (Walker & Salt, 2006).  In coupled social and ecological systems, there is a reciprocal relationship between people and nature, characterized by complex feedback loops (Liu et al, 2007).  Resilience provides complex social-ecological systems an ability to withstand shocks and disturbances (Berkes et al., 2003).  Folke, Colding & Berkes (2003) identified a framework of four principles of resilience building to enhance the adaptive capacity of social-ecological systems.  They suggest that these factors interact across temporal and spatial scales to deal with nature's dynamics in social-ecological systems: 1) learning to live with change and uncertainty, 2) nurturing diversity for reorganization and renewal, 3) combining different types of knowledge for learning and 4) creating opportunity for self-organization toward social-ecologic al sustainability.

According to this framework, several key attributes were identified that are vital for building resilience and adaptive capacity, including social and institutional learning, knowledge integration, diversity and redundancy.   Some scholars discuss how these characteristics could be part of the community-based natural resource management (CBNRM) benefits and outcomes.  For example, community-based management allows resource users to cooperate and define their own governance structure to manage their

resources (Ostrom & Schlager, 1996). Communities that practice community-based management are thought to possess a diversity of management practices that have developed through continuous trial-and-error experiences (Colding et al., 2003) and which influence social-ecological resilience, promoting and sustaining ecosystem processes and services (Tengo & Hammer, 2003). For example, in arid and semi-arid ecosystems with highly variable climates, herders need to move frequently to avoid recurrent droughts that cause major die-offs of livestock (Ellis & Swift, 1988). Frequent movements and livestock die-offs allow vegetation in grazing lands to recover (Reid et al., 2007). However, reduction of mobility and concentrated grazing in these ecosystems changes the composition of vegetation, increasing the risk of losing productivity in both grazed as well as in remote less frequently utilized areas (Coughenour, 1991; Niamir-Fuller, 1998; Fernandez-Gimenez & Swift, 2003; Vetter, 2005). Such a strong feedback between the resource users and the ecosystem occurs because rangeland management practices of the users may alter the vegetation in grazing lands in equilibrium rangelands and key resource sites in drier non-equilibrium rangelands (Ellis & Swift, 1988). Due to the strong feedback, the resource users continuously adapt their management practices to the characteristics and dynamics of the ecosystem and accumulate more local practice and ecological knowledge than centralized resource management agencies (Davidson-Hunt & Berkes, 2003).

Social and ecological memories are important components of social-ecological resilience. When social-ecological systems are disturbed and undergo change, the systems will be renewed and reorganized by capitalizing on their social and ecological memories. Diversity and redundancy in social-ecological systems build up greater

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ecological and social memory, thus increasing a system's ability to cope with of change

and reduce the system's sensitivity to loss of components (Folke et al., 2003; Norberg et

al., 2008). Ecosystems undergoing change need to have a diversity of functional groups,

diversity within species and populations, and a diversity of species in functional groups to

be resilient and continue generating ecosystem services (Folke et al., 2004). For

example, in pastoral systems, diverse herd composition in terms of species, breeds and

ages of animals plays a significant role in overcoming harsh climatic conditions and

frequent weather disasters. A herd composed of sheep and goats that are considered to be

highly mobile animals, are crucial for the ecosystem, because they influence the nutrient

supply by feeding in one place and dying or defecating somewhere else (Chapin, 2009).

The ability of ecosystems to sustain their multi-functionality is determined by species

diversity at a local scale and community diversity and redundancy at a larger scale of the

landscape (Hector & Bagchi, 2007; Zavaleta, 2010). Species diversity and redundancy

play a vital role in resilience and stabilization of ecosystem processes and associated

ecosystem services, and management that sustains diversity is critical to long-term

sustainability (Chapin, 2009). Ecological memory is fostered by social and institutional

structures that make necessary adjustments to environmental dynamics and ecological

feedbacks (Folke et al., 2003). Social memory is the "institution of knowledge, which

frames individual remembering, creativity, and learning within a social-ecological

environment, the land" (Davidson-Hunt & Berkes, 2003). Social memory is collectively

produced and it consists of a diversity of individuals, institutions, organizations, and

other players with different, but overlapping roles of knowledge carriers and retainers,

networkers and facilitators, stewards and leaders, visionaries and inspirers (Folke at al.,

2003).  With limited social-ecological memory, the system will be unable to create the necessary net of overlapping and mutually reinforcing components that buffer the system from uncertainties and disturbances (Folke et al. 2003).

This study aimed to understand the relationship between community-based natural resource management and resilience building of coupled social-ecological systems.  We used the resilience building framework of Folke et al. (2003) as a theoretical lens to analyze two types of herding communities in rural pastoral systems of Mongolia.  Formally organized herder groups that have agreed to do community-based rangeland management (CBRM) were studied in parallel with customary herding communities who follow their traditional range and herd management practices without being formally organized.  To understand whether CBRM builds the resilience and adaptive capacity of pastoral social-ecological systems, we assessed the range of social and ecological diversity among CBRM and non-CBRM herders. The main research question was "Does CBRM foster or increase diversity and redundancy in social and ecological systems"?  This question is related to the second principle of the resilience building framework, "nurturing diversity for reorganization and renewal".

The specific objectives of this study were (a) to explore the range of social and ecological diversity among organized (CBRM herders) and customary group of herders (non-CBRM), and (b) to assess whether CBRM communities differ from non-CBRM communities in their capacity to implement diversity enhancing practices.  We posed the following propositions about the relationship between diversity and CBRM.

Overall Propositions:

- Herder communities who practice community-based rangeland management have more diverse practices that reduce their vulnerability to disturbances and build up their resilience and adaptive capacity.

- CBRM herders make greater efforts to enhance their social and ecological memory related to resource and ecosystem management

Sub-propositions:

1. CBRM herders have more communication networks than non-CBRM herders

2. CBRM herders get information about rangelands more often and from a greater diversity of sources

3. CBRM herders make greater efforts to access and utilize a diversity of pasture resources

4. CBRM herders make greater efforts to implement diversity-enhancing rangeland management practices

5. CBRM herders have more sources of income

To understand the range of social and ecological diversity among CBRM and non CBRM-herders, I examined the following indicators: communication networks, source and frequency of information, diversity of management practices and diversity of income sources. Social and ecological diversity are the main components of social and ecological memories that lead to social-ecological resilience.

**Study Sites**

Research sites included both primary and control sites (Table 1). Primary sites, Jinst *soum* and Khujirt *soum*, are herding communities with community-based rangeland

management organizations.  Control sites, Bayantsagaan and Kharkhorin *soum*s, are adjacent to primary sites and they do not have any CBRM experience, but have customary forms of range and herd management that is based on the seasonal pasture neighborhood of herders.  Having paired sites supports my research as it provides results for comparative analysis and conclusions.  Selection of the *soum*s was first based on the presence and absence of herders who have some community-based rangeland management experiences.  Other criteria such as availability of social and ecological data and previous scientific research history were important considerations for the selection of the sites.  Past disaster and drought experiences, economic location and land use pressure were some other factors influenced the selection.

The both primary and control sites were areas that were dramatically affected by *dzud* (severe winter weather disaster) in 1999-2003. About 75% of the livestock population died in Bayantsagaan and Jinst due to these consecutive bad winters.  In terms of location and ecological region, Khujirt and Kharkhorin are close to the central roads and markets and located in the mountain steppe region, whereas Jinst and Bayantsagaan are more isolated and don't have as favorable infrastructure as the other two *soum*s (Table 5.1).

Table 5.1 The research field sites

| Province | Ecological zone | Paired sites | |
|---|---|---|---|
| | | Primary sites: with CBRM | Control sites: without CBRM |
| Uvurkhangai | Mountain steppe | Khujirt | Kharkhorin |
| Bayankhongor | Desert steppe | Jinst | Bayantsagaan |

In Jinst and Khujirt *soum*s the UNDP-funded Sustainable Grassland Management (SGM) project was implemented by the Ministry of Food and Agriculture in 2003-2007

(UNDP, 2008). The project facilitated formation of herder communities with the purpose of improving pastureland ecological status in parallel with improving the herders' livelihoods. In addition, sufficient ecological and social data were available in Jinst *soum* from longitudinal studies done by my advisor, Dr. Fernandez-Gimenez. The research sites have been grazing grassland for many centuries for various types of pastoral livestock such as sheep, goats, cattle, camel, horses and yaks. The type of livestock varies one site to another. Jinst and Bayantsagaan *soum*s are dominated by sheep and goats, with camels, horses and a few cattle, whereas in Khujirt and Kharkhorin herd composition is more diversified by having yak and a greater proportion of cattle.

**Research Design and Methods**

To describe the phenomena of social-ecological resilience-building in relation to community- based natural resource management, the research was designed as combined sequential and concurrent research with the both qualitative and quantitative data collection and analysis (Figure 5.1). The resilience of social-ecological systems is an emerging perspective that deserves more research in order to test resilience concepts and develop a broader and more robust body of theory (Cumming et al., 2005).

This design was proposed as two-phase research, where the first phase was more exploratory qualitative method followed by the second phase that combined both quantitative and qualitative measures. The qualitative and quantitative data collection and analysis that addresses the same research problems allows for methodological triangulation (Morse, 1991). Methodological triangulation can be classified as simultaneous or sequential (Morse, 1991). Simultaneous triangulation is the use of the

qualitative and quantitative methods at the same time and this approach has limited interactions between the two datasets during the data collection, but the findings complement one another at the end of the study.  Sequential triangulation is used if the results of one method are essential for planning the other method.
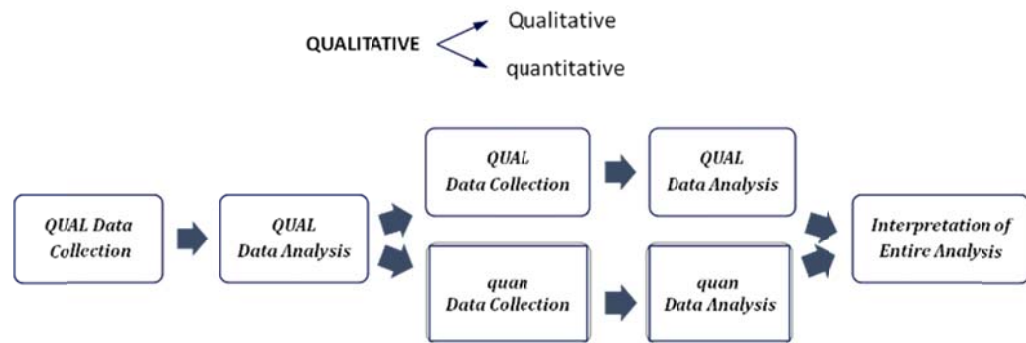


Figure 5.1 Combined sequential and concurrent exploratory design
(modified from Creswell, 2003)

### Qualitative data collection

Interviews, focus groups, observation and document review, were collected over two months in 2008, the first qualitative phase of the research. There were 70 informants involved, of which 34 people participated in in-person interviews and 36 people in focus group discussions. Of the 70 informants, 38 were males and 32 were females.  In terms of occupation, there were 53 herders, 12 government officials and five people who were the donor project former staff and advisors.

#### In-person interviews

In CBRM community sites, in-person interviews were conducted mainly with key informants, such as local government officials, herder group leaders, herder group facilitators, and elderly and women members of herder groups.  In non-CBRM communities, I interviewed with traditional neighborhood leaders, elders, officials, and women. All interviews with herders were conducted in the felt yurts (*ger*s) of informants

in native Mongolian language, but interviews with local government officials were conducted in their respective offices. In some places I camped overnight which allowed more time for additional dialogue, follow-up questions or observation. An interview protocol approved by the Institutional Review Board of CSU, was translated to follow during each interview. Before starting each interview, as a custom I normally set aside some time for greetings, tea and informal introduction. Each interview continued for more than one hour. The questions asked during interviews aimed to explore the range of social and ecological diversity among organized herder groups and customary neighborhoods. Set of questions was focused on availability and utilization practices of important natural resources in the area. Questions to explore what are the social and economic components such local individuals, organization and rules with respect to range management. As an interviewer, I occasionally took notes, but interviews as well as focus group discussions were also audio-recorded and later transcribed.

*Focus group discussions*

Focus group discussions were mainly organized with eight different groups of herders and in total 36 participants were involved in all meetings. In average there were 4-5 people in each focus group. All meetings were also organized in the respective communities in one of herder's *ger*. Participants were not informed beforehand about the meeting, but they were spontaneously invited on the previous night or sometimes even few hours before the meeting. Since it was organized within close neighborhood, it seemed that herders did not have trouble to come even on short notice. In addition, settings and environments were kind of enabling for them to speak up and feel comfortable to express their thoughts and answer to the questions. One focus group

lasted in average about 1 hour 30 minutes and in few cases it lasted even more than two hours, because some participants, especially women, became more engaged as the focus group progressed.

Questions asked during focus group discussions were directed to get response to assess whether CBRM communities differ from non-CBRM communities in their capacity to implement diversity enhancing practices. I have tried to get as much as possible details on how as an individual household and as a community they describe any existing natural wealth and other resources and potentials that they heavily rely on.

*Document review*

In addition to interviews and focus group discussions, field data was supplemented by reviewing documents and other secondary source of information. Several types of documents were reviewed as part of data collection, including local government documents, donor project reports, brochures and leaflets. Most of the collected information represents secondary materials that are secondhand accounts of the people and accounts written by others (Creswell, 2003). To find relevant materials, I have approached mainly local government officials, the donor project staff and herders themselves. Only few materials, such as herder group brief reports, were found from herders that could be considered as primary information obtained directly from herders.

### Qualitative data analysis

For the qualitative data analysis, I followed three flows of data analysis approach that consists of three components that happen in parallel or concurrently to each other: data reduction, data display, and conclusion drawing/ verification (Figure 5.2) (Miles and Huberman, 1994).

```
                  Data collection period
           ┌- - - - - - - - - - - - - - - - - - -┐

                  DATA REDUCTION
    Anticipatory   During            Post              ┐
                                                        │
                  DATA DISPLAYS                         │
                  During            Post                ├  =  ANALYSIS
                                                        │
                  CONCLUSION DRAWING/VERIFICATION       │
                  During            Post                ┘
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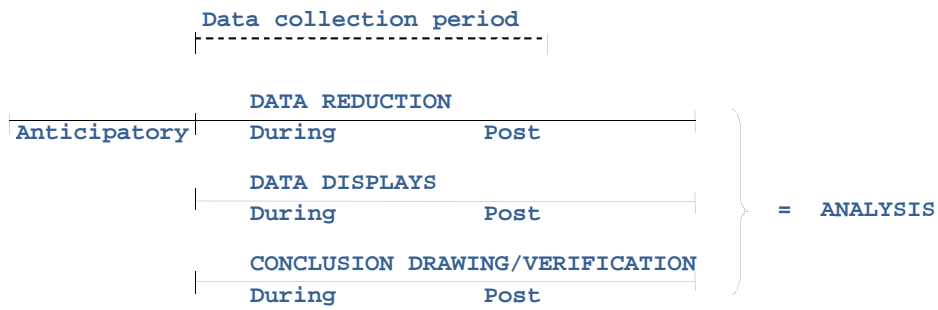
Figure 5.2 Components of Data Analysis: Flow Model
(Miles & Huberman, 1994)

The first flow is data reduction, the process that helps to transform the written-up

extensive field notes and transcriptions into more focused and organized set of data.

Such reduced dataset becomes more manageable to work with and to draw some initial

conclusions and inferences.  Data reduction strategies are writing summaries, coding,

teasing out themes, making clusters, writing memos, etc. (Miles & Huberman, 1994).

The second flow is data display that includes matrix and network displays, graphs and

charts.  This process produces user-friendly forms of dataset that allow the researcher to

see relationships between meanings, concepts and attributes.  The third flow of analysis is

conclusion drawing and verification that is about deciding what things mean by

identifying regularities, patterns, explanations, possible configuration, causal flows and

propositions (Miles & Huberman, 1994).

While collecting my qualitative data I could make some preliminary steps of data

sorting and data interpretation.  Preliminary data analysis is ongoing process which could

be undertaken every time data are collected (Grbich, 2007), because after each interview

or observation exercise, some distinctive patterns of meaning were noticed.


Data reduction

From my interviews, focus group discussions and field journals, I generated more than 400 pages of data. After transcribing interviews and focus group discussions, I reduced my data by coding them using Nvivo qualitative analytical software. Coding is often the first step in organizing the data in a meaningful way that condenses the bulk of data into analyzable units by creating categories (Coffey & Atkinson, 1996). However, coding is not only data reduction or data simplification process, but it also a process of data complication that calls for data expansion and reconceptualization (Coffey & Atkinson, 1996).

Prior to the field work, I developed an initial list of codes using the research questions and sub-questions. Codes could be defined as "tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study" (Miles & Huberman, 1994, p. 56). There were 14 codes and over 100 sub-codes in the start list and using them I coded my data in Nvivo. As a result of coding, I was able to pull together evidence and systematically categorize it under related themes or codes. In parallel with coding, I used a number of data analysis methods such as research memos, content analysis, domain and taxonomic analysis and constant comparative analysis. Domain and taxonomic analysis was helpful analytical approach that resulted in data categorized into domains and sub-domains, and showed taxonomic relationships between them. Having multiple data analysis techniques provided me with flexibility in choosing the right approaches in analyzing various types of data allowing to obtain greater level of description, interpretation and elicitation throughout the research process (Creswell, 2003). These analytical approaches structured my data in a more working style to conduct more in-depth analysis and interpretation my data.

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Data display

Data display means a user-friendly visual format of the systematic data presentation that allows the user to draw valid conclusions and take needed action (Miles & Huberman, 1994). There are many styles of display of data and the researcher can choose them in accordance with the audience to which the results are targeted and the researcher position in the research study (Grbich, 2007). Styles of display include graphic summaries, quotes, case studies, interactive approaches, hyperlinks, vignettes, poetry, visual displays, etc. (Grbich, 2007). In my analysis, I have decided to generate graphic summaries, such as matrices and flow charts, to provide a quick summary of considerable chunks of data as an overall snapshot which can then be more fully explained and illustrated with other forms of qualitative display such as quotes or poems (Grbich, 2007).

*Household survey questionnaire*

The subsequent second phase of the study was conducted in the summer of 2009 and was designed on the basis of the qualitative findings and inferences of the first phase. The results of the first phase raised needs for more qualitative data and also informed about potential quantitative measures of social and ecological resilience, on which basis the survey questionnaire was developed. The household survey was administered at one point in time using face-to-face structured interviews. In total, about 250 households were selected using stratified random sampling where the stratification was based on three criteria: 1) membership and non-membership to CBRM groups, 2) wealth levels and 3) ecological regions (desert-steppe and mountain-steppe). The survey was administered to 250 families who were located with the help of local people. Some of the

selected herders were camping in different locations that were difficult to locate and reach. The content of the survey was comprised of sections on household demographics, seasonal movements, land and water tenure, knowledge, attitudes and practices about rangeland management and protection, social relationships, household production and income. In the following paragraphs, I describe how each concept was operationalized, measured and combined into an index to measure this concept.

*Communication network index*: I made this index variable by combines multiple survey items that answer to the questions "how many people do you know who can help with the following topics and issues?" The communication network index was calculated as the sum of all possible communication networks that were used by the respondent (sum of all items checked by the respondent divided by the total number of items). I wanted to know the number of communication networks used by each respondent across the following topics relevant to rangeland and livestock management: Advice on marketing, Advice on veterinary matters, Advice on livestock diet and herd management, Advice on legal matters, Advice on rangeland protection, Advice on rangeland monitoring, Advice on risk management and Advice on environmental protection.

*Source of information index* was created and to make this up I used several survey items that answer to the questions: "Please tell us how often you get information from each of the following sources". Herders rated 10 sources from where they obtain information and their responses were coded on 4 point scales ranging from 0 to 3. The value '3' corresponded to "once a week", value '2' to the "once a month", value '1' to the "once or twice a year" and the value ' 0' to the "never": Get info from radio, Get info from TV, Get info from newspapers, Get info from brochure, Get info from experts, Get info from governors, Get info from local vets, Get info from herder in my *khot-ail*, Get info from visitors, Get info from *bag*/sum khural.

*Access to and utilization of different pasture resources*. Different pasture resources summative index variable was created by using access to: Small drainages, Ravines, Upland (mountains), Small hills, Lowland steppe, River, Spring, Big rocks, Shrubland, Ders (tal grass), Salt licks, Sand dunes, Forestland, Trees, Crop land.

There are five variables *on management practices*: total number of moves within two years; average moves per year; total distance moved per year (km); average distance moved per move (km); total number of different camps per year. These were not combined into an index but rather analyzed as individual metrics of pastoral mobility.

*Number of income sources*: The income diversity variable was computed from 14 different income sources that include: pension, salary, wage labor, crafts, hunting, small business, herding, vegetable gardening, remittance, rent, credit, savings interest, investments, and other incomes).

*Household questionnaire data analysis*

There were two independent variables used in this study in the quantitative

analysis. First was the membership of herders to community-based rangeland

management group, group and non-group. The second variable was the ecological zone:

desert-steppe and mountain-steppe. Note that my sample size of tested soums in both

cases was only n=2 and thus statistical inference beyond the study soums is not possible.

For all dependent variables except the management measures, indices were

created that were the sum of the items measuring a particular concept or behavior (as

described above). Differences between CBRM and non-CBRM herders with respect to

each index were determined using a student's t-test, where the dichotomous independent

variable was herder group membership (yes or no) and the continuous dependent variable

was the index or the mobility metric. Statistical analyses were performed in SPSS 19.

Due to the small sample size and variability among sites, difference were considered

significant at *p*=0.10.


**Results**

*Sub-Proposition 1: Herders from CBRM communities know more people to get advice*

*from (or have more communication networks) than non-CBRM herders.*

Survey results supported this proposition. CBRM herders in these 2 soums had

significantly more number of communication networks (mean = 3.39) than non-CBRM

herders (mean=2.60) (t=1.890, df=77.591, *p* =.062).

Qualitative focus group and interview data provided a deeper understanding of the

nature of communication networks and how they differ between CBRM and non-CBRM

herders. There was a general pattern of forming social groups among herders who share

common winter or summer pastures and have a common feeling that they are part of the same community or network. A middle-age female herder who headed a family of four people expressed how nice her neighborhood is: "We certainly lend a hand to each other, for example we help out those who are moving, help them to assemble their *ger*, and we ask those who have trucks to help to move, surely all such good things we have in practice." Social networks are established at different scales of time and space and in one year a family may camp with different families in different seasons. A herder from Bayantsagaan *soum* shared that, "During the winter and spring we camp together with my relatives, but we move to different places for summer and fall, and in following winter we all come back to our traditional winter camp."

Despite some general patterns in the formation of social groups, I observed differences between CBRM and non-CBRM communities in the number of networks present in them. According to CBRM-community informants, each herder group had about 7 communication networks (Table 5.2). Apart from having strong herder-to-herder interactions, CBRM herders had well established cooperation with people and organizations outside their *soum*, which was not common for non-CBRM communities. Horizontal or herder-to-herder interactions were also more prevalent in CBRM communities, as herders were invited to different activities organized by local government and donor-funded projects, facilitating herder-to-herder interactions. CBRM groups were able to establish direct interaction with experts who provided them on-site training and demonstration activities. CBRM groups were quite successful in communicating with local government officials who were more interested in relating to groups rather than individual households. The local government official from Jinst *soum*

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expressed that when herders get organized officially, it is easier for the government to regulate pasture management: "Once herders cooperate with each other and get organized as groups, they are in a much better position to carry out more sustainable pastureland management activities."

Table 5.2 Comparison of communication network types in CBRM and non-CBRM communities, with illustrative quotations.

| CBRM herders | Non-CBRM herders |
|---|---|
| Communication networks: | Communication networks: |
| ■ Herder-to-herder<br>■ Group-to-group<br>■ Cross soum interaction<br>■ Herder-to-expert<br>■ Herder-to-government<br>■ Herder-to-donor<br>■ Herder-to-NGO<br>*"Six herders from our group participated in pasture management training …"* | ■ Herder-to-herder<br>■ Cross soum interaction<br>■ Herder-to-local government<br><br><br><br><br>*"I receive helpful advice from the radio program led by Daima"* |

In contrast, herders in non-CBRM communities have more interactions with each other and less or almost none with people and organizations beyond the community. They had an observed lack of networking with government, non-governmental and other professional organizations. Non-CBRM communities have experiences that are limited to local perspectives and local practices and there is not much of access to the government and other upper scale organizations to mutually share their knowledge, concerns and interests: "Except the *Bag* governor who comes occasionally nobody comes to visit us."

They shared that during *bag* meetings organized once or twice a year they have some opportunities to meet with officials and speak up. But mostly during this kind of meeting, *bag* and *soum* governors present implementation of their action plans, but do not necessarily provide relevant training and information. Non-CBRM herder expressed their need for more information and better communication with local government

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officials: "Local governor is supposed to be our government representative, but we never see him around checking on us. I feel a little disappointed about this, because I would like to talk about our concerns and share our ideas with him."

*Sub-Proposition 2: CBRM herders get information about rangelands more often and from a greater diversity of sources*

We expected that CBRM-herders would get information from more sources and this was supported by the survey results. Group herders received information from significantly more sources (*mean* = 5.92) compared to non-CBRM herders (*mean* = 5.11) (t=2.065, df =197, *p* = .04).

We also expected that CBRM-herders would receive information more frequently than non-CBRM herders. CBRM herders received information more frequently than non-CBRM herders from two types of information sources: brochures and experts (Table 5.3).

Table 5.3 Average frequency of obtaining relevant information by Non-Group and Group Herders

| Dependent Variable | Group membership[1] | | *t*-value | *df* | *p*-value |
| | Group (*N* = 51) | Non-group (*N* = 146) | | | |
| --- | --- | --- | --- | --- | --- |
| Get info from radio | 2.94 | 2.93 | .047 | 195 | .962 |
| Get info from TV | 2.88 | 2.78 | .482 | 197 | .630 |
| Get info from newspaper | 1.51 | 1.59 | -.529 | 196 | .597 |
| Get info brochure* | 1.63 | 1.23 | 3.576 | 75.328 | .001 |
| Get info from experts* | 1.69 | 1.20 | 3.611 | 61.332 | .001 |
| Get info from *soum, bag* government | 1.75 | 1.95 | -1.577 | 197 | .116 |
| Get info local veterinarians | 1.86 | 1.65 | 1.538 | 74.680 | .128 |
| Get info from herders | 2.63 | 2.78 | -.704 | 83.286 | .483 |
| Get info from visitors | 1.67 | 1.56 | .750 | 87.077 | .456 |
| Get info from *bag soum* khural | 2.02 | 1.89 | 1.396 | 92.264 | .166 |

1. Cell entries are average frequency rates of obtaining information from 10 different sources. Non-group: herders that are not formally organized as CBRM. Group: herders that are formally organized as CBRM groups. Herders rated 10 sources from where they obtain information and their responses were coded on 4 point scales ranging from 0 to 3. The value '3' corresponded to "once a week", value '2' to the "once a month", value '1' to the "once or twice a year" and the value '0' to the "never".

Qualitative results also confirm that organized groups obtained professional advice and training directly from experts and relevant booklets and brochures. They were in a more favorable situation than non-CBRM communities because donor projects implemented various training and awareness activities on rotational grazing, risk management, development of reserve pastures, production of silage and hand fodder. A CBRM group leader shared his experience in learning from rangeland professionals: "Training organized by Altanzul and Erdenekhuyag on resting the pasture was the best one. When was it organized? In 2005. After that training we learnt many things on rangeland protection and rotational grazing."

*Sub-Proposition 3: CBRM herders access and utilize a greater diversity of pasture resources*

We expected that CBRM-herders would have access to and utilize a greater diversity of summer and winter pasture resources than non-CBRM herders. However, our results showed no significant differences in access to diverse resources between CBRM and non-CBRM communities in either the desert or mountain steppe.

Interview and focus group data in the desert-steppe zone revealed that non-CBRM herders in Bayantsagaan *soum* mentioned a patch of rangeland with the tall grass, *Achnatherum splendens,* as an important pasture to graze during bad winter days. This area is used as shelter against wind as well as forage. Herders in that area were concerned that *Achnatherum spp.* rangeland was getting degraded and overgrazed and all expressed their need to do something about it, but they made no collective efforts to protect this key resource.

*Sub-Proposition 4: CBRM herders make greater efforts to implement diversity-enhancing rangeland management practices*

In the desert steppe, CBRM herders moved significantly more often (7.1 times within two years) than non-CBRM herders (6.4 moves). The average number of moves per year was also significantly greater for group herders (3.5) compared to non-group herders (3.1). However, in the desert steppe non-CBRM herders moved greater distance (98 km) per year than CBRM herders (70 km) (Table 5.4).

Table 5.4  Management practices implemented by Non-Group and Group Herders

|  | Group | Non-group | F-value | *p*-value |
|---|---|---|---|---|
| Desert Steppe: | n=29 | n=67 |  |  |
| Total number moves* | 7.07 | 6.36 | 3.52 | .06 |
| Average moves per year* | 3.48 | 3.13 | 3.55 | .06 |
| Total distance moved* | 70 | 98.3 | 3.36 | .07 |
| Average distance moved* | 12.45 | 20.7 | 7.0 | .01 |
| Total number of different camps | 3.72 | 3.42 | 1.5 | .224 |
|  |  |  |  |  |
| Mountain Steppe: | n=22 | n=74 |  |  |
| Total number moves* | 7.32 | 5.97 | 10.13 | .002 |
| Average moves per year* | 3.64 | 2.97 | 10.16 | .002 |
| Total distance moved | 69.5 | 50.7 | 1.74 | .190 |
| Average distance moved | 9.4 | 8.5 | .22 | .642 |
| Total number of different camps* | 5.2 | 3.7 | 11.1 | .001 |

In the mountain steppe, group herders moved significantly more often (7.3 times per year) compared to non-group herders (5.9 times per year).  CBRM herders used significantly more camps per year (5.2 camps/yr) than non-CBRM herders (3.7 camps/yr). Although CBRM herders moved farther on average, the difference was not significant.

Qualitative data revealed that CBRM-communities with support and training from the SGM project establishing reserve pastures, practiced rotational grazing on a seasonal basis, prepared hand-fodder and other supplementary feeds.  Most herder groups in the desert steppe established small reserve pastures by fencing of about 2 ha of summer and spring pastures to use for hay-cutting and graze livestock in times of emergencies during

spring.    Group herders shared that the trainers provided them some training on risk

management and got them to prepare some feed and silage using locally available plants

*Allium spp.* and *Artemisia spp*.  In Jinst *soum*, the Tuin River crosses the *soum* from the

north to south and herders expressed a lot of concern that continuous grazing along the

river bank never lets the rangeland to recover.  During the collective period the riverbank

was used as a resource where they collected hay and they grazed the area only in the

winter and spring.  Herders who live along the river all year around agreed to form herder

groups with an aim to protect the riverbank from all-season grazing by resting it and

utilizing more distant pastures during the winter.  In practice, group herders varied in

implementing the agreed plans and those families who had few livestock tended to stay,

but those who had several hundred sheep and goats moved to a more distant pasture in

the summer.

*Sub-Proposition 5:     CBRM herders have more sources of income*

We expected that the mean number of income sources for the CBRM herders

would be greater than for non-CBRM herders, indicating more diversified livelihoods.  In

both desert steppe and mountain steppe zones the number of income sources in CBRM

herders was not significantly greater than non-CNRM herders.

Herders across all study communities described that the important sources of

income are the meat, dairy and cashmere production. They mentioned goats are raised

mainly for cashmere, as it has a permanent market demand. Almost all herders

interviewed in 2008 summer were quite concerned about the price for cashmere, which

was relatively stable until 2007, but in spring of 2008 it dropped by 40-50% and then rose

again in December 2008.  Sheep and cattle are raised primarily for meat and milk

production, however the prices are lower for meat and milk is relatively lower than

cashmere in the desert-steppe region.  Apart from selling cashmere and occasionally

meat, other source of income are pensions, day labor and small-scale trading.  The

government is the only significant employer in the area.  In the mountain steppe, herders

had more opportunities to market their dairy products than in desert-steppe as they are

located closer to central roads, capital city and have better infrastructure development.

Data from focus groups, interviews and the survey suggests that herders from

CBRM-communities were able to participate in skill-development trainings that

facilitated generation of alternative incomes, increasing their diversity of livelihood

options.  Several informants mentioned that production of handicrafts and felt boots and

other items became a part of their income sources.  One elderly female herder described

that she used sheep wool to make felt mittens, socksand sell them for cash to local

people. Another woman shared her experience of making and selling felt products, "It is

possible to produce many things from one kg of wool. A few hundred grams of wool is

required to make warm winter socks. In our *soum*, one kg of wool is 500 tug (about 30-35

cents) and about 5-6 products could be made from one kg of wool. Normally in the

winter warm socks are sold about 2000-2500 tug (2 dollars)."

These qualitative results were consistent with survey responses. Among the

survey respondents, 13% of group-herders got income from selling vegetables (in the

range of 30,000-300,000 tugrug of income a year), whereas only one non-group family

obtained income (250,000 tugrug) from selling vegetables.  Production of felt and wool

products was also one source of income for 19% of survey respondents from CBRM-

communities and they earned in the range of 10,000-500,000 tugrug a year. There were

four households (2.7%) from CBRM-communities that had some income the same source

(125,000-500,000 tugrug).

When exhibitions and trade fairs occurred, CBRM herders were usually invited to

display and sell their products made from camel and sheep wool and various dairy

products. For example, in late summer of 2007 the group herders from Jinst collected the

products from each family and a few representatives participated in an exhibition fair

organized in Uvurkhangai provincial center. They had about 500 kg of dairy products

that were immediately sold out. To diversify sources of food, group herders benefited

from obtaining on-site gardening training on the cultivation of adapted vegetable and root

crops, insect control, fertilization and irrigation. This initiative led them to start small

scale gardening for household consumption purposes.


**Discussion**

*Sub-Proposition 1: CBRM herders have more communication networks than non-CBRM herders*

Herders who were organized as community-based organizations demonstrated

greater potential to establish more communication networks that improve their ability to

obtain information and knowledge from a greater diversity of sources. CBRM herders

established these communication networks with different types of people that have

overlapping and redundant functions.

The presence of the SGM project played a significant role in creating such diverse

networks among CBRM herders. It facilitated strengthening linkages between CBRM

herders and local government and building a new relationship between local and external organizations.  Approximately 80-150 herder families administratively belong to one *bag* unit, however, the *bag* governor does not have capacity and resources to interact with such number of households who are spatially scattered.  When herders organized they combined not only their individual interests and needs into one common goal, but also they became more accessible to local government and other interested organizations for collaboration and networking.  Lack of organization among non-CBRM herders resulted in fewer communication networks.

Intermediary institutions, such as the donor project focused on community-based rangeland management, appear to be critical in building multiple networks between local and external organizations.  For example, range management trainers from outside the *soum* interacted with both herders and local officials by informing them about the training objectives and sometimes inviting them to observe the training. This kind of communication may have raised awareness and capacity of the *soum* government officials to interact with herders for learning and policy implementation.  Non-CBRM *soum* government officials had less formal opportunities to have interactions with herders, and thus they have no way to learning from herders.  Lack of such networking prevents non-CBRM herders from being aware of the local government's plans and it also means the government lacks herders' perspectives to base their decisions on.

*Sub-Proposition 2: CBRM herders get information about rangelands more often and from greater diversity of sources*

Various training and awareness activities were available to the organized groups of herders and it was more efficient for the donor project to target groups rather than individual herders. Information and education in range management are necessary not only for herders, but also for local officials who implement range policies and face related issues on a daily basis. Therefore, education and awareness offered by the SGM project was actively supported by local government increasing chances for them to participate in such activities more often. Statistical results show that CBRM herders received information significantly more often from brochures and from experts than non-CBRM herders. Available printed materials were introduced by experts during training and therefore it seems that CBRM herders have obtained better understanding of how to use these materials in the future.

*Sub-Proposition 3: CBRM herders access and utilize a greater diversity of pasture resources*

The statistical results showed no difference between CBRM and non-CBRM herders in their access and use of diverse pasture resources that include seasonal pastures, salt licks, water points, rivers, forest, shrubs, etc. Ability to move the livestock to different pasture resources appears to be open for all herders. Herders appear to have access not only to key pasture resources, but have flexibility to make distant movements during the time of emergencies. However, sustainable management and utilization of key pasture resources seem to be the most crucial and urgent tasks across all communities. Such need was a main factor driving the CBRM herders to organize and strengthen their capacity to protect the key resources in the both desert steppe and mountain steppe. In

non-CBRM communities, herders were all concerned about protecting the key resources, but lacked the leadership and capacity to organize and convey their common concerns and interests to local officials and other stakeholders for support.

*Sub-Proposition 4: CBRM herders make greater efforts to implement diversity-enhancing rangeland management practices*

CBRM herders moved more often than non-CBRM herders in both desert and mountain steppe regions, suggesting that CBRM herders had some kind of institutional arrangements to enforce or facilitate these practices. Some CBRM herders had pasture management plans drawn on existing movement patterns that was mostly focused on resting the seasonal pastures from off-season grazing. Once herders collectively agree on the timing of when and where to move, it seems they get more responsible to follow their joint decision. In the mountain-steppe region, group herders had more camps than non-CBRM herders.

Interview and focus group informants from at least five herder groups in both regions mentioned the local governor issued special decree that formalized decisions of the CBRM herders about resting and rotating their seasonal pastures. Once the local government undertook such measures it prevented other herders from grazing off-season in those formally protected areas. Even though some of non-CBRM herders expressed needs to rest and protect their winter and spring pasture from year-round grazing, they were troubled by trespassing and intrusion of other herders who might come while they are away. For this reason, they moved less often and shorter distances in order to protect their pasture from others.

The following quotations emphasize the importance local government's support in pasture management practices initiated by herder groups.  A group leader from Khujirt *soum* shared that: "We altogether agreed to rest our pasture and gave a request to the *soum* governor to support our decision. For consecutive three years our *soum* governor issued the decree that states the date, place and location of the pasture for resting and it restricts grazing on this location. As result we could rest our winter and spring pasture for three years. In the first year, some non-group herders didn't want to move, but when the decision was formalized they didn't have other choice just to move, because officials came over and fined two families who refused to move." Local official from Jinst: "On the basis of *bag* assembly agreement, the *bag* governor issues a decree to protect, rest and rotate some pasture and this was helpful for herders."

One member of the herder group "Olon burd" in Khurjirt mentioned  that "We protected (haven't used during growing season) our winter and spring pasture for consecutive three to four years (2002-2007), this year (2008) some said that they will not move, because the SGM project is over. I told them during harsh winter it was helpful and we will anyway move away. Herders who were part of the herder group didn't want to move this year, they think that the project is finished, everyone has its own way of thinking."

It appears that non-CBRM herders in the mountain steppe unwillingly chose to make fewer and shorter movements to keep an eye on their winter pasture that otherwise might be grazed or trampled by others.  However in CBRM cases, herders collectively decided to revive rotational grazing, as they expected support from the local government to prevent other herders from grazing the rested pastures.  The local government

approved of the organized herders who came up with the productive plans for pasture resting, as it helped government to implement its annual targets and partially solve pasture degradation issues.

In the desert-steppe region the results showed that non-CBRM herders moved longer distances than CBRM-herders.  This result was found for the Bayantsagaan *soum* herders where they make long distance movements from low-lying rangelands to high mountain areas to access their seasonal pastures.  That Bayantsagaan herders moved farther had to do with local geography and movement patterns that made it difficult to compare "fairly" between the two study sites, Jinst and Bayantsagaan. In non-equilibrium pastoral systems where high spatial and temporal variability in resources is the norm (Ellis & Swift, 1988) distance moved may not be a reliable indicator to assess herders' mobility, but the number of camps and number of moves may be more reliable indicators. For example, herders in Bayantsgaan soum have summer pasture in the uphills of Bayankhairkhan mountain and they shared that depending on forage availability in the summer they need to move in close distances but higher to access better pasture.

In addition to inducing mobility, CBRM motivated herders to test other measures such as establishing reserve pasture for hay making and emergency grazing, making hand-fodder, preparing silage using local plant species, controlled burning of areas with weedy species, etc.  All these practices are not necessarily innovative because most of them were practiced during the collectivization period. CBRM encouraged herders to recall and mobilize pre-existing good practices in collaboration with experts and local government.

*Sub-Proposition 5:     CBRM herders have more sources of income*

The both CBRM and non-CBRM herders' main source of income comes from the production of pastoral livestock products.  Cashmere production is the most reliable source of income in both desert steppe and mountain steppe regions.  However the CBRM herders demonstrated joint efforts to add value to their goods by utilizing their skills obtained from the training on wool processing, felt making and maximize production of dairy products for outside markets.  The group herders were more organized to benefit from organized training and marketing events, as they said that share costs associated with the travel and other expenses.

The social memory of diverse practices in pasture and livestock management as well as lessons of *dzud* and other disturbances are still retained among herders.  However, herders and the government do not consistently recognize, appreciate and learn from their collective social memory.  All the main actors, including local officials, development practitioners, experts and herders have undervalued the importance of diverse social rules, local solutions and practices that herders use to make decisions about their seasonal movements and other types of pasture management.  This perception prevent mobilization of diverse herding knowledge and tradition that persisted from historic times demonstrating dynamic and self-organizing adaptive behavior.

With greater levels of communication with and support from different networks and access to diverse information, CBRM herders obtain opportunities to enhance their collective social memory of experiences and knowledge in range management.  Herders may be more likely to enhance their particularistic knowledge and personal experience by being part of small scale place that is herder group scale (Cheng & Daniels, 2003).

**Conclusion**

The ability of complex social-ecological systems to withstand changes partly depends on diversity that supports creativity and adaptive capacity (Folke et al., 2003). Diversity increases the capacity of social-ecological systems to overcome disturbance, learn and change (Norberg et al., 2008). This study looked at diversity and redundancy qualitative and quantitative indicators in herding communities to investigate potential differences in resilience of pastoral communities with and without organized CBRM. CBRM communities demonstrated greater diversity and redundancy in communication networks, information sources, and some management practices, specifically mobility, establishing reserves of pasture and fodder. However, there is no difference in having access and using diverse pasture resources that indicates moving the livestock to different pasture resources appears to be open for all herders. Herders follow the customary pastoral strategies of having access not only to key pasture resources, but also flexibility to make distant movements during the time of emergencies (Fernandez-Gimenez & Le Febre, 2006).

Ever-changing socio-economic and ecological conditions require building adaptive capacity by not only capitalizing on traditional institutional structures and management practices, but also adopting new principles and institutions for re-organization and renewal (Folk et al., 2003). In Mongolia's case, the study results show that social memory of pastoralists could be expanded if herders are frequently exposed to different experiences, concerns and interests without being limited to local perspectives and local practices. In situations where herders are disadvantaged not only by their geographic location, but also by lack of access to relevant information and networks, self-

organized institutions and community-based organizations serve as mechanisms or

structures to promote diversity of local solutions and practices in rangeland management.

# Chapter 6  Meaningful Learning for Resilience Building

**Introduction**

Folke et al. (2003), propose that combining different types of knowledge for learning increases potential for building social-ecological resilience.  According to their description, knowledge combining is a practice that allows natural resource users and other interest groups such as government officials, agency experts and scientists, to build knowledge together, on the basis of which they explore uncertainties and events of complex ecosystems and their management.  Resource users' knowledge about local natural systems is characterized as knowledge-practice-belief systems (Berkes, 1999), as it is place-based knowledge and belief that drives local people's practices and decisions (Gadgil et al., 2003).  Resource user groups and interest groups have different perspectives about learning and doing, however, the ability to build on each other's knowledge is part of adaptive capacity and resilience (Folke et al., 2003).  Both natural systems and social systems are considered complex systems in themselves, and their interactions contribute further to making these systems more complex (Berkes et al, 2003).  To understand the complexity of social-ecological systems Berkes (2008) suggests bringing knowledge systems together.

Scientific or western knowledge and traditional or non-western knowledge are two different paradigms and each of these sets of knowledge is built on a different background and with different purposes (Agrawal, 1995).  Traditional knowledge could be understood as the local knowledge held by indigenous peoples or local knowledge that is only specific to a given culture and society (Berkes, 1999; Warren & Pinkston, 1998).

Whereas western knowledge is based on a whole system of classification and representation of ideas that determine the wider rules of practice (Hall, 1996). Agrawal (1995) discussed fundamental distinctions and relationship between traditional science and western science. He describes that the two types of knowledge systems could be distinguished by substantive, methodological, epistemological and contextual matters. However, Agrawal argues, finding clear cut differences between indigenous and western knowledge is pointless and they could complement each other (Agrawal, 1995) and "enrich each other as needed" (Berkes, 2008, p. 270). It is also important to recognize geographic scales when we talk about traditional knowledge; small scale communities have a particularistic approach of knowing because they rely on personal experiences and specific place features (Cheng & Daniels, 2003). As for large-scale places stakeholders ways of knowing tend to be aesthetic and rely primarily on recreational experiences and scientific analyses (Cheng & Daniels, 2003).

It is risky to compare and contrast scientific information with the local people's interpretation of their activities and livelihood practices (Sillitoe, 1998), because local knowledge is a *knowledge of how* (Ross et al., 2011) and it relates to a survival strategy (Kalland, 2000). The potential to combine scientific knowledge with local knowledge is demonstrated in the process of adaptive co-management (Gadgil et al., 2003), a process of sharing management power and responsibility between government and local resource users (Pinkerton, 1989). Fernandez-Gimenez et al (2006) discussed how traditional ecological knowledge can be combined with science and applied in co-management of natural resources by doing cooperative research that draws on local skills and knowledge.

The continual engagement model was proposed by Reid et al. (2009) to better integrate knowledge from diverse stakeholders with the goal to improve the impact of science on local and national decision making. The continual engagement model has a core team of diverse stakeholders committed to cross-scale linking of a wide range of actors from local to national and to global levels. Authors call this team the core boundary-spanning team. Ross et al. (2011) examined epistemological and institutional barriers to the integration of indigenous knowledge into western construction of knowledge. They argue that although many barriers are related to the epistemological difference between these two knowledge systems, "the practical manifestation of the barrier is often institutional" (p. 112). Despite numerous attempts and practices involving indigenous people in resource management, the bureaucracy of modern institutions still remains as anobstacle to cooperative management of natural resources (Ross et al., 2011).

Therefore Novak (1998) discusses about creating knowledge on the basis of formal and informal meaningful learning where he describes relating new knowledge to knowledge the learner already knows in some non-trivial way. Novak's theory of education states that the union of our actions, feelings, and conscious thought constructs a knowledge that we have learned meaningfully and thus makes people empowered to make commitments and accept responsibilities.

The main research question for this chapter is to understand how resilience of pastoral herding communities in Mongolia is determined by their ability to combine different knowledge types for learning. The first objective is to examine what types of knowledge are available in these herding communities and how they are integrated for building social-ecological resilience. The second objective is examine to what extent

different types of knowledge are generated and applied in two types of herding

communities, herder groups that have community-based natural resource management

experience (CBRM herders) and traditional herding neighborhoods that do not have such

exposure and experience (non-CBRM herders). I hypothesized that the CBRM

organizations help facilitate knowledge combining and sharing.  In resilient social-

ecological systems, learning encourages systems thinking (Davidson-Hunt & Berkes,

2003).


**Study Sites**

  This study was conducted in two provinces of Mongolia, particularly

Uvurkhangai *(pronounced as Uvr-han-ga)* located about 500 km west to Ulaanbaatar

capital city and Bayankhongor *(pronounced as Bain-hon-gr)* is about 650 km southwest

to Ulaanbaatar (Figure 6.1).  One pair of sub-provinces (*soum*s) selected in each of the

provinces that represent two ecological zones.  Uvurkhangai *soum*s are Khujirt

(*pronounced as Hu-ji-rt*) and Kharkhorin (*pronounced as Har-ho-rin*) in the mountain

steppe and Bayakhongor *soum*s are Jinst and Bayantsagaan (*pronounced as Bain-tsa-gan*)

in the desert-steppe.

Figure 6.1 Location of research sites

The research sites have been grazing grassland for over several centuries for various types of pastoral livestock such as sheep, goats, cattle, camel, horses and yaks. The type of livestock varies one site to another. Jinst and Bayantsagaan *soum*s are dominated by sheep and goats, with camels, horses and a few cattle, whereas in Khujirt and Kharkhorin a herd composition will be more diversified by having yak and a greater proportion of cattle.

Research sites include two pairs of *soum*s: Bayantsagaan *soum* adjacent to Jinst and Kharkhorin to Khujirt. Primary sites, Jinst and Khakhorin, are herding communities with community-based rangeland management (CBRM) organizations. Control sites are Bayantsagaan and Kharkhorin, which do not have such organizations, but instead have traditional neighborhoods of herding communities. The unit of analysis in the primary sites was a herder group practicing CBRM, and in the control sites were the traditional neighborhoods of herders (Table 6.1).

In Jinst and Khujirt *soum*s the UNDP-funded Sustainable Grassland Management (SGM) project was implemented by the Ministry of Food and Agriculture in 2003-2007 (UNDP, 2008).  The project facilitated formation of herder community-based organizations with the purpose of improving pastureland ecological status in parallel with improving the herders' livelihoods.  In this study, I included 8 community-based herder groups of Khujirt and Kharkhorin.  There are at least three traditional neighborhoods lar*ger* than herder groups in number of households included in the research and these group and non-group herder communities range in size from 7-70 households (Table 6.1).

Table 6.1 The research field sites and names of herder groups and traditional neighborhoods

| Province | Ecological zone | Paired sites | | | |
|---|---|---|---|---|---|
| | | CBRM herders (group herders) | Approx. no of households | Non-CBRM herders (non-group herders) | Approx. no of households |
| Uvurkhangai | Mountain steppe | Khujirt<br><br>CBRM group names and year established:<br>– Olonburd, (2003)<br>– Ikhburd (2003)<br>– Hangimust (2003) | <br><br><br>12<br><br>8<br>9 | Kharkhorin<br><br>Traditional neighborhood place name:<br>– Shankh | <br><br><br>70 |
| Bayankhongor | Desert steppe | Jinst<br><br>CBRM group names and year established:<br>– Orgil (2003)<br>– Bodi (2003)<br>– Sharkhad (2003)<br>– Devshilt (2003)<br>– Sar-Uul (2006) | <br><br><br>8<br>10<br>8<br><br>7<br><br>10 | Bayantsagaan<br><br>Traditional neighborhood place name:<br>– Tsetsen Uul<br>– Bayantsagaanii Uvur | <br><br><br>20<br>20 |

**Methods**

This study used a mixed-methods approach consisting of both qualitative and quantitative methods of data collection and analysis. Data were collected from 2008-

2010.  The qualitative methods included interviews, focus groups, workshops,

observation and document review.  I conducted 39 in-person interviews and nine focus

group discussions and three workshops, which were attended by 121 people. Out of total

160 informants, 79 were males and 81 were females.  Informants included herders,

government and agency officials and the "Sustainable Grassland Management" project

former staff and advisors (Table 6.2).  I took four fieldwork trips in the summers of 2008

and 2009 to collect the field data.  In 2008, I made a one-week trip in June and a second

trip from July 10-25.

Table 6.2 The number of informants of each gender

| | Informants | Date | Male | Female |
|---|---|---|---|---|
| *Focus groups:* | | | | |
| 1. | Jinst – Sharhad herder group | 7/17/2008 | 2 | 3 |
| 2. | Jinst – Sar-Uul herder group | 7/17/2008 | 4 | 5 |
| 3. | Jinst – Bodi herder group | 7/16/2008 | 0 | 5 |
| 4. | Jinst – Sharhad herder group | 6/24/2009 | 2 | 5 |
| 5 | Bayantsagaan – in Erdene's *ger* | 7/13/2008 | 3 | 3 |
| 6 | Bayantsagaan – Idermunkh | 7/14/2008 | 4 | 5 |
| 7 | Khujirt – Ikhburd (Batbold) | 6/23/2008 | 2 | 3 |
| 8 | Khujirt – Olonburd (Dorj) | 6/22/2008 | 4 | 3 |
| 9 | Kharkhorin – Bileg-Urnukh's *ger* | 6/25/2008 | 3 | 2 |
| *Workshops:* | | | | |
| 1 | Jinst | 6/25/2009 | 15 | 19 |
| 2 | Bayantsagaan | 7/30/2009 | 9 | 7 |
| 3 | Kharkhorin | 6/14/2009 | 8 | 5 |
| *Interviews:* | | | | |
| 1 | Bayantsagaan | 7/10-16/2008 | 5 | 6 |
| 2 | Jinst | 7/17-22/2008 | 3 | 4 |
| 3 | Khujirt | June-July, 2008 | 7 | 3 |
| 4 | Kharkhorin | June-July, 2008 | 5 | |
| 5 | UB | June-August, 2008 | 3 | 2 |
| | Total | 160 | 79 | 81 |

In addition to interviews and focus group discussions, in 2009 I organized three

workshops with representatives of the herding communities and local government

involved in my interviews and focus groups in 2008 to present them preliminary

conclusions and interpretations of the data. Having community people actively

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participating in the workshops allowed me to use some elements of participatory

research, which has an advantage of constructing a more detailed and accurate knowledge

base about the social and cultural contexts of the study sites (Arnold & Fernandez-

Gimenez, 2007).

There are a broad range of approaches to qualitative data analysis available that

allow qualitative researchers to reveal systematic patterns and meanings in their datasets.

The data analyses follow three flows of data analysis stipulated by Miles and Huberman

(1994). According to this approach three analytical steps were implemented in parallel or

concurrently to each other: data reduction, data display, and conclusion

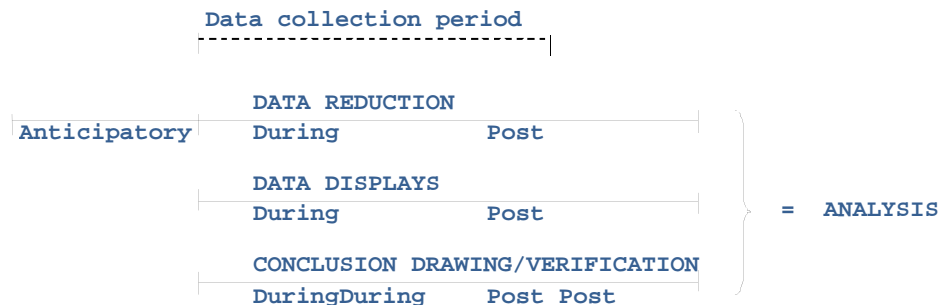drawing/verification (Figure 6.2).



Figure 6.2 Components of Data Analysis: Flow Model (Miles & Huberman, 1994)

While collecting my qualitative data I did a preliminary analysis and

interpretation of the data.  Preliminary data analysis is ongoing process which could be

undertaken every time data are collected (Grbich, 2007).  Almost after each interview,

focus group or observation exercise, some distinctive patterns of meaning were noticed,

but I used to hold these kinds of conclusions light until data collection is over.

From my interviews, focus group discussions, workshops and field journals, I

generated more than 400 pages of data.  After transcribing interviews and focus group

discussions, I started to reduce my data by coding them using Nvivo qualitative analytical software (NVIVO, 1999-2000). Coding is often the first step in organizing the data in a meaningful way that condenses the bulk of data into analyzable units by creating categories (Coffey & Atkinson, 1996). Prior to the field work, I developed a preliminary list of codes using my research questions and sub-questions (see appendix). Codes are defined as "tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study" (Miles & Huberman, 1994, p. 56). There were 14 codes and over 100 sub-codes in the initial list and using them I coded my data in Nvivo. Since the initial codes were theoretically designed and predefined, I found some level of rigidity, redundancy and irrelevance in code list. Some codes were used too much and some codes were broken down into several sub-codes. Therefore, after coding about one third of my data, I revised my codes by dropping some, combining several codes in one, and renaming some into more easily readable codes.

In parallel to coding, a number of data analysis methods were used such as research memos, content analysis, domain and taxonomic analysis, constant comparative analysis and poetic analysis. Having multiple data analysis techniques provided me with flexibility in choosing right approaches in analyzing various types of data and led to greater level of description, interpretation and elicitation throughout the research process (Creswell, 2003). With help of these analytical approaches, I reduced, focused and organized my data, allowing me to present and display them to further enhance analysis and draw conclusions. In my analysis, I generated matrices to provide a quick summary of considerable chunks of data as an overall snapshot (Grbich, 2007).

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I used poetic analysis approach to analyse some of my herder interviews. For this I first structured the narrative transcript as a poem and coded it. When I did my coding I didn't used my preliminary set of codes, but I coded them naturally according to the meanings the phrases attach to. This resulted in a set of data clustered in several domains. To generate meanings out of these sets of data I formed patterns and themes, made comparisons, looked at the contrasts and relationships to build a coherent understanding (Miles & Hiberman, 1994).   To evaluate evidence in support of or in contradiction to my propositions, I triangulated different data sources of information (Creswell, 2003).

**Results**

Types of knowledge systems

Analysis of qualitative data revealed five distinct types of knowledge in the study sites: herders' traditional knowledge, knowledge from the collective period, expert knowledge, knowledge held by government officials and external innovative knowledge (mostly from donor organizations) (Table 6.3).

*Herders' local or traditional knowledge*

Herders have a particular knowledge system that exists locally among them and this knowledge is relevant to local ecological and socio-economic settings.  Herders talk to each other about weather conditions almost every hour and continued discussion on this common topic helps them to assess the current weather conditions for herd movements and grazing.  The information that herders share about local changes happening in their places that related to longer-term trends are descriptive and specific. For example, one herder in Khujirt recounted, "We have a forest in Dulaan Uul, where

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we have our winter pasture, and for the past few years we quickly lost our forest because the pests ate up the trees till it got dry."

Table 6.3. Summary of knowledge types observed, and their application and integration.

| Types of knowledge | How it is applied to management and how it is shared/transferred within and outside the community | Examples of whether and when it is combined with other types of knowledge |
|---|---|---|
| Local or traditional knowledge of herders | - Through daily practices<br>- Transferred orally from herder-to-herder and from herder-to-outsiders<br>- Important to be part of a community to make it relevant knowledge | For CBRM-communities:<br>- *bag* citizens khural[1] (meeting)<br>- training, seminars<br>- experimentation, monitoring<br>For non-CBRM communities:<br>- *bag* citizens khural<br>- occasional visits from government officials |
| Knowledge assimilated in times of the collective period | - Possessed by elders and officials who used to work during the period<br>- Recall their memories of experiences and practices<br>- Application is done with support from the government and donors | - During times of *dzud* and drought<br>- Disaster preparedness<br>- Fodder preparation |
| Experts knowledge | - Trainers and experts are paid to conduct on-site training and experimentation<br>- Disseminated through monitoring plots and demonstration sites | For CBRM-communities:<br>- Not regularly, but with support on training and inputs training, seminar<br>- Experimentation, monitoring<br>- Participation in conferences<br>For non-CBRM communities:<br>- Rarely occurs |
| Government knowledge | - Through Governor's action plan, decrees and decisions<br>- Shared during meetings with herders | For CBRM-communities:<br>- Co-management committees<br>- Emergency committee<br>- *Soum* and *bag* meeting<br>- Working with various projects and initiatives<br>For non-CBRM communities:<br>- Rarely occurs<br>- Emergency committee<br>- *Soum* and *bag* meeting |
| Donor innovative knowledge | - Through available financial resources and trainers<br>- Implements the project | For CBRM-communities:<br>- Co-management committees<br>- Emergency committee<br>- *Soum* and *bag* meeting<br>- Working with various projects and initiatives<br>For non-CBRM communities:<br>- Rare chance<br>- Emergency committee<br>- *Soum* and *bag* meeting |

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[1] Smallest administrative unit's citizens assembly organized at least twice a year.

A young woman herder described the wind in the area: "We have a very strong wind, especially in the morning and it gets calm at night. We are accustomed to live with such wind and the wind is really nasty in the fall, because it blows all dry forage and plants away. The plants are losing their roots." Herders' knowledge about upcoming weather events are generated on the basis consultation with each other. For example, in the face of upcoming *dzud*[2] herders get mutual perspectives about making distant movement, "Last winter cattle become so weak that once they lay down, herders helped them to stand up and 10 households from our neighborhood did a long-distance move (*otor*) to Tuleenii nuruu in Bulgan province. After one day their cattle recovered and herders stopped lifting them up. By now almost all the people who went there are back except two families."

The knowledge about different plant communities was mainly based on grazing behavior of the livestock, "At this time of the year, livestock is not interested in those bushes, called "*naitas*", and animals go for small grasses and forbs. But in late winter and early spring, livestock like to browse on these bushes, because they thaw earlier and livestock that browse on it will not easily die from starvation and cold. They digest it well." Certain types of plants are popular among herders only for the particular season and experienced herders know when exactly move their herd to satisfy their diet and nutritional requirements: "During summer plants grow very poorly in gobi and late fall the 'mongol' type of plants (perennial grasses) almost disappear, but only taana (*Allium spp*) that grow in "thin soil" and make pasture very homogeneous. *Taana* dries up very quickly. In gobi, animals can perish just by foraging on *taana* alone. *Taana* is a kind of

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[2]In Mongolian describes the cumulative consequences of natural hazards that results in mass destruction of livestock due to poor forage available to livestock and extreme cold temperatures that undermine the livelihood security of the herders (Farkas & Kempf, 2001).

hot forage that builds up fat in livestock. Taana is important forage, but it is necessary only to accumulate energy during fall and winter."

Herders shared their concerns related to changes in vegetation in pastureland and how this affects to the herd composition. One elder herder said that their pasture is becoming less suitable for raising horses "when horses forage on *taana* it makes them sweat a lot and their stomach gets so thin and that is how a poor horse tries to adapt to this diet". Another herder observed that "This summer rain was early and grass gave off shoots early that made them so dry in the middle of summer. Needles (*Stipa spp*) soon grew hard that caused mortality of young lambs and kids. Most of our neighbors have gone on *otor*[3] and we will go soon." In the mountain steppe area herders harvest and dry nettles, which is the diet in summer, but "In spring we use dry nettle leaves as a supplement for our weak cattle. This is a nutritious diet that quickly strengthens cattle and sheep and goats. We used it for our own consumption too, you wash it with hot water and when you put in khushuur with meat, it is really good."

Herders shared their local norms of pasture use and one older male herder explained that "Because our winter pasture is far from the river, it is not overgrazed by outside herders. There are two families who have winter camps in the south and I have seen few families from low valleys who come and herd livestock in their winter pasture area, but they do not usually overgraze all the pasture." "Last summer herders in our *soum* did a lot of *otor* to the south *nutag* and livestock fattened on that pasture. Fat will help livestock to overcome the harsh weather in the winter, weak ones will starve to death, so the most important is to rotate *nutag* and move".

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[3] In Mongolian describes distant or local movements with livestock for shorter (few days) or lon*ger* period (several months).

Herders like to share their knowledge in a familiar way, orally and face to face, from parents to children, herder to herder and from *ger* to *ger* (traditional felt yurt) and community to community: "I tell my children where to herd the herd, what the weather will be like today and I remind them about herding practices." Another very old herder from Kharkhorin who lived with his son shared, "I became a herder thanks to my uncle who was a very experienced herder in our *nutag*. It is important to follow these people, as they have a great impact and leave behind a lot with you. Now I nag my son and tell him do this or don't do that. My son is becoming a good herder and his herd is growing".

Herders speak of their necessity of consulting with each other and government officials about specific events that inevitably affect their livelihoods. They consult with each other over tea and *airag* or *arhi* (traditionally brewed alcoholic drinks) about pasture condition, movements and upcoming drought and *dzud* signs, "We ask each other if they are staying in our *nutag* (place, pastureland) or moving. We chat about condition of the *nutag*'s pasture and examine places to move. Many of these younger herders don't really know, *nutag* elders like me must tell them". This consultation is important to make timely decisions to prevent and mitigate potential risks of losing livestock and government officials play key roles in making distant and cross-border movements. In case of emergency situation, local government officials receive weather forecasts and instructions for risk management from the central government that they urgently disseminate to herders. Based on hydro-meteorological forecast about coming winter and spring, local officials discuss with herders about current pasture conditions to assess winterization and they will check if without making distant movement to other *soum*s the

herders are able to pass the winter. During this period, herders have opportunities and necessity to meet local *bag* and *soum* governors, land and agriculture officers.

I observed in CBRM communities, local knowledge got some enrichment from learning during training events organized by the SGM, where herders got helpful information about legislation and policy in rangeland management and advice on how to organize and run groups from trainers. They also got some business training and learned how to operate the group revolving funds. Group herders were appreciative of having such opportunities for exposure to share and learn new things and skills. Focus group discussions and interviews done with non-CBRM herders demonstrate that there were fewer opportunities were open for the non-CBRM communities' herders to exchange their ideas and knowledge with local officials, donors and experts. They were less aware about community-based rangeland management initiatives, but they have heard various stories about herder group operation by radio and from newspapers. One non-group informant mentioned that "It seems that getting organized as a group is quite beneficial and it won't hurt if a few of us who live closely and who are relatives come together and organize the group, so we can benefit for example by selling the livestock products in the market." Non-group informants perceived that it is a good idea to have some collective action to improve pasture management and protection. They said that "We don't have good leaders who organize meetings and if someone shares with us good practices, the herders are willing to listen and do something; we do face a serious shortage of information here."

Herders have a strong willingness to exchange their observations and thoughts, especially with familiar local officials, and a need for such constant interaction obviously

exists in both CBRM and non-CBRM communities.  The former project local person

expressed that "Herders have potentials for collaborative action if they have closer

relationships with officials, but the reality is the *bag*[4] governors don't collaborate with the

herder groups, so herder eventually lose their trust to them."


### *Knowledge assimilated in times of the collective period*

During the focus group discussion and interviews, informants often recalled

practices and experiences from the collective period.  During the socialist period, the

collective administration organized various informal and formal types of seminars,

exposure trips and conferences to train and improve capacity of the herders.  One of the

popular means of information dissemination was publications about best practices of

champion herders, pamphlets and books on know-how of good herding practices.  There

was an enabling policy framework where best practices were purposefully disseminated

and replicated.  Cross-scale interactions between herders and other stakeholders were

encouraged and supported at all levels of state agencies. In contrast to the old system, the

present local government doesn't have resources and incentive systems to facilitate this

type of mutual learning and experience-sharing initiatives.  Knowledge or social memory

from the collective times is still used among the communities as a reference to the best

practice, "During those days movements were far better organized. This *nutag* (pasture

area) during the summer normally was rested, as the collective administration would

issue a decree to move herders to the north. When we come back to *nutag* in the fall, the

forage was abundant".

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[4] *Bag* is the smallest administrative unit in Mongolia.

A herder from Khujirt shared that during the collective period, herders were specialized to herd a certain type of animals. There were sheep and goat herders, cattle and horse herders. Since the preferred diets for each type of the livestock differ from each other, this kind of management practice was good in terms of pasture utilization and proper livestock distribution: "During the collective period there was a system where herders had one type of livestock to herd, which was convenient for making *otor* movements. Herders who had a herd of horses would go to a more distant pasture to graze and herds of sheep and goats would stay in close pastures. This grazing system supported pasture re-growth and production."

Local officials and elderly herders shared that knowledge about livestock and pasture management assimilated during the collective period was influenced by heavy subsidies and control provided by the collective directorate that created a "dependency mentality" among herders. Interviews with herders confirm that by being administratively divided into smaller regions the collective directorate was responsible for allocating special regions for reserve pastures and supplying all necessary services related to herd movements and disaster management. The state, through local livestock collectives, provided enormous subsidies to livestock production, including labor and transportation assistance in making seasonal movements, vet care and low-cost emergency fodder. An elderly herder who used to work as brigade leader described: "We had enough hay and fodder during collective period. Every herder family was supplied by enough hay and fodder. There was a big hay barn and a separate house for fodder in the *bag* center". Settlements were established in each district, which served as the headquarters for local collective and rural residents not employed as herders were

encouraged to settle in these centers (Fernandez-Gimenez, 1999).Many herders described that heavy subsidies from the collectives resulted in a mentality of dependence on the state provisions and supplies emerged among herders that eventually affected the state of traditional pasture management knowledge and practices.

### Expert knowledge

External experts and trainers disseminate technical knowledge about risk and rangeland management, skill development and rangeland monitoring.  In CBRM communities this type of knowledge was more prevalent than in non-CBRM communities.  Experts' knowledge is distinguished from local knowledge by the terms, concepts and technical justifications that are often perceived as advanced and distant by local herders.  One middle age herder shared his impression about the training activities, "We listen to the radio a lot and also we listen to the teachers who used to visit us during the project. Teachers talk good stuff, but most of what they talk is not implementable. They provide us new knowledge and understanding about pasture, dairy processing and production. I had a chance to chat with Mr. Gansukh, a trainer in business development, and his talk was very nice".

Various trainers visited CBRM-communities multiple times to conduct training on management practices such as risk management, pasture land use and rotation, fodder, silage and supplemental feeding production.   A female CBRM group herder shared her experience about her exposure to various educational activities: "It makes a lot of difference when you frequently attend training and some other educational activities.  We become more innovative afterwards. It provokes creating new ideas worth testing.  After

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hearing good and helpful information, it enriches our knowledge and we apply them into the practice by adapting to our local context."

Group-herders remembered well the names of trainers whom they got several trainings from and experimented with a series of management practices over few years. Some herders knew how to contact the familiar trainers, and when they had something relevant to ask they would talk to them by telephone and even meet them when they go to Ulaanbaatar city. A young lady from herder-group in Jinst shared that she is still in contact with her teacher in Ulaanbaatar who trained her in wool processing and felt making and who is still helping her to sell her felt products in the city. She shared that "When women herders in our group call me to show them how or to get some advice, I come and help them to make felt slippers, felt soles and felt mats and some use it for themselves and some sell it in the winter."

Herders who were involved in the rangeland monitoring activities demonstrated an understanding of how to identify and measure cover of different plant species and they had some understanding about indicator plant species for the various level of pasture degradation.  One herder group leader Batbold from Khujirt described his participation in the rangeland monitoring research and shared his experience working with the range specialists to learn monitoring methods and other important information that he previously was not aware of.

In my interview with him, Batbold demonstrated more in-depth understanding of importance of protecting pasture than any other herders from non-CBRM communities (Box 6.1).  He expressed his knowledge of the relationship between rangeland productivity and appropriate rangeland management practices.  Herders who participated

in rangeland monitoring activities obtained basic scientific knowledge and

methodological skills to identify plants and assess the wellbeing of their pastureland.

Box 6.1 A small section of narrative interview transcription with Batbold structured as a poem to illustrate a poetic analysis approach used to structure some interviews to do coding, translation and making notes of the findings and interpretations.

> *"… Dr. Altanzul with other teachers*
> *Came every year and taught us about the monitoring*
> *They used to come in spring and late July*
> *I was unfamiliar with many plants before*
> *They taught us how to identify all those plants*
*We fenced two plots for a monitoring*
*One was in the meadow*
*Another was in the open steppe*
*We did monitoring inside and outside of the fence*
*And we did it in the north and south slopes of the hills*
*In total nine areas were measured*
*Everyone who was involved in the research*
*Did recording of the measurements*
> *From our group I participated together with another herder*
> *And both of us become responsible for group pasture monitoring*
> *I told other herders in the group what I have learned*
> *It is knowledge for all of us*
> *To know about the plants dominating one pasture or another and*
> *To know about what are the unfavorable plants that grow in our*
> *pasture."*

Batbold has also shared about his experience working with the researchers, where

he has learned monitoring methods and other important information that he previously

was not aware of.  In an interview conducted with Demid, a herder from the same group,

he said as result of monitoring herders learn about plants and start watching their

pastureland.  It's likely that Batbold shared what he's learned from the monitoring

experience with others.  The result of the monitoring may have affected not only the

group herders, but also the local government to issue a decree to rest their group's winter

pasture for consecutive three growing seasons.

Experts' knowledge could be both beneficial at individual and collective levels depending on how much the knowledge is relevant to meet the needs and solution for current problems encountered by herders. Interview responses from the experts and research observation provide considerable number of instances where herders were able to incorporate a new knowledge into their management practices or build up good skills that would stay with them forever. It was evident that experts' innovative knowledge was the most useful when it was disseminated with application of the ideas. I observed that when a strong relationship was established between group herders and trainers through regular training visits and extended stays, herders were more likely to combine and integrate new learning into the practice and keep practicing them.

### Local government knowledge

Local government officials have their own way of understanding the situation that is primarily through the policies and regulations of the natural resources. Herders shared that they have few opportunities to meet with local government officials, and they feel they really need to talk to them regularly about condition of the pasture and livestock. In June 2008 after a spring *dzud* in Khujirt, one herder said, "Local authorities almost do not listen to the words of herders, they organize a *bag* meeting once a year. It is very rare when they come to talk to us, and this year they came once after the *dzud* just to get the number of perished livestock." When I interviewed government officials, one mentioned that "this spring we established a team to visit and check on herders' situation". Herders prefer meeting local officials more often to share their observations and ideas. However, local officials' knowledge is mainly generated after the events that affect the social-ecological systems, making it a kind of reactive knowledge. Officials report that the

budget they have is fixed expenses such as salary, utility costs and transportation, "it is all about budget we have and due to the shortage of money we can't do much". Therefore, it appears that the main reason for officials having few visits and meetings with the communities is lack of financial resources that prevent local government from organizing adequate outreach and meeting activities.

CBRM *soum* governors emphasized that they have developed pasture management and disaster action plans that are comprehensive but appropriate to the local context. In most cases these were partially implemented with support of non-state financed sources, as illustrated by the following quotation. "We developed *soum* disaster prevention plan of action and in 2006 we have first time approved our *soum* sustainable pasture management policy, but difficulties are related to its implementation because of our limited budget. Some activities were implemented in cooperation with and support from donor and other non-government organizations".

In interviews conducted with several governors and officials, it was evident that local *soum* government is the place where herders as well as outside agencies, projects and individuals come for first-hand help and cooperation, "*soum* citizens, international organizations and other NGOs have a willingness to cooperate with the *soum* governor's office and I think their support encourages and contributes to the implementation of action plans." The local government has good opportunities to combine multiple knowledge systems and make decisions integrating interests of all parties involved.  In CBRM *soum*s local government officials were much engaged and had interacted not only with donor projects and experts, but also with herders groups and its members more often than in non-CBRM *soum*s.

Across all study sites, in times of emergencies such as drought, *dzud* and animal disease outbreak, local government mobilizes a relief and emergency team headed by the *soum* governor, as shared a governor "during the critical events the *soum* emergency committee launches its activity. We discuss emergency situation and draw an emergency action plan and measures to be taken on the basis of the predicted duration and magnitude of the disaster".

When asked whom herders approach first to get advice and support first when they have some concerns about the livestock and pasture condition (*nutag* condition), many informants mentioned they go to the *bag* governor, "the first person we communicate is our *bag* governor and expect him to take measures within the level of his authority, then if necessary maybe talk to land officer, environmental inspector or even to the *soum* governor." The person who used to work as the SGM project's local officer mentioned that "during the project years, as a person who was in charge of pasture management they would also come to me with questions".

For the non-group herders, there were two main opportunities to talk to government officials. First at the *bag* citizen's meeting (*khural*), where herders have a forum for mutual interaction with each other and with *bag* governor. In most cases herders feel uncomfortable starting a good discussion and expressing their interest and concerns openly in this setting. The second type of opportunity is a *ger* visit that allows for open and transparent communication and face-to-face dialogue. In the words of one official, "I think when we visit herders, they are relatively open and talk freely to us".

The knowledge of the officials more inclined to be based on and learned from the organizational level above, the provincial and central government. This is due to the

instructions and policy support from the upper level of government institutions. Most reports and documents produced at the *soum* level are submitted to the *aimag* officials and therefore knowledge of local officials is less communicated to and shared with herders. However, standard procedures are in place where local *bag* and *soum* governors orally report back to local people at least once a year during *bag* and *soum* meetings.

### *Donor innovative knowledge*

External donor organizations and projects bring alternative and innovative knowledge and perspectives about collaborative resource management, participation and pasture co-management to herder communities. The former SGM project staff described how the project had a logical framework that was the basis for developing monthly, quarterly and annual work-plans and reports at the *soum* as well as at the central office level. When the project ideas and goals were communicated to the local people, project personnel in most cases would use the terms and language written in the project document. Donors often use words that are new to local people that appear to create some obstacles to innovative ideas important for pasture management. During the workshop, herders provided much deeper explanation about the word on "pasture management". In Mongolian, the word "management" doesn't have a direct translation and therefore it is used without translation by donors and experts when they design and implement projects. Herders believe that humans can never manage nature, but rather are dependent on how well land will produce for them: "We pastoralists are happy when land is giving and when it is not we can't do much. We live by and follow the mood of the sky, and herd our livestock in accordance with its mood." For herders it is more important to consider

weather variability and climatic condition before thinking about the management of the pasture. It seems that donors try to simplify the complex behavior of pastoral social-ecological systems into a prescribed concept of management that might have narrow meaning and application for herders.

When the SGM project had a target to draw boundary maps for each established herder group to make pasture management plans, non- group herders got concerned about being excluded from pasture use. "The project encouraged herders to make group pasture maps that actually led to disputes among and confrontation between group and non-group herders". In the context when the pasture is used commonly among herders in a wider neighborhood, the pasture boundary delineation caused confusion and misunderstanding among herders. The former project local staff shared that "It took a lot of elaboration and time to explain to other herders that this mapping is not restricting your movements or excluding your livestock from grazing, but for pasture management and protection purposes, and after that herders eventually understood about mapping that is done for pasture management".

Another example of the donor's prescribed knowledge application was about pasture co-management. "The project supported establishment of a pasture co-management committee in the *soum* that included representatives from local government, herder groups and project local staff. This committee's aim was to promote sustainable management of seasonal pastures through supporting herder's initiative and organization." During the project implementation period this committee was one form of *soum*-level information and knowledge sharing forums where representatives from herders had an equal position to discuss matters related to the pasture condition and

utilization with diverse stakeholders. However, when the project phased out in early

2008, during my field work in June-August, the committee ceased operating and has not

met again in both Khujirt and Jinst.

Herders as well as local officials expressed how local knowledge of herders was

enriched by interacting with and learning from other, different knowledge carriers. A

local official mentioned that the donor project used innovative and diverse forms of

information dissemination to increase awareness and participation of the herder groups.

A former SGM project local person was proud to share that they "organized a mobile

conference called 'herder-to-herder learning' and this conference visited several herder

neighborhoods where our group-herders shared their lessons and practices with non-

group herders in the *soum*".  Within a few years of project implementation, donors

demonstrated practices and learned lessons of herder group-based approach to pasture

management and livelihood development. With sufficient resources available from

donors, it was evident that CBRM-communities were more knowledgeable and applied

into practice different ideas and topics relevant to their livelihoods and pasture

management practices.

Another important observation of mine was the terms and concepts from the

donor's project documents that CBRM-herders used during their interview. The most

common words and phrases in herder's language were the following: "collaboratively",

"collectively", "collective efforts", "revolving fund", "in collaboration with …",

"conservation", "rangeland management", "herder training", "monitoring", "capacity

building" and "produces results". Integration of new terms into local language was

interesting and the group herders, local official and local project staff used them quite

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often during the interviews. In contrast, non-CBRM herders did not say these words much, but in both types of communities there were a lot of local words, terms and phrases used to explain their opinions. The following common words were very popular: "*nutag*[5]", "*khot-ail*", "*saahalt*", "*otor*", "rich land", "wealth of the nature", "learn from elders", "experience", "lesson", "weather dependent", "livestock ", "sacred hills", "from generation to generation", "accommodate", "accept them", "*uvuljuu, namarjaa*[6]", "search for".

When herders asked if they received any kind of the documented results and lessons of the donor project they mentioned that they have training handouts, brochures and agreements produced during the period of the project implementation, but not reports and results. The donor project mobilized significant financial and human resources to produce outputs such as formal committees, agreements and pasture management plans that were somewhat utilized for cross-learning for pasture management. The donor's knowledge produced during the four years of SGM project implementation is maintained by herders and officials in their memories and experiences.

Discussion

***Knowledge integration for building social-ecological resilience***

My analysis compared the presence, sharing and combining of different knowledge types in CBRM and non-CBRM communities. In CBRM communities, all five types of knowledge were evident, whereas in non-CBRM communities, expert knowledge and donor innovative knowledge were missing. In the CBRM communities

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[5] *Nutag* in Mongolian it describes about homeplace. *Nutag* is discussed in Chapter 7

[6] *Uvuljuu* and *khavarjaa* in Mongolian it means a campsite where they put their *ger* during the winter and summer

mutual knowledge and experience sharing practices were represented by the integrative meetings in the forms of regular group gatherings, occasional meetings with local officials and participation in various training and awareness activities. Though the traditional forms of the information exchange among herders are widespread in both CBRM and non-CBRM communities, herders from CBRM communities had experienced communication in different institutional settings.

Integration of knowledge systems commonly occurred in response to critical events such as disaster, *dzud* and drought (Marin, 2009; Murphy, 2011). In these critical situations pastoralists as well as the local government administration have extended consultation among themselves and between herders and government to improve the accuracy of weather condition assessments and predictions important to devise strategies to overcome the disaster (Marin, 2009). Apart from critical climatic events, results demonstrated that in CBRM communities different knowledge types are integrated as a result of adoption of participatory approaches, expanded networks, and co-management initiatives, as has been found in other studies of co-management outcomes (Fernandez-Gimenez et al., 2006; Arnold & Fernandez-Gimenez, 2008). It seems that organized CBRM groups create formal conditions where new information is welcomed to compare with and complement existing local knowledge, whereas non-CBRM communities lack facilitation and leadership for such information exchange.

Herders from the CBRM communities provided more positive assessments and attitudes towards networking and cooperation with other stakeholders. They believe that an intermediary institution's role was critical to communicate their concerns and interests across multiple scales and networks. Local project staff, local government officials, local

trainers, herder group leaders or recognized elders could function as boundary spanning institutions (Reid et al., 2009). Adaptation to gradual and significant changes should involve continual engagement among experiential, experimental and innovative knowledge carriers to create boundary-spanning teams of members who bridge between institutions at different, nested scales (Levin, 1998; Folke et al., 2003, Reid et al., 2009).

In the study sites, the local government expected that donors' capacity and resources would provide alternative solutions to local rangeland management problems. Donors in turn facilitated and advocated for solutions based on cooperation with and empowerment of the herders who are more organized than customary neighborhood . However, information and knowledge-sharing in CBRM communities was often one-way, donors-to-communities and experts-to-communities, missing opportunities for mutual learning and sharing of relevant languages and terminologies.

The ability of herders to integrate diverse types of knowledge is determined by the way new information is transferred. External knowledge could be successfully blended with local knowledge and applied into practice when it is circulated orally face to face, a method which is easily accepted by community members. Herder communities speak up and feel more comfortable in gatherings and meetings that are open-ended in terms of time and number of participants who can speak, as it was observed in other indigenous communities (Ross et al., 2011). New forms of information dissemination and knowledge display, such as agreements, written manuals and brochures appears to create context for knowledge exchange and integration in the short run. To make any information revealing and refreshing for the herders, setting of appropriate learning platforms is important (Keen et al, 2005). Appropriate environment would include

familiar faces, familiar terms and familiar information exchange norms. Herders mentioned about their information sharing daily practices: "we would normally visit each other and talk over tea exchanging our news."

Bringing different kinds of knowledge together and complementarity of these knowledge systems helps increase the capacity to learn (Berkes, 2007). In both CBRM and non-CBRM communities, evidence shows that mutual information and experience sharing is the part of the mutual support system in the herding communities. Herders' ability to listen, observe and follow practices of more experienced herders is a familiar and common method to learn from others. Sharing of lessons, mutual consultation and face-to-face knowledge exchange are commonly practiced from parents to children, from relative to relative and from *ger* to *ger* (traditional felt yurt). It appears that CBRM herders have more formal opportunities to practice such knowledge exchange with diverse network channels than non-CBRM communities.


Conclusions

In the study areas, five distinctive knowledge types were revealed to be the most common: local knowledge, expert knowledge, donor knowledge, local government officials' knowledge and knowledge accumulated during the collective-period. All these knowledge types are available in CBRM communities, whereas non-CBRM communities lack expert and donor knowledge. These two types of herder communities have some differences in terms of use and integration of existing knowledge types. The establishment of the community-based institutional frameworks creates some formal space to combine multiple knowledge systems at smaller social scale to manage local rangeland resources (Marin, 2009). Local or traditional knowledge on herd and rangeland

management is the common knowledge herders in both communities rely on daily basis (Fernandez-Gimenez, 2000). Mongolian herders have norms of reciprocity and flexibility that are common strategies to exchange their knowledge and other resources with each other (Murphy, 2011; Fernandez-Gimenez & LeFebre, 2006). As the mechanisms for enhancing social and ecological resilience are often inherent in the communities (Davidson-Hunt & Berkes, 2003), traditional forms of cooperation and mutual support system was a base for novel and traditional knowledge blending in natural resource management. Since traditional knowledge is not static, but in continuous development (Menzies & Butler, 2006), innovative knowledge of experts and donors contributed to renewal of the local knowledge among herders in CBRM communities creating new types of local knowledge among more formally organized herders.

The new knowledge must be relevant to other knowledge to become meaningful and knowledge acquired meaningfully is retained longer and can be applied in a wide variety of new problems and contexts (Novak, 1998). Well established relationship and communication methods are critical for herders to relate new information to prior knowledge (Novak, 1998). The challenge in knowledge integration for learning could be when outside knowledge carriers present their information to herders without establishing committed relationship and communication with them and without use in practice. With established trusted relationship they can avoid one-way knowledge exchange and issues relation to equity and inclusion.

The experiential knowledge generated by local communities is the most important resource they have and this knowledge system is often ignored by knowledge-holders themselves (Warren, 1995). Therefore, resilience of the coupled human-natural systems

is determined by the ability to get relevant information from diverse sources for meaningful learning and practice. Integration of the different types of knowledge systems encourages the evolution of renewed local or community-based forms of cooperation and institutions that are sensitive to the building of social-ecological resilience.

# Chapter 7  Peace of Mind about Change

**Introduction**

To understand the dynamics of a complex system, a resilience perspective has emerged that focuses on the complex relationships between ecosystem development and social dynamics (Folke, 2006; Gunderson et al, 2002).  Resilience thinking includes systems thinking, and it provides a framework for viewing a social-ecological system as one system continually adapting through cycles of change (Walker & Salt, 2006).  Resilience has been defined as:

- The amount of change/stress a system can undergo and still be in the same domain of attraction (e.g. still have capacity to provide goods and services to humans)

- The degree to which the system us able to self-organize (it requires little human interventions to maintain its functions and structure by withstanding various management errors and disturbances)

- The degree to which the system express capacity to learn and adapt (e.g. have adaptive capacity for social-ecological systems) (Holling 2001, Walker et al, 2004)

Indicators of resilience are hard to define, because indicators that are appropriate for the current regime may become useless as ecological and social expectations shift (Carpenter et al., 2001).  Resilience indicators are fluid and flexible, because resilience "in one time period or at a particular scale can be achieved at the expense of resilience in a later period or at another scale" (Carpenter et al., 2001, p. 779).  However, a framework

for analyzing social-ecological resilience was proposed that provides fundamental questions and considerations for policies and practices to enhance resilience based on a participatory approach (Walker et al., 2002). Walker et al. (2002) developed a four-step process of resilience analysis, where the first two steps generate information about the past and current state of the system to predict major issues about future states and major unpredictable and incontrollable drivers. Once this information is generated, the third step is designed to analyze system resilience using modeling and non-modeling methods to understand the interactions and identify attributes of the social-ecological system that affect resilience (Walker et al., 2002). The fourth step is about resilience management and how emerging understanding of the system's resilience could impact policy and management actions (Walker et al., 2002).

Walker & Salt (2006) described nine attributes for a resilient social-ecological system, including diversity, ecological variability, modularity, acknowledging slow variables, tight feedbacks, social capital, innovation, overlap in governance and ecosystem services. Measuring these attributes would help us to understand the resilience of a particular social-ecological system. Four principles of resilience building defined by Folke et al. (2003) enhance the adaptive capacity of social-ecological systems. They suggest that these factors interact across temporal and spatial scales to deal with nature's dynamics in social-ecological systems: 1) learning to live with change and uncertainty, 2) nurturing diversity for reorganization and renewal, 3) combining different types of knowledge for learning and 4) creating opportunity for self-organization toward social-ecological sustainability. These four elements of building resilience and adaptive

capacity in social-ecological systems were measured in this current study to explore the concept of resilience in the arid and semi-arid rangeland regions.

Rangeland ecosystems behave as complex adaptive systems that demonstrate resilience dynamics, a nested hierarchical structure, cross-scale interactions, non-linear processes and components that adapt to disturbances (Walker & Abel, 2002). Research is needed to obtain a better understanding of the rangeland as a coupled adaptive system by exploring: the links between the social and ecological subsystems, the conditions under which the changes occur, and the dynamics of regulatory policies in face of changes in climate, markets and in government (Walker & Janssen, 2002).

This chapter will discuss the state of resilience building of Mongolian pastoral communities in relation to formally organized and informal forms of cooperation in rangeland management. The previous three chapters discussed three principles of resilience building: 1) learning to live with change, 2) diversity and redundancy, and 3) knowledge integration for learning. Indicators of each of these principles were measured to determine its contribution to building resilience and adaptive capacity in the face of social-ecological changes among formal community-based herder groups and traditional herder neighborhoods.

In this concluding synthesis chapter, I first briefly review the conclusions from my assessment of the first three principles (Chapters 4, 5 and 6) in adjacent herding communities with and without community-based rangeland management. Second, I discuss the processes and strategies of reorganization and renewal in these communities-- assessing the fourth principle of the resilience building. Finally, I conclude by discussing about what the current study can contribute to the resilience framework proposed by

Folke et al. (2003) that would better capture the specific dynamics, complexity and values of the Mongolian pastoral social-ecological system. In doing this, I take a herder's stance rather than that of a scientist and suggest framing resilience as "peace of mind about change and renewal." There is a native framework emphasizing human-nature-livestock relation (Avarzed & Sodnoi, 2008) that may serve as a foundation for community resilience building and as a basis for adaptation in the complex pastoral social-ecological systems in Mongolia.

This study examines to what extent CBRM and non-CBRM communities re-organize or renew themselves in response to changing social-ecological environments. I attempt to reveal social and ecological practices and strategies developed among these communities that deal with environmental uncertainty and variability as well as with socio-economic upheavals. I discuss innovative and adaptive behavior and practices to explore how herders reorganized and adapted to different external and internal factors affecting their social-ecological pastoral systems.

The main proposition is that CBRM communities demonstrate more resilience indicators than non-CBRM communities. This overarching hypothesis is divided into two sub-propositions:

Sub-proposition 1: Herders with CBRM experience demonstrate strategies to cope with effects of combined novel and cyclical changes, greater number of diversity-enhancing practices and capacity to integrate different knowledge systems for learning. Sub-proposition 2: Herders with CBRM experience have more novel practices and adaptive strategies as a response to changes in the society and ecosystem.

**Study Sites and Methods**

This study was conducted in two provinces of Mongolia, particularly
Uvurkhangai (pronounced as Uvr-han-ga*) located about 500 km west to Ulaanbaatar
capital city and Bayankhongor *(pronounced as *Bain-hon-gr)* is about 650 km southwest
to Ulaanbaatar (Figure 7.1).  One pair of sub-provinces (*soum*s) selected in each of the
provinces that represent two ecological zones.  Uvurkhangai *soum*s are Khujirt
(pronounced as Hu-ji-rt) and Kharkhorin (pronounced as Har-ho-rin) in the mountain
steppe and Bayakhongor *soum*s are Jinst and Bayantsagaan (Bain-tsa-gan) in the desert-
steppe.



Figure 7.1 Location of research sites

The research sites have been grazing grassland for centuries for various types of
pastoral livestock such as sheep, goats, cattle, camel, horses and yaks.  The type of
livestock varies one site to another.  Jinst and Bayantsagaan *soum*s are dominated by
sheep and goats, with camels, horses and a few cattle, whereas in Khujirt and Kharkhorin

a herd composition will be more diversified by having yak and a greater proportion of cattle.

Research sites include two pairs of *soum*s: Bayantsagaan *soum* adjacent to Jinst and Kharkhorin to Khujirt.  Primary sites, Jinst and Khakhorin, are herding communities with community-based rangeland management (CBRM) organizations.  Control sites are Bayantsagaan and Kharkhorin, which do not have such organizations, but traditional neighborhoods of herding communities. The unit of analysis in the primary sites was a herder group practicing CBRM, and in the control sites were the traditional neighborhoods of herders (Table 7.1).

Table 7.1 The research field sites and names of herder groups and traditional neighborhoods

| Province | Ecological zone | Paired sites | | | |
|---|---|---|---|---|---|
| | | CBRM herders (group herders) | Approx. no of households | Non-CBRM herders (non-group herders) | Approx. no of households |
| Uvurkhangai | Mountain steppe | Khujirt<br><br>CBRM group names and established year:<br>– Olonburd, (2003)<br>– Ikhburd (2003)<br>– Hangimust (2003) | <br><br><br>12<br><br>8<br>9 | Kharkhorin<br><br>Traditional neighborhoods place name:<br>– Shankh | <br><br><br>70 |
| Bayankhongor | Desert steppe | Jinst<br><br>CBRM group names and established year:<br>– Orgil (2003)<br>– Bodi (2003)<br>– Sharkhad (2003)<br>– Devshilt (2003)<br>– Sar-Uul (2006) | <br><br><br>8<br>10<br>8<br><br>7<br><br>10 | Bayantsagaan<br><br>Traditional neighborhood place name:<br>– Tsetsen Uul<br>– Bayantsagaanii uvur | <br><br><br>20<br>20 |

In Jinst and Khujirt *soum*s the UNDP-funded Sustainable Grassland Management (SGM) project was implemented by the Ministry of Food and Agriculture in 2003-2007 (UNDP, 2008).  The project facilitated formation of herder community based

organization with the purpose of improving pastureland ecological status in parallel with improving the herders' livelihoods. In this study, I included 8 community-based herder groups of Khujirt and Kharkhorin. There are at least three traditional neighborhoods lar*ger* than herder groups in number of households included in the research and these group and non-group herder communities range in size (Table 7.1).

The data for this study consisted of qualitative data that were collected from 2008-2010. The qualitative data was comprised of interviews, focus groups, workshops, observation and document review. I conducted 39 in-person interviews and nine focus group discussions and three workshops, which were attended by 121 people. Out of total 160 informants, 79 were males and 81 were females. In terms of occupational engagements, there were herders, government and agency officials and the "Sustainable Grassland Management" project former staff and advisors (Table 7.2).

Table 7.2 The number of informants of each gender

| | Informants | Date | Male | Female |
|---|---|---|---|---|
| *Focus group:* | | | | |
| 1. | Jinst – Sharhad herder group | 7/17/2008 | 2 | 3 |
| 2. | Jinst – Sar-Uul herder group | 7/17/2008 | 4 | 5 |
| 3. | Jinst – Bodi herder group | 7/16/2008 | 0 | 5 |
| 4. | Jinst – Sharhad herder group | 6/24/2009 | 2 | 5 |
| 5 | Bayantsagaan – in Erdene's *ger* | 7/13/2008 | 3 | 3 |
| 6 | Bayantsagaan – Idermunkh | 7/14/2008 | 4 | 5 |
| 7 | Khujirt – Ikhburd (Batbold) | 6/23/2008 | 2 | 3 |
| 8 | Khujirt – Olonburd (Dorj) | 6/22/2008 | 4 | 3 |
| 9 | Kharkhorin – Bileg-Urnukh's *ger* | 6/25/2008 | 3 | 2 |
| *Workshops:* | | | | |
| 1 | Jinst | 6/25/2009 | 15 | 19 |
| 2 | Bayantsagaan | 7/30/2009 | 9 | 7 |
| 3 | Kharkhorin | 6/14/2009 | 8 | 5 |
| *Interviews:* | | | | |
| 1 | Bayantsagaan | 7/10-16/2008 | 5 | 6 |
| 2 | Jinst | 7/17-22/2008 | 3 | 4 |
| 3 | Khujirt | June-July, 2008 | 7 | 3 |
| 4 | Kharkhorin | June-July, 2008 | 5 | |
| 5 | UB | June-August, 2008 | 3 | 2 |
| | Total | 160 | 79 | 81 |

I organized four field trips in two consequent summers of 2008 and 2009 to collect the field data.  In 2008, first field one-week field trip was in June and the second trip was more than 2 weeks from July 10-25.

In addition to interviews and focus group discussions, I organized three workshops with representatives of the herding communities and local government involved in my interviews and focus groups in 2008 to present them preliminary conclusions and interpretations of the data. Having community people actively participating in the workshops allowed me to use some elements of participatory research, which has an advantage of constructing a more detailed and accurate knowledge base about the social and cultural contexts of the study sites (Arnold & Fernandez-Gimenez, 2007).

There are a broad range of approaches to qualitative data analysis available that allow qualitative researchers to reveal systematic patterns and meanings in their datasets. The data analyses follow three flows of data analysis stipulated by Miles and Huberman (1994). According to this approach three analytical steps were implemented in parallel or concurrently to each other: data reduction, data display, and conclusion drawing/verification (Figure 7.2).
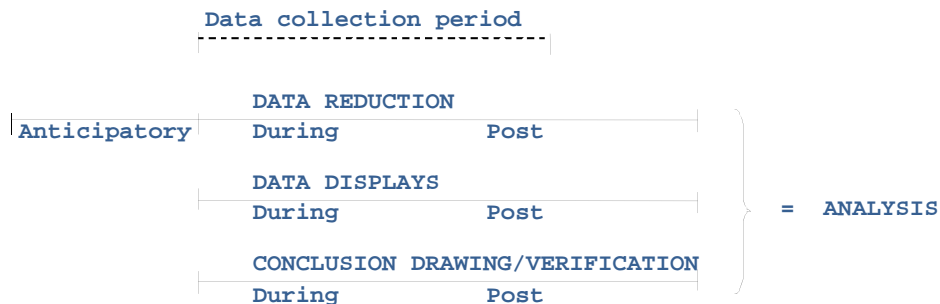


Figure 7.2 Components of Data Analysis: Flow Model
(Miles & Huberman, 1998)

While collecting my qualitative data I did a preliminary analysis and interpretation of the data. Preliminary data analysis is ongoing process which could be undertaken every time data are collected (Grbich, 2007). Almost after each interview, focus group or observation exercise, some distinctive patterns of meaning were noticed, but I used to hold these kinds of conclusions light until data collection is over.

From my interviews, focus group discussions, workshops and field journals, I have generated more than 400 pages of data. After transcribing interviews and focus group discussions, I started to reduce my data by coding them using Nvivo qualitative analytical software (NVIVO, 1999-2000). Coding is often the first step in organizing the data in a meaningful way that condenses the bulk of data into analyzable units by creating categories (Coffey & Atkinson, 1996). Prior to the field work, I developed a preliminary list of codes using my research questions and sub-questions (see appendix). Codes could be defined as "tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study" (Miles & Huberman, 1996, p. 56). There were 14 codes and over 100 sub-codes in the initial list and using them I coded my data in Nvivo. Since the initial codes were theoretically designed and predefined, I found some level of rigidity, redundancy and irrelevance in codes list. Some codes were used too much and some codes were broken down into several subcodes. Therefore, after coding about one third of my data, I have slightly revised my codes by dropping some, combining several codes in one, and renaming some into more easily readable codes.

In parallel to coding, a number of data analysis methods were used such as research memos, content analysis, domain and taxonomic analysis, constant comparative analysis and poetic analysis. Having multiple data analysis techniques provided me with

flexibility in choosing right approaches in analyzing various types of data and led to greater level of description, interpretation and elicitation throughout the research process (Creswell, 2003). With help of these analytical approaches, my dataset become much reduced, focused and organized allowing me to present and display them to further enhance analysis and draw conclusions. In my analysis, I generated matrices to provide a quick summary of considerable chunks of data as an overall snapshot (Grbich, 2007). I used poetic analysis approach to analyze some of my interviews taken from herders. For this I first structured the narrative transcript as a poem and then coded it. Rather than using my preliminary set of codes, I coded them naturally according to the meanings the phrases attach to. This resulted in a quite interesting set of data that were clustered in several domains. To generate meanings out of these data, I formed patterns and themes, made comparisons, looked at the contrasts and relationships to build a coherent understanding (Miles & Hiberman, 1998). To evaluate the evidence in support of or in contradiction to my propositions, I triangulated different data sources of information (Creswell, 2003).

**Results**

*Resilience Principle 1: Learning to live with change*
   Chapter 4 discussed the results on learning to live with change. The results are based on the qualitative research to explore whether the herder communities who practice CBRM developed more practices and social institutions that build up adaptive capacity in the face of social-ecological changes than non-CBRM communities. Changes faced by the pastoral social-ecological system were both novel and cyclical. Novel changes were

associated with transition to market economy and novel events such as market liberalization and globalization were not common problem in the history of Mongolian pastoralists. Cyclical events such as climate-driven vegetation dynamics is part of the experience of the herders (Fernandez-Gimenez, 2006). Pastoralists have built up sufficient memory to live with and adapt to negative effects of drought and *dzud* as well as major socio-economic and political transitions happened in the 20<sup>th</sup> century. However, the combined effects of novel and cyclical disturbances over the past two decades hit hard on the resilience of the pastoral communities in Mongolia overwhelming their adaptive capacity. Newly established government organizations under the struggling transition economy system didn't have the appropriate policy framework and experience to realize and address evolving effects of such changes.

To better illustrate different levels of findings in the pastoral social-ecological systems, the results are described in terms of outputs, process outcomes, ecological and socio-economic outcomes. The main reason to describe the results in four different levels is to meaningfully document results that were achieved or not achieved beyond goals and objectives set for collaboration.

Outputs (Table 7.3) were easily measurable with evidence of established agreements such as group pasture management sketch maps, group revolving fund operation regulations and *soum*-level pasture co-management committee rules and regulations. Policy outputs at *soum* and *aimag* levels influenced development of sustainable rangeland management plans at the local level and approval of government action plans that integrated objectives of sustainable rangeland management at *aimag* and

national levels. It is important to note that the output level results were mostly achieved during the SGM project implementation timeframe of 2003-2007.

Table 7.3 Output results of CBRM communities in two study soums in Mongolia.

| Outputs | Results |
|---------|---------|
| Agreements | ■Group pasture management plan<br>■Group revolving fund operation regulations<br>■Group risk management plan<br>■Pasture Co-management Committee rules & regulations at *soum* level |
| Policy outputs | ■*Soum* pasture management program that supports collaborative actions<br>■Jinst Sustainable Rangeland Management Program<br>■Local government plan of action integrated actions about rangeland management and conservation |
| Resource mobilization | ■Obtained matching grant to the group revolving fund<br>■Grants were mobilized to build reserve pastures and monitoring plots<br>■Income generation equipments and tools were obtained at subsidized rates<br>■Wells were rehabilitated<br>■Skill training participation |

In terms of socio-economic outcomes, CBRM communities were one step ahead of non-CBRM communities in experimenting with alternative livelihood development initiatives such as dairy production and marketing, wool processing and felt making, and gardening (Table 7.4). These activities not only served as means to improve their seasonal income, but also developed their capacity for collective efforts. Herders saw some short-term benefits and results from their innovative cooperation with each other as well as with local government and external donor projects that provided incentives to try some other actions as a group.  They collectively agreed to rotate pasture and control grazing duration of their winter and spring pastures.  In contrast to non-CBRM herders, CBRM herders established small areas as reserves to cut hay in the fall and graze livestock during the days of blizzard or storms.

Table 7.4 Socio-economic outcomes of CBRM and non-CBRM communities

| Socio-economic outcomes | CBRM socio-economic outcomes | Non-CBRM socio-economic outcomes |
|---|---|---|
| Capacity building and knowledge | ▪Improved rangeland and risk management<br>▪Increased relevant legal knowledge<br>▪Various income-generation skills | ▪Occasional informal training organized by local government<br>▪Rely on personal knowledge and experience as well as on relatives |
| Attitude | ▪Have learning attitude<br>▪Understand that collective action can make improvements in grassland<br>▪Recognition of their responsibilities over the health of pasture<br>▪Recognition of long term benefits vs short-term gains<br>▪Greater sense of responsibility and trust | ▪Not formally assigned roles and responsibilities<br>▪Concerns are at the individual level<br>▪No collective actions to improve pasture<br>▪Traditional collective actions<br>▪Low awareness and urgency to improve their pastureland |
| Communication networks | ▪Herder-to-herder<br>▪Group-to-group<br>▪Cross *soum* interaction<br>▪Herder-to-experts (trainers)<br>▪Herder-to-local government<br>▪Herder-to-donor<br>▪Herder-to-NGO | ▪Herder-to-herder<br>▪Occasional cross *soum* interaction<br>▪Herder-to-local government |

Process indicators (Table 7.5) such as participation, engagement and leadership were evident in CBRM communities, as groups had internal rules, leaders and tasks that helped them to focus on mutually desirable outcomes, whereas non-CBRM communities exercised customary forms of cooperation and networking: visiting each other for chat, sharing information, checking on each other's herds, etc. According to informants, these process outcomes were achieved especially when the support and collaboration from the donor project was still available and they mentioned that when the project was finished the level of participation, engagement and leadership decreased.

Table 7.5 Process indicators of CBRM and non-CBRM herders

| Process outcomes | CBRM communities | Non-CBRM communities |
|---|---|---|
| Inclusiveness/ Diversity | ▪Involvement of all herders who use the same pasture<br>▪Equal opportunities for training & exposure<br>▪Participation and engagement in the group meetings and activities | ▪Less knowledge about group and group activities |
| Facilitation & leadership | ▪Active group leadership and management<br>▪Local leadership recognized and promoted | ▪Local leaders are not promoted<br>▪Local people with leadership capacity is not recognized and mobilized |
| Rangeland management practices | ▪Established group reserve pastures<br>▪Well rehabilitated and managed<br>▪Monitoring of rangeland<br>▪Rotational grazing of seasonal pastures<br>▪Frequent movements | ▪Individual herder families have their small reserves |
| Governance | ▪Certain set of rules established at a group level<br>▪Access to local knowledge and feedback from others<br>▪Organize group meetings<br>▪Frequent interaction with local government<br>▪Have greater interactions with outsiders and other herder groups | ▪Meeting limited to *bag* khural meeting<br>▪No constructive feedback to the local government |

There are fewer direct results measured that demonstrate differences in ecological outcomes between the two types of communities, but there were practices implemented by CBRM groups that increased short-term pasture productivity (Table 7.6). For example, CBRM herders fenced 1-3 ha of pasture, establishing a reserve pasture to harvest hay in the fall and graze livestock in times of emergencies. In contrast, although non-CBRM herders understand importance of protecting the reserve of *Achnatherum spp.,* a tall grass that is considered one of key sites in time of emergencies, no collective action to protect *Achnatherum spp.* pastures was initiated during the study period.

Table 7.6 Ecological outcomes of CBRM and non-CBRM communities in the study soums in Mongolia

| Ecological outcomes | CBRM results | Non-CBRM results |
|---|---|---|
| Vegetation | ■Improvement in range productivity as a result of protecting for three consequent years the winter and autumn range from grazing during the growing season (UNDP, 2008; Baival et al., 2011)<br>■Short-term increase in pasture productivity by establishing reserve pastures | ■No organized protection of winter pasture<br>■"It seems that organizing as a group is quite beneficial. It won't hurt if few of us who live closeby and who are relatives come together and organize the group. The key benefits is to collectively sell the livestock products in the market" |

Each level of results (outputs, process indicators, socio-economic outcomes and ecological outcomes) demonstrates the presence of differences in collective action between adjacent communities with and without community-based rangeland management achieved through CBRM activities. The role of CBRM in building resilience of social-ecological complex system is illustrated in a system diagram, in which I show how social and ecological components are linked through community-based rangeland management practices (Figure 7.3).
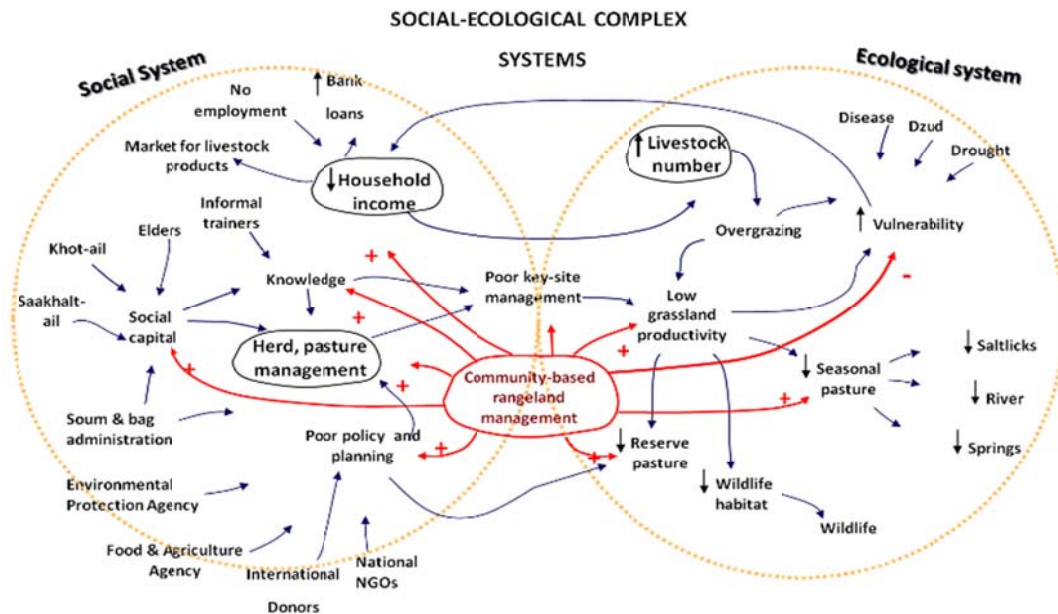


Figure 7.3 Link between social and ecological components through CBRM practices in the study soums in Mongolia.

For example, customary social groups such as *khot-ail* and saahalt-ail jointly

formed a community-based herder organization that improved management of key

rangeland resources, created reserve pastures, encouraged seasonal movements, and

improved the knowledge and social capital of herders. In terms of policy development,

CBRM study sites served as a site to experiment with community-based natural resource

management and provided significant information and lessons not only for local

government, but also for provincial and national level policy makers to review the

existing policy on rangeland and herd management in Mongolia.


### *Resilience Principle 2: Diversity and Redundancy*

In Chapter 5, the results of my quantitative analysis of diversity demonstrate that

CBRM communities have greater diversity and redundancy in communication networks,

information sources, and management practices, specifically mobility. In the desert

steppe, CBRM herders moved significantly more often (7.1 times within two years) than

non-CBRM herders (6.4 moves). The average number of moves per year was also

significantly greater for group herders (3.5) compared to non-group herders (3.1).

However, in the desert steppe non-CBRM herders moved greater distance (98 km) per

year than CBRM herders (70 km).

Non-CBRM herders faced lack of access to information and networks, whereas

community-based organizations created institutional structures at local scales to promote

local solutions and practices in rangeland management, such as mobility for example. In

both CBRM and non-CBRM communities, pastoral livestock production if the main

source of income and cashmere production is the most reliable source of income in both

desert steppe and mountain steppe regions. There is a well-developed permanent

cashmere market all around the country, but the market for meat, dairy products and sheep wool varies depending on the location and infrastructure development. The CBRM herders demonstrated better capacity to add value to their goods by utilizing their skills obtained from the training on wool processing, felt making and maximize production of dairy products for outside markets. The group herders were more organized to benefit from organized training and marketing events, as they had more trust to each other to share costs associated with the travel and other expenses. Geographic location and poor access to relevant information and networks are common to herders in both types of communities. However, formal community-based herder organizations are more organized to deal with these limitations and get collective benefits from expanded networks and sources of information.

### *Resilience Principle 3: Combining knowledge systems for learning*

In Chapter 6, I identified five distinct knowledge types: local herder knowledge, expert knowledge, donor knowledge, local government knowledge and knowledge accumulated during the collective-period. All these knowledge types are available in CBRM communities, whereas non-CBRM communities lack expert and donor knowledge. These two types of herder communities also differed in terms of use and integration of existing knowledge types. The establishment of the community-based institutional frameworks allows combining of multiple knowledge systems at the smaller social scale to manage local rangeland resources.

Local or traditional knowledge of rangeland management was equally important and functional in both types of communities. Local knowledge is comprised of

ecological knowledge, pasture management knowledge and knowledge of culture, people and norms. The nomadic culture of Mongolian herders calls them to cooperate for rangeland resources even in the absence of formal community-based organizations. However, the CBRM communities show evidence that the customary terms of cooperation have been strengthened by exposure to other knowledge types and efforts to link them into existing knowledge types. Ordinary herders being part of more organized groups cooperated and networked with local officials and trainers more often than non-CBRM communities and had group leaders and activists who communicated their concerns and interests across multiple scales and networks. It appears that at local community level, herder groups establish a kind of structure that spans boundaries of different but local stakeholders through group facilitation and leadership (Reid et al., 2009).

Novel knowledge and traditional knowledge systems can best be integrated at a small scale, in this case at the social scale of a herder group. It appears that CBRM herders could attract more formal opportunities to practice such knowledge exchange with diverse network channels than non-CBRM communities. In non-CBRM communities herders lack opportunities to engage in meaningful discussion and information exchange with experts, officials and other communities to share their traditional knowledge and practices in herd and pasture management. Apart from integrating knowledge from different sources, the formal herder group environment provides the opportunity to blend knowledge across generations of herders, allowing youn*ger* herders to learn and experiment. In this perspective, CBRM contributes to the emergence of a new generation of herders and new traditions of knowledge systems.

The new knowledge must be relevant to other knowledge to become meaningful, and knowledge acquired meaningfully is retained lon*ger* and can be applied in a wide variety of new problems and contexts (Novak, 1998). A relevant environment and method of information transfer is critical for herders to relate new information to prior knowledge (Novak, 1998). The major challenge in knowledge integration for learning is how diverse knowledge carriers use and present their knowledge. Pastoralists prefer face to face knowledge exchange and they also prefer using local terms and explanations. During workshops where I invited herders to share and the same time get their constructive comments on my first year's results, herders expressed their opinions easily and openly in one of *ger*s (traditional felt yurt) among trusted herders in the neighborhood. I tried using common language and words to share my results to them using examples from their place and same time friendly bold letter-displays of key finding in laminated posters worked well to provoke discussion among them.

The way new information is transferred determines the ability of herders to integrate diverse types of knowledge. In other indigenous systems, external knowledge is easily accepted by community members when gatherings and meetings are open-ended in terms of time and number of participants who can speak (Ross et al., 2011). Face to face discussion and use of local words and terms could create an initial entry point for knowledge exchange and integration in the beginning. New forms of information dissemination and knowledge display, such as extensive formal meetings, agreements, written manuals and brochures, would be probably more effective using in the long-run when herders feel engaged and feel ownership of the findings.

### *Resilience Principle 4: Reorganization and renewal*

In this section, I present results related to processes and strategies of reorganization and renewal in CBRM and non-CBRM communities that assess the fourth principle of the resilience building. I will also present results to answer to sub-proposition 2, which states that communities with CBRM experience have more novel practices and adaptive strategies as a response to changes in the society and ecosystem than non-CBRM communities.

I begin my analysis of resilience of the pastoral social-ecological systems with a historic reconstruction of the events that have occurred in the period of 1950-2011, focusing on the surprises and crises that have arisen as results of both external influences and internal instabilities.  Second, I present results on diversity in the face of disturbance and different scales of cooperation among pastoral communities. Finally, I present results on the commonalities across different types of herder communities—with and without formal CBRM.

### *The cyclic phases of Mongolian herding*

A sequence of adaptive cycles for the pastoral social-ecological systems is illustrated in the Figure 7.4.  This figure consists of three major interacting adaptive-renewal cycles of different timeframes that helps to understand cycles of changes in complex social-ecological pastoral systems in Mongolia from the beginning of collectivization (1950) time until the present (2011).

Table 7.7 provides characteristics for each of three lar*ger*, slower adaptive cycles and the adaptive responses that affect resilience for each of the subsequent cycles. Three major disturbances caused rapid release of each cycle: democratic revolution (1990),

nationwide *dzud* (winter disaster) (2000-2002) and another *dzud* in 2009-2010. The table also provides examples of multiple nested small and fast cycles that generate adaptive responses and transformations in the face of perturbations
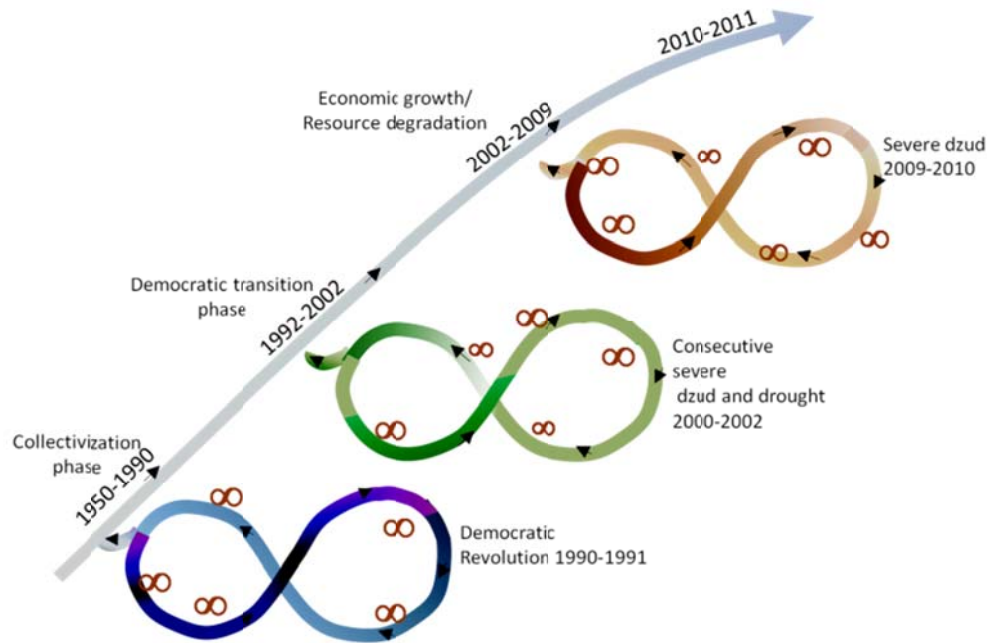


Figure 7.4 A sequence of the adaptive cycles of Mongolian pastoral social-ecological systems (Small and fast adaptive cycles are marked with "∞")

The collectivization phase (1950-1990)

During the collectivization period of 1950-1990, the state livestock collective farms in Mongolia played a significant role in allocating pastures and campsites and directing seasonal movements based on pre-existing customary rights and traditional pasture management practices (Fernandez-Gimenez, 2001). Several decades of the exploitation and conservation phase dominated during the collective period, in which the rapid growth of socialist rural development structures with herd specialization and institutionalization of collectives were fueled by development of a centrally-planned socio-economic regime and support of former Soviet Union and other CIS countries.

Because each collective had a defined territory for which it was responsible, and the collective allocated grazing areas within its territory to herder work teams, such a system did not result in open access. Pastoral land use practices remained mobile and herding families were generally supported by trucks and deliveries of hay, thus limiting negative impacts on the landscape (Sneath, 1998). In the early 1990s, national level structural changes in Mongolia began immediately following the democratic elections in 1990.

Democratic transition phase (1990-2000)

As a result of the democratic revolution in 1990-1991, all the state collective farms were dismantled and collective assets were privatized, including livestock, over the period of 1992-1993. The resilient "collective" management system transformed into a post-collectivist system where the rapid socio-economic and political changes poised Mongolia's pastoral systems to experience the strong turbulence of creative destruction from the rapid release phase into a new re-organization phase, making herders owners of private livestock with open access to pasture resources. Herders obtained rights to raise their own herd of livestock and the opportunity to practice traditional pasture management. Wealth differentiation increased among herding households, because assets were distributed only to members of the cooperatives and distribution between members was often inequitable (Nixson & Walters, 2006). An initial increase in the number of poor herding households suggested several potential impacts on pastoral land-use patterns and land tenure, and there are also recorded inequalities in access to resources (Fernandez-Gimenez, 2001). The number of herder households increased from

about 75,000 in 1990 to more than 150,000 in 1993, because many rural non-herding households moved out to the steppe to raise their own stock of animals. The number of livestock in Mongolia simultaneously increased from 25 million in 1992 to 33 million in 1999.

A critical disturbance that severely affected the community since privatization was the *dzud* of 2000-2002 that had a dramatic impact onto pastoral social-ecological systems in Mongolia. This *dzud* continued for years and was characterized by severe drought in the summer and heavy snow fall and very cold temperature in winters that significantly reduced herd size and prevented quick recovery of livestock assets for herders, and some of them even abandoned herding. Recovery from this *dzud* brought the pastoral social-ecological phase to a new adaptive cycle transforming the couple system into less resilient system.

Economic growth – Resource degradation phase (2001-2009)

The cycle period of 2002 to 2009 which is a large, slow cycle, set conditions for multiple smaller, faster cycles such as price fluctuations of consumer goods and livestock products, declines in pasture productivity, steady drought in the dry steppe and desert, gold rush, donor-induced community-based natural resource management, and bank loans. These fast, smaller cycles invent, experiment and test (Holling, 2001). Right after *dzud* of 2000-2002, the pastoral social-ecological system was in the beginning of reorganization and provided a favorable environment for donors to intensify their support in mobilizing herders themselves through local community associations, based on the ways herders already collaborate to manage grasslands.

International donor communities and NGOs such as World Bank, UNDP, GTZ,

IDRC, FAO, IFAD, WCS, WWF, World Vision, USAID, etc., sponsored and facilitated

community-based resource management experiments throughout the country by

promoting formation of herder groups and associations.  This process intensified for

subsequent growth, resource accumulation and storage (Holling, 2001). Some such

groups failed and some survived, accumulating lessons and good results.   Another

example of small, faster cycles of socio-economic systems that reduce the social system's

resilience is local bank loans that herders depend on to cover their cash needs, as they use

their livestock as collateral. Herders expressed that it is increasingly hard not to take

repeated bank loans due to a constant shortage of cash to cover school needs, mobility

expenses and other related costs.  The combined effects of variability in precipitation and

climate conditions and poor pasture production decreased flexibility to access necessary

pasture resources, affecting livestock productivity and household livelihoods.

This cycle of economic growth phase could be considered as a rapid rangeland

resource degradation phase, because the number of livestock reached in the end of 2009

to its historic high level of 44 million livestock (69.5 million sheep forage unit).   This

situation brings the complex system into the point when the resilience is low with its

accumulated vulnerabilities and rigidities.

In the winter of 2009-2010, the social-ecological pastoral system was again hit by

another round of *dzud*, affecting the whole country affecting 769,000 people or 28% of

Mongolia's human population (ReliefWeb, 2010; Fernandez-Gimenez et al., 2011).

According to the statistics of December 2010 the number of livestock reduced by 27.7%

(12.2 million livestock) or by 23% SFU (16.2 million SFU) in comparison with

December 2009.

Table 7.7 Characteristics of three lar*ger*, slower adaptive cycles and the adaptive responses that affect resilience for each cycles

| Periods | Year | Phase | | Change processes | Supporting quotes |
|---|---|---|---|---|---|
| Collectivization | 1960-1990 | Exploitation & conservation | r, K | – Collective period | "During collective period there was sufficient hay and fodder, because the directorate will ship it right to your camp. We had a storage barn with hay and fodder in *bag* and *soum* centers. We had an emergency preparedness reserve."<br><br>"We had two types of incentives during the collective times for herders. First, impose high demand and requirements. Second, herders were honored with titles, tokens and certificates."<br><br>"Leaders from directorate pushed and hold us responsible to fatten the livestock, to make timely movements. Nowadays no-one is there who make such requirements, as livestock became private and herders are sloppy with casual attitudes."<br><br>"In fact, collective directorate gave herders top-down management, herders would wait for instructions and they will do it if they are said so." |
| | 1991-1992 | Release | Ω | – Democratic revolution | |
| | 1992-1993 | Re-organization | α | – Collectives dismantling<br>– Livestock privatization<br>– Restructuring of local and national government institutions<br>– Collapse of state vet and breeding services<br>– Collapse of emergency funds and winter shelters<br>– Collapse of engineered wells | "After the privatization, many deep and engineered wells were damaged and broken apart in our *soum*. People took the engines out of the wells to sale in the market."<br><br>"Those specialized people went to urban areas and there were shortage of people who could organize and lead the *soum*."<br><br>"It became very disorganized because many good and educated people left this rural area."<br><br>"Herders left on their own, no one there to visit and check on them, as it was during the collectivist period." |
| Transition | 1993-1999 | Exploitation | r | – Herders with private productive assets, livestock<br>– Increase in # of herder households | "It was very profitable for herders when the country moved to the free economy. Livestock got private and it was up to the herder what to do with livestock products." |
| | | Conservation | K | – Continuous increase in livestock number<br>– School drop-outs<br>– Increase in poverty rate<br>– Shortage of food<br>– Increase in consumer goods price | "We all used to think only a large number of livestock will secure our livelihoods, and thus all raised their herd size."<br><br>"Before *dzud* 2000 herders worked hard to raise their livestock, because the land was very giving and we would move around 3-4 times around seasonal camps without any problems of pasture growth. We camp everywhere and anywhere we camp there was a lot of greens. We didn't think of cutting or buying hay for reserves before. Sometimes we have had some bad weather or snow storm in winter, but it was not that devastating."<br><br>"Many children were interrupted from their school, somehow herders thought now it is a time to live on their livestock and no need to |

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|---|---|---|---|---|---|
| | | | | | "Those herders who lost livestock became very weak and vulnerable. Every family had a shortage of cash, no income, no jobs. Many of us just can do herding, and don't have a specialization or profession to get a job." |
| | | | | | "It was hard when consumer goods were in shortage, especially staple food such as wheat flour, rice and millet were not available." |
| | 2000-2002 | Release | Ω | − Consecutive severe *dzud* and drought<br>− Animal disease | "That *dzud* was indeed alarming for the people"<br>"Having heavy snow fall or strong blizzard was not a surprise for us. However, I remember that year there was a harsh storm that blew away all plants with roots and next spring we didn't have any grass growing and livestock starved a lot even during the summer. We started to feed them with wheat brans that in normal years they would not even smell. We had to train them to eat brans, but that time livestock was starving."<br>"Fodder was not available in the *soum* for purchase and anyway no cash to buy it. Herders were just watching and couldn't do much about it. The herders from our *soum* got lessons and now they will not let the livestock perish easily." |
| | | Re-organization | α | − Herd recovery from the remaining livestock - ∞<br>− Donor relief, rehabilitation, restocking projects (World Vision, ADRA, Red Cross, etc)<br>− Sustainable Grassland Management projects- ∞<br>− Gold panning or artisanal mining - ∞ | "After *dzud* people went to mine the "yellow stuff", herders would leave few surviving livestock with other family and went for artisanal mining and with earned cash some used to buy livestock, few at a time, from those who have some more livestock."<br>During that period, many herders who lost livestock moved to *soum* center and some moved to the *aimag* center to look for some employment." |
| Economic growth/ resource degradation | 2002-2004 | Exploitation | r | − A more formal herder cooperation - ∞<br>− Herder group formation, herder cooperation formation- ∞<br>− Donor-induced PIU and other community-based organization for resource management ∞<br>− Disaster management (fodder reserve, hand-fodder, hay reserves)<br>− Skill development and alternative income generation (wool processing, felt making, gardening, | "Everyone was thinking of working somewhere, earning some money, and all were so overwhelmed to do something for living. Some projects started to implemented some training and other educational skill development training and the herders who were thinking of only herding, they started to try out alternative things for living such as making boots, briquettes, grow vegetable."<br>"Our livelihoods dropped down to below the poverty level. Those who are from the same *nutag* got together and agreed to form a more formal group that was founded in August 2003 with support from that grassland project."<br>"Most of the herders' livestock got replenished since the last *dzud*"<br>"During that period of *dzud* many local herders who suffered from the livestock loss went for gold. We still have people went for |

| | | | | |
|---|---|---|---|---|
| | | | dairy products)<br>− Pasture reserve establishing<br>− Hay production<br>− Change in herders mentality | gold panning. These people are barely meeting their daily needs, as it doesn't provide sustainable income. But we do have people who bought livestock from the mining money".<br>"Herders ability is increasing to live in accordance with market system"<br>"Herders are getting the market mentality that make them more independent" |
| 2004-2009 | Conservation with sudden small and fast cycles of events [7] | K | − Steady increase in livestock number<br>− Herder cooperatives boom<br>− Outbreak of livestock disease ∞<br>− Decline in pasture productivity ∞<br>− Steady drought in desert area ∞<br>− Steady increase and sudden decrease (2008) in cashmere price ∞<br>− Secondary and college education development ∞<br>− Government subsidies from mining investments ∞<br>− Getting intensive bank loans from local banks ∞<br>− Group revolving funds ∞<br>− Casual, seasonal wage-based employment opportunities ∞ | "Since 2003 climate and livestock number has increased. This year of 2007 we have it reached nearly 100,000."<br>"In general, it seems that year after year the nature-earth is getting worse, it actually doesn't improve. This condition becomes a normal phenomenon for us"<br>"The bank loan is certainly helpful, but it is a hard time to pay it back. If you fail, they will confiscate everything"<br>"We take loans thinking that we can repay when we sell cashmere in the spring. From one hand, it is convenient, but from other we are in debt. Herders think they can repay it, but there are few who can pay on time. All herders have loans, except those who have many livestock. Nice when you get it, but difficult to pay it back. When repayment date approaches we get loan from others to pay the bank loan, and once we pay it, we get another loan to pay to the person who lent us. You see the debt is still there. This is what happens to us."<br>"Last year of 2007 the pasture growth was still poor, however in the entire *aimag* level our *soum* and Ulziit were considered the best in terms of production. And many outside herders moved in our *soum* to winter"<br>"From old times, our herders have a tradition of conserving and maintaining the pasture through herding the livestock. I mean our plan of action is based on this and supporting this practice."<br>"Recent price increases is really affecting us. The products produced by herders still have very low value, but prices for the goods that we consume are getting very high.<br>"Herders grow herd size, because it is productive and cover household needs. When household income grows herders consumption grows as they buy cars and motocycles. They also cover school expenses for their children, clothes ad school supplies cost is getting higher."<br>"Each herder has a thought to educate children. They aim to send them to any college without knowing which one is good or not good." |

| 2009-2010 | Release | Ω | – Severe *dzud* affecting whole country | – |
| 2010-present | Re-organization | α | – Herd recovery<br>– Human development subsidies∞<br>– Increase in cashmere price | – |

## *Diversity in the face of disturbance*

The results discussed in Chapter 5 suggest that CBRM communities demonstrated greater diversity and redundancy in communication networks, information sources and management practices. Diverse source of information and experience lead to increased willingness to learn and empower herders try out interesting and challenging ideas and practices. Table 7.8 illustrates examples of creative solutions and adaptation measures that CBRM communities demonstrated during the implementation of the SGM project in 2003-2008. For example, diverse sources of information were available to herder group members through having various experts to train and facilitate them taking action: "The most useful training was on improving pasture condition by pasture resting and rotation, and professional trainers gave us a lot during these few years of the project."

Table 7.8 Creative solutions and adaptation measures observed in CBRM communities

| Sources of diversity | Creative solutions, adaptation measures, novel practices |
| --- | --- |
| Source of information | Discussed individual and collective perspectives and strategies<br>Increased willingness to learn and experiment<br>Increased willingness to tap potential resources and opportunities |
| Trainers, resources and training programs | Joined efforts to learn new skills and practices<br>Mobilized financial and other resources<br>Trained herders to become local trainers |
| Local/group rules, agreements and consultation | Joined efforts to self-organize to make innovations in pasture utilization and management practices<br>Shared responsibility over pasture rotation and protection<br>Shared mistakes and lessons<br>Motivated peers<br>Practiced principles of local leadership<br>Addressed common concerns and obtained individual benefits<br>Depend on each other for greater success in the face of emerging pressure |
| Communication and networking | Obtained advocacy from local government<br>Experienced results of co-management initiatives<br>Impacted others (government, other communities) for change |

Increased communication networks of group-herders with various stakeholders mobilized support of the local government and later the government advocated for the decisions of the

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group herders. "In three consecutive years the *soum* governor issued a formal decree that prohibited herders to graze out-of season in our winter/spring pasture." Another herder group leader recalled how it was not easy to convince herders to rest the winter and spring pasture: "In the beginning herders were very hard, they would say "no, we don't want to leave the *nutag*" and eventually when most of us moved and protected the winter pasture, [they were] motivated to rest it in the following years. It was interesting when our family first moved to rest it and the rest of our *nutag* herders followed us."

The factors illustrated in the Table 8 helped herders to respond constructively to recent perturbations such as the crash in cashmere prices in 2008, the *dzud* of 2009-2010 and other events. According to the *Dzud* & Resilience study conducted in the following summer after the 2009-2010 *dzud*, coping and adaptive capacities were influenced by herder knowledge and experience with *dzud*, effective collective action and government leadership in response to the *dzud*, and informal local and extra-local social networks (Fernandez-Gimenez et al., 2011).

CBRM-community herders affected by the 2000-2002 *dzud* expressed that the lessons from this experience have influenced their preparations for and their ability to respond during the most recent disaster. Focus group informants as well as local government officials referred to the importance of collective action that group members undertake together. A leader of a herder group said that, "herders in our group established a small area for reserve pasture by fencing it and kept it from summer and fall grazing for several years, the December of 2009 the forage in the reserve pasture was very thick and almost one meter high and we used it in the spring." Another group leader mentioned that they didn't have much livestock losses, as they reserved a pasture area, collected hand fodder, warmed up their shelter or coral for livestock. He further mentioned that "The SGM project trained us to have pasture management plan and now we use

our pasture on rotational basis, protecting our reserve pasture from off-season grazing, which is about 5 km x 2 km area. Two families protected it from two sides and didn't graze their livestock in this pasture. This helped a lot to overcome this year's *dzud*."

*Different scales of cooperation and governance - Cross-scale dynamics*

   Depending on the purpose, herders participate in collective action at several different scales. The results from the CBRM communities show that group herders had opportunities to cooperate in multiple initiatives, from small/micro-scale cooperation to larger scale cooperation (Figure 7.5). Table 7.9 illustrates examples of goals, inputs, outputs and involved stakeholders in each of the cooperation scales.
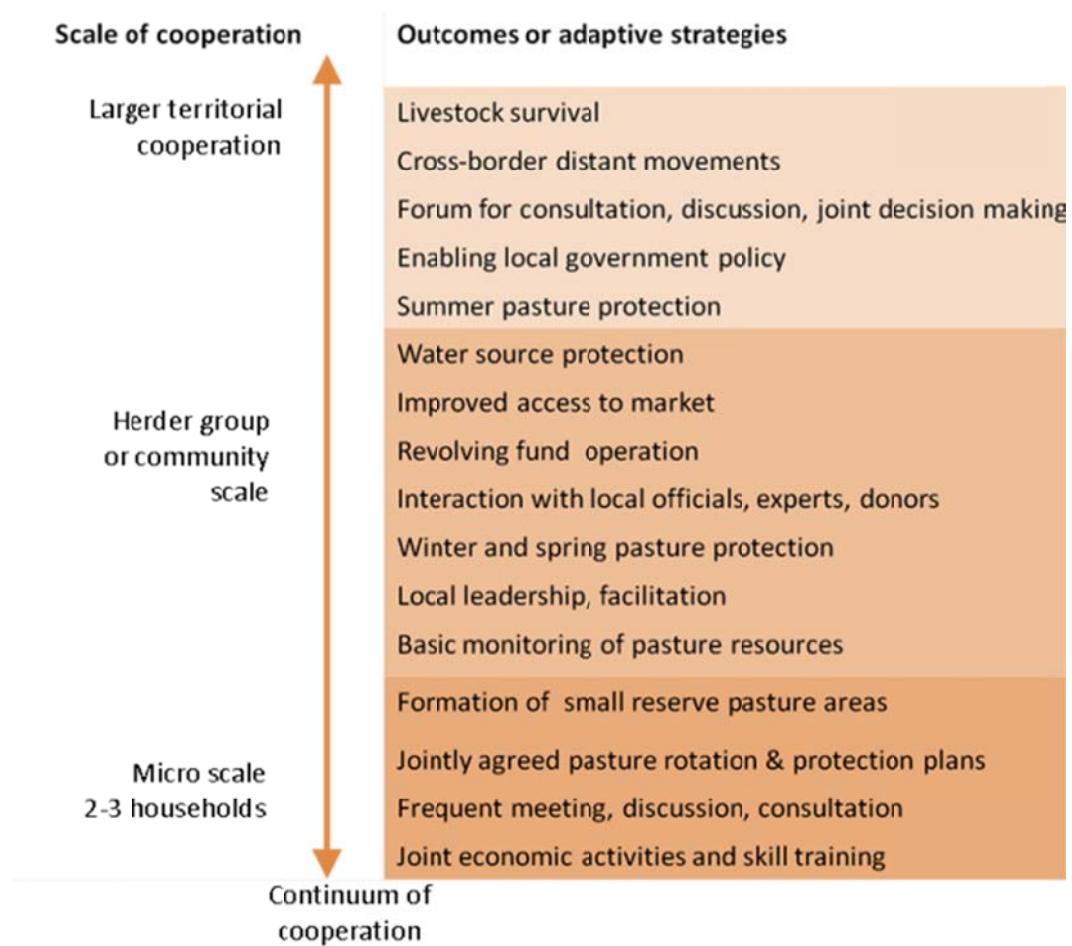


Figure 7.5 Different scales of cooperation of the CBRM-herders during the donor project implementation period

During the SGM project implementation, at a micro scale, herders in CBRM communities were involved in socio-economic activities, like skill training, targeted fewer households located within easy commuting distance. Wool processing and felt making training involved on average 3-5 female herders and this group size was the most appropriate to interact with and get the most from a trainer within a short period of time. This micro scale cooperation normally involved two stakeholder groups, trainers and herders.

Table 7.9. Examples of goals, inputs, outputs and stakeholders involved in different scales of cooperation

| Scales of cooperation | Goal | Average # of families | Inputs | Outputs | Stakeholders |
|---|---|---|---|---|---|
| 1. Micro-scale of 3-5 people (*khot-ail*) | Livelihood & skill development initiatives | 3-5 | Trainers Raw materials Equipments Time | Processing of raw wool Felt products Dairy products for market | Trainers/experts Group-herders |
| 2. Herder group level or community scale | Pasture protection, resting, reserve pasture on wider community level | 5-20 (desert-steppe) 10-40 (mountain-steppe) | Training Discussion Consultation Advocacy Exposure Assessment Awareness Local and regional policy & decree | Winter pasture rotation and protection Agreements Pasture utilization plan Pasture management plan, Bylaws | *Bag*/*Soum* officials Rangeland/livestock experts Project staff Group-herders |
| 3. Lar*ger* territorial communities | Conference Demonstration Exhibition Emergency situations (drought, *dzud*) Risk management | 20-40 (desert-steppe) 30-50 (mountain-steppe) | Advocacy Regional and National policy & decree Assistance/Aid Appeal | Inter*soum* agreements, Utilization of reserves Overgrazing, overstocking | Multiple *soum*s *Aimag*/Central government Agencies Projects Herder groups Donors Emergency Management Agency |

Another level of cooperation is the herder group. To improve pasture management required engagement of several households whose seasonal pastures overlap. In this level, in addition to the neighboring herders who share pasture, involvement of other stakeholders was essential to achieve concrete results. *Bag* and *soum* officials, donor project staff and rangeland and livestock experts got involved and provided support, training and incentives to support

herder group practices. Collaboration in this pasture co-management is implemented one social scale up from economic initiatives and thus covered broader spatial, temporal and networking ranges of cooperation.

CBRM community herders got also involved, but not frequently, in lar*ger* spatial scale cooperation beyond their own community territory and herder group networks. This broader-scale cooperation would happen in special or emergency occasions. In this scenario, for example, group herders participated in events outside of their *soum* representing interests of the wider community members and collaborated with other groups and neighborhoods.  Some herders from CBRM communities went to other neighboring *soum*s to buy quality male livestock to improve their herd quality.  In addition, they participated in fair-trade events and conferences in *aimag* centers and Ulaanbaatar capital city. This level of cooperation involves cross-border cooperation and negotiation, support and advocacy of different government agencies, donors, NGOs, herders groups and non-group herders.

During the times of emergencies like *dzud* and drought, mutual dependence and cooperation of the herders grows, leading to the expansion of the scale of collaboration and co-management.  In this situation herders focus more on survival of the livestock, but not necessarily sustainable resource management. Therefore, to tap the resources during the crisis period, they need to rely on strong relationships or institutions and discipline cultivated before a crisis.

### *Donor project and CBRM*

This section will describe specific results related to the implementation of the SGM project. The Sustainable Grassland Management project was implemented in 2003-2008 by the United Nations Development Program in Khujirt and Jinst *soum*s and supported formation of

community-based organizations to manage the pastoral resources sustainably while improving livelihoods of herder households. Different levels of results characterized as outputs, socio-economic outcomes and process outcomes show that based on the customary social groupings of *khot-ail*, *saahalt-ail* and kinship herders jointly agreed to cooperate with the SGM project. They agreed to get more formally organized as community-based pasture management herder groups to improve their rangeland management practices. Herders who agreed to organize as one group were from the same place, whose livestock share a common pasture territory or *nutag*. A group leader mentioned that the herders in his group are those people whom he knows very well, "We are people from the same *nutag* who anyway get along with each other, some of them my relatives, some are not, and since we have known each other for years we are trustful and reliable." Another herder group leader emphasized that formation of the group was based on local territorial approach, "*Nutag* was the basis of our group organization, herders who lived on the same *nutag* gathered and we all agreed to have a more formal group and over the four years some of us quit and some new families added." An elderly herder expressed that they trust each other, especially when it comes to livestock herding, "our people would help herd each other's camel, they say I drove your camels closer, they were browsing there and here. We trust each other on livestock. Even herders from the neighboring *soum* will inform us where they spotted the exact types of camel, very helpful."

CBRM communities organized themselves to collaborate with the SGM project and were assisted to make formal agreements amongst themselves and with the government and donor project, such as herder groups' pasture management sketch maps, 15-year pasture management contract and group revolving fund bylaw. Results demonstrate that with the support of the SGM project, CBRM communities developed group networks, communication, skills and local

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leadership that contributed to improved management of their seasonal pastures, created small reserves, encouraged seasonal movements and contributed to integration of various knowledge systems for learning.

At the local and national levels, as part of its broader objectives the SGM project worked closely with relevant department and divisions of the Ministry of Food, Agriculture and Light Industry to improve its administrative and structural capacity on pasture improvement and management issues. The SGM and same projects of other donors provided opportunities as well as lessons on community-based natural resource management in inform policy makers. The CBRM initiatives in some extent informed not only local government, but also provincial and national level policy makers to review the existing policy in rangeland and herd management in Mongolia.

These outcomes were visible especially during the project implementation period in 2003-2007. After the project was completed in December 2008, most group herders from CBRM communities gradually lost their group organization and cooperation and only two herder groups of the 6 groups in Jinst continued their cooperation by cooperating with other donor projects and mobilizing some other sources of funding and training opportunities. "When the project was implemented we learned each others' experiences, and when the project finished we have not done much, especially the years of 2006 and 2007 we participated a lot in various programs and were pretty active to learn from each other." One young herder who was part of the group emphasized, "We protected (haven't used during growing season) our winter and spring pasture for consecutive three to four years (2002-2007), this year (2008) some said that they will not move, because the SGM project is over. I told them during harsh winter it was helpful and we will anyway move away. Herders who were part of the herder group didn't want to move this

year, they think that the project is finished, everyone has its own way of thinking." A former local staff shared that "all activities were ceased when the project finished its work in our *soum*."

In the first three years, the project resources were allocated to and the project cooperated exclusively with about 10-15% of the households living in one *bag* and herders who were part of the organized herder groups benefited from the SGM projects' activities. These project-induced herder groups share a common pasture with other non-group herders in the neighborhood and some innovative management practices such as fencing, group pasture boundary delineation and mapping, generated a sense of exclusion and competition among the local herders. One female herder group leader recommended that "I think it would be important for the project to work not only with herder groups, but also with other herders in the *soum* and to discuss about reserving pasture and stressing on importance of rotational use of seasonal pasture." A former SGM project local staff reported:

> "An experimental 15-year pasture use contract was made between the local governor and a herder group, that states that herders will undertake pasture protection practices that are sustainable and in cooperation with local government. In my opinion this was ineffective, no positive changes happened in our case. Because of this contract we had serious disputes and misunderstandings between group and non-groups herders. Another case was when group herders got to fence out some pasture to establish reserves non-group herders made complaints about a common pasture is going to be possessed by project herders. This contention among herders lasted a while and we had many efforts to provide clarification to herders that it was just an experiment and it doesn't mean that the pasture will be given into the group possession."

In a broader scale than a herder group, every herder has to rely on various types of pasture reserves in special times and emergencies. A herder put this idea this way, "When pasture growth is bad, I must move where there is grass. First I will meet with local herders and ask them if I could pass here this winter or spring." Herders in times of "hard" years when there is not much for livestock on their own pasture, go out and look for other areas, so they depend on other herders' permission and reciprocity, as one herder put it "if I am stingy I will not find a place to camp back, so I must think of possible consequences."

External input, training and resources were critical in formation of herder groups that would not have formed without donor assistance. Their assistance helped them to obtain clear benefits, but these benefits and the changes in cooperation and management may not be lasting and the creation of the groups that benefit only some herders can create resentment and inequities.

### *Commonalities across all herders*

The objective of this research was to explore differences between CBRM and non-CBRM communities in resilience building, and my results thus far have focused on elucidating these differences. However, I found many more commonalities than differences between the two types of communities. Table 7.10 presents four types of overarching commonalities among all case study sites, focused on context, practices and behaviors observed across all study sites. Herders experience and live with the sense of embeddedness (McCay, 2002), as they share the same pastoral culture and face the same stressors affecting their social-ecological systems and undergo change processes that are novel and cyclical.

Formation of herder groups in CBRM communities was based primarily on existing traditional neighborhoods, and customary forms of cooperation that was the main starting point

for the projects' operation. "Even before the group, we are people from one *nutag* and we live with support from each other. We help each other to shear the sheep and comb goats. Instead of sitting on your own and shearing 10 sheep a day, it is much better shear over 100 a day altogether." Another herder mentioned that "people from one *nutag* become like relatives, they look after each other's herd, they openly talk to each other and share their daily observations and thoughts."

Table 7.10 Commonalities among all CBRM and non-CBRM herders

| | Common practices and behaviors observed in both CBRM and non-CBRM herders |
|---|---|
| Embeddedness | Same administrative structure (*soum* and *bag* level) and governance<br>Same cultural base and social networks<br>Same natural resource base<br>Same source of livelihoods<br>Common approach of learning and transferring information: face-to-face |
| Pastoral culture | Respect for elders<br>Respect for the *otor* (a long distance movement with livestock) people<br>Mobility mentality – ready to move mentality and lifestyle/routine<br>Strong neighborhood and kinship<br>Unwillingness to engage in direct disputes with herders<br>Willingness to listen and openness to new information and opportunities |
| Exposure to novel and cyclical events | Same stressors: novel and cyclical (*dzud*, drought, price fluctuations, pasture degradation)<br>Same concerns: pasture degradation, water scarcity, reduction in mobility, overstocking<br>Same interests: increase number of livestock to the level that would fully meet livelihood needs, improve quality, improve pasture condition, good market<br>Same market access |
| Sense of *nutag* (homeplace) | Refer to *nutag* as a living thing that feeds and sustains both humans and animals<br>Use *nutag* as part of the description of their daily life, including the place they dwell in, live, make movements, worship and others |

Common environmental and socio-economic contexts bring herders as well as local officials closer and embedded within one *nutag* or homeland. Herders across all four study sites have the same administrative structure and governance at *bag* and *soum* levels that are

approachable and accessible governance systems available to herders. *Bag* and *soum* governors play critical roles in initiating and supporting local practices and those who come to collaborate from outside. They serve as bridges between government and herders and link herders with external organizations and initiatives. However, the same administrative and governance principles do not mean that herders across all sites experience the same level of attention and cooperation from government officials. In both CBRM and non-CBRM communities, herders felt the need for more frequent interaction with the local government officials. For example, a group-leader from CBRM communities shared that "we have elders in our neighborhoods who stay at home and have something to say, but we don't often see the officials."

Exposure to novel and cyclical events was a common experience across all study sites. Each person experienced the same stressors, some of which were familiar and cyclical and others that were new to them. They also shared common concerns such as declines in pasture productivity, water scarcity, reduction in mobility and overstocking, as well as interests, including improving livelihoods, improving herd quality and having secure access to seasonal pasture and other key resources.

Herders and other participants in this study commonly used the Mongolian term "*nutag*," roughly translated as homeland or grazing territory, to answer questions and describe their experiences. They refer to *nutag* as a living thing that feeds and sustains both humans and animals. *Nutag* could represent a meaning that herders share a tremendous wealth of nomadic culture, pastoral herding wisdom, nomadic governance system and pasture (Avarzed & Sodnoi, 2008). This is even stron*ger* among the herders who use it to describe their daily life, including the place they dwell in, live, make movements, and worship. A young couple referred to *nutag* as a land where they live and value "When we got married and started to herd livestock, the Dulaan

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hills, was our *nutag*, a very beautiful *nutag*." Another herder used *nutag* in describing a key-resource in the area, "when stream ders (*Achnatherum spp.*) grows well, it becomes a main *nutag* for us and other herders in the neighborhood, and when *dzud* occurs we all move herds to that *nutag*." A female herder referred to *nutag* as a distant place where she moved in to overcome *dzud*, "Our livestock survived, because we moved to the north *nutag*, to Gurvanbulag *soum*. I love herders in Gurvanbulag who accepted us even though it was also hard for them." An elder herder provided instances of how *nutag* could be recovered after resting it, "… it is all about rotation of the *nutag* and the *nutag* gets refreshed afterwards." A local official described that they "issue decree for *otor nutag* where outside herders are allowed to move in and camp" and he also used the word to describe the resource locations, "that *nutag* with salt licks are part of another *soum*, Bogd *soum*."

When asked what do you really mean by *nutag*, an old women herder said that "This is a land that we have, our winter campsite (*uvuljuu*) is our *nutag*, our summer camp is our *nutag*, and this is a place where we were born, and where our livestock was raised. If my ancestors lived there from far old times, this inevitably becomes my *nutag*. When there is a good rain and grass grows, we say our *nutag* is growing well and others can come to camp there as well. We have a holy mountain, Sant Khairkhan, that is guarded and worshiped by local people and once a year people go to give the prayers and offerings."

*Nutag* can carry meanings in noun, verb and adjective forms. For example, several *khot-ail*s, social grouping of 2-12 households, who share the same landscape such as a valley or a watershed was called "*neg nutgiihan"* or "people from one place or homeland" (Mearns, 1996, Fernandez-Gimenez, 1999). *Nutag* could be modified as a verb if necessary, "*nutaglakh*" or camp in the *nutag* in a particular season or time, "it is critical to search for and rotate *nutag* and

camp in an appropriate *nutag*, and I know from my life, once you find the right *nutag* your

livestock will not easily perish, when animals have some forage they will not be chilled."

Another meaning as an adjective "*nutgiin*" is a common one that was the most

encountered during the interviews and focus group discussion, "*nutag* families," "*nutag* elders

are smart," or "*nutag* people," "under the local *nutag* conservation," "*nutag* old customs to give

offerings and worship *ovoo*," "tasks related to local *nutag* government," "it is crucial to have

fodder production unit in local *nutag* as part of risk management." Results reveal that the sense

of *nutag* is very powerful in the both CBRM and non-CBRM communities. Herders explain and

describe everything through the lens of *nutag*. Table 7.11 provides a list of *nutag* terms that can

be further continued covering every element of the pastoral social-ecological system.

Table 7.11 Use of *nutag* as a conceptual lens among herders

| Social/cultural | Ecological/natural | Economic |
| --- | --- | --- |
| *nutag* people | *nutag* pasture | *nutag* dairy |
| *nutag* methods | *nutag* livestock | *nutag* tea |
| *nutag* customs | *nutag* landscape | *nutag* business mind |
| *nutag* elders | *nutag* waters | *nutag* wealth |
| *nutag* song | *nutag* air | *nutag* resources |
| *nutag* association | *nutag* hills | |
| *nutag* stories | *nutag* forest | |
| *nutag* festival | *nutag* sand | |
| *nutag* celebrity | | |

**Discussion**

A resilient system has the capacity to change as the world changes while still maintaining

its functionality (Walker & Salt, 2006, pp. 144). The pastoral social-ecological system in

Mongolia is experiencing both cyclical and novel changes. Novel changes are associated with the

transition to a market economy, and events such as market liberalization, globalization and

resource degradation were not common problems in the history of Mongolian pastoralists.

Cyclical events such as climate-driven vegetation dynamics are part of the experience of the herders (Fernandez-Gimenez and LeFebre, 2006). Mongolian herders have built up sufficient memory to live with and adapt to negative the effects of drought and *dzud* as well as major socio-economic and political transitions in the 20[th] century. However, the extent of combined effects of novel and cyclical stresses over the past two decades may have been unprecedented to overwhelm their adaptive strategies to deal with *dzud* and drought in parallel adapting to ever changing socio-economic context. Government organizations at multiple levels under the struggling transition economy system lack an appropriate policy framework and experience to recognize and address the evolving effects of such changes.

Two general types of herding communities, CBRM (formally organized herder groups) and non-CBRM (customary or traditional neighborhoods) were examined in this study. CBRM communities emerged during the past 10-15 years in Mongolia as a result of donor-induced projects that were supported later by Government policy. CBRM and non-CBRM herders have common strategies to cope with change and these strategies are rooted in pastoral traditions and customs such as mobility, flexibility, reserves, diversity and reciprocity (Fernandez-Gimenez & Le Febre, 2006). Herders also live with a sense of embeddedness in their *nutag* (homeland) that help them cope with and absorb effects of novel and cyclical changes. These strategies were cornerstones for the resilience of pastoral human-natural coupled systems that demonstrated dynamic and self-organizing adaptive behavior over the long history of Mongolian pastoralism.

However, the study results show that in the face of the combined effects of novel and cyclical changes, the pastoral social-ecological system has experienced a gradual loss of resilience from one adaptive cycle to another over three different timeframes: collectivization

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(1950-1990), transition (1991-2000) and market economy growth phase (2001-2009), affecting herders' knowledge and practice of pastoral adaptive strategies.

CBRM was based on customary forms of existing cooperation among herders and CBRM communities demonstrated more resilience to novel and cyclical changes and greater capacity to re-organize using a diversity of communication networks, information sources, and management practices, such as mobility. Furthermore, CBRM fosters an environment where different types of knowledge systems are combined to generate new traditional or renewed local knowledge systems.

By applying the resilience framework (Folke et al., 2003) to the Mongolian pastoral social-ecological systems and evaluating the proposition that CBRM enhances resilience, this study supports the findings that a CBRM approach strengthens customary social relationships and generates new local institutions for building adaptive capacity and social-ecological resilience (Galvin, 2007; Li & Huntsin*ger*, 2011; Dong et al., 2011). The findings of this study suggest, however, that at large scale local pastoral social-ecological systems are transforming into a less resilient system at the cost of values embedded in existing social relationships and traditional institutions. Examining resilience in a place-based coupled system (Turner et al., 2003) reveals new insights towards exploring human-in-ecosystem perspective (Davidson-Hunt & Berkes, 2003).

### *Towards a nutag-knowledge approach for rural development in Mongolia*

This research demonstrates that the four principles of the resilience framework of Folke, Colding and Berkes (2003) can be applied to practically assess practices and characteristics of

social mechanisms that build social-ecological resilience in complex pastoral systems. To assess these principles it is important to devise more process-oriented indicators to capture ideas of complexity and uncertainty. Measurement of each resilience principles' indicator itself was a very ambiguous exercise and when these indicators were investigated through the lenses of cultural values this exercise became even more challenging and provoking. Folke et al (2003) concluded that these four principles and their interactions are to be recognized and serve as drivers for directing society toward sustainability. To complement the notion of what drives resilience, I asked myself how best to explain and act on building resilience. What is pre-required for a practitioner or a scholar or herders to learn about building resilience?

Novak (2007) described how to relate new knowledge to knowledge the learner already knows in some non-trivial way. According to his theory of education, union of our actions, feelings, and conscious thought constructs knowledge that we have learned meaningfully and thus empowers people to make commitments and accept responsibilities (Novak, 2007). As it has been documented in other studies, meaningful participation is a key component of adaptive capacity (Armitage & Plummer, 2010) and adaptive capacity is promoted by a joint function of institutional linkages, meaningful multi-level participation and deliberation (Robinson & Berkes, 2011).

Throughout the study period, I was puzzled about and later become concerned that the current study on resilience and adaptive capacity was more directed to produce expert knowledge than to build resilience locally. I questioned whether my research favored Western knowledge, and implemented academic work to develop concepts and theories that may privilege Western ways of knowing (Smith, 1999). The purpose of this study was partly to benefit local officials

and herders' knowledge and practice in meaningful ways, respecting the validity of their knowledge, language and culture.

The principles of resilience examined in this study contain technical and formal language that required interpreting them in common Mongolian language to get responses.  When I introduced the purpose of the study to informants, I made an effort to use Mongolian terms to construct and explain my protocol and questions. Smith (1999) discussed attempts towards developing indigenous methodologies, namely Kaupapa Maori, as a way of structuring assumptions, values and priorities in research.  Berkes (2008) discussed that the use of traditional knowledge provides an entry point to implement co-management and that self-government of the natural resource will help finding "a new balance against an expert dominated positivist science" (pp. 274).  Community-based management fosters and encourages learning, experimentation, development of local rules and novelty (Walker & Salt, 2006). Resilience thinking is a work in progress (Walker & Salt, 2006), and therefore developing local methodologies as a way of structuring assumptions, values and priorities should contribute to building resilience. Any new directions and approaches to management of natural resource have to address seriously the cultural dimensions of social-ecological systems.  Differences in environments lead to different cultural adaptations and by being culturally and socially adapted to emerging uncertainties and changes in the surrounding systems, human beings can build up their adaptive capacity (Folke et al., 2003).  To contextualize resilience framework for Mongolian pastoral social-ecological systems, I therefore attempt linking the framework to the native Mongolian worldview, an easily identifiable and meaningful knowledge foundation for the pastoral communities in Mongolia.

*Nutag* is a term that is common knowledge in Mongolia. This is not a technical or specialized word, but it is a term and concept that is known to every Mongolian as part of their

worldview. *Nutag* encapsulates an idea of sense of homeland or birthplace, community and belonging (Murphy, 2011). *Nutag* was discussed by Murphy (2011) as referring to a territory, its people, national, ethnic, racial, regional, local, clan, or familial homelands or territories. Berkes et al. (1998) described that "Indigenous peoples have local words that usually get translated into English as land. But land, as understood by them, often carries other meanings." (p.410). *Nutag* captures a meaning of "human and nature connected by the birth cord" a phrase that any Mongolian would identify with. This notion was discussed by Mongolian scientists as human-nature-livestock triple relationship (Erdenetsogt, 1998; Avarzed & Sodnoi, 2008). It is both the worldview and mindset. The researcher as a native Mongolian knows from her personal experience that *nutag* is part of what we Mongolians normally live with. Addressing the issue of *nutag* is important from the perspective of resilience building of pastoral social-ecological systems. As part of herders' frame of reference *nutag* would allow outsiders to approach their experiences from indigenous perspectives.

Other researchers have addressed concepts similar to the *nutag* framework. Berkes et al. (1998) discussed about traditional ecosystem-like concepts that captured in native languages of indigenous people. This native language used by traditional peoples to describe the ecosystem differs from scientific language in "metaphorical ima*ger*y and spiritual expression" (Berkes et al., 1998). A transformational model of ecological stewardship for indigenous communities developed by the Lakota describes indigenous and local perspectives and solutions to the development of the local systems (Ross et al., 2011). The model provides stewardship elements that recognize and promote indigenous ecological practices and values as a culturally appropriate alternative to steward and care for land and its resources. The *nutag* framework is in line with the Indigenous Stewardship Model in the sense that Mongolian pastoralists approach their place or

*nutag* "with an attitude of reverence and stewardship rather than dominion" (Ross et al., pp 240). It is impossible to detach herders from their *nutag*, no *nutag* no herders. It becomes meaningful for herders when novel ideas are communicated in *nutag* terms. Therefore, I propose making resilience theory relevant and practically meaningful in the Mongolian context by blending with and building upon this meaningful local framework. Nutag framework brings resilience perspective closer to what herders experience and this framework have the potential to inform national and international stakeholders about locally appropriate or *nutag* appropriate strategies and approaches to natural resource management and rural development.

**Conclusion**

Resilience building in pastoral social-ecological systems in Mongolia demands preserving and nurturing existing social, economic and ecological components and their interactions that enable the system to renew and reorganize itself following unprecedented changes that are both novel and cyclical (Walker et al., 2002). Resilience thinking asks scientists to talk to the local communities not in the language of scientific concepts, methods and results, but in common language (Ross et al., 2011) using meaningful frameworks (Novak, 2005) that transcends boundaries of different worldviews.

My attempt to examine indicators of resilience in the local pastoral place-based context was challenging from the starting point to find an appropriate translation of the term in Mongolian. I suggest looking beyond academic terms of resilience framework, and to identify with native *nutag* terms as part of resilience building in pastoral societies in Mongolia. At local scale, herders who were formally organized as community-based organizations got support from the donors as well as other stakeholders. Community-based rangeland management communities

in the study sites have shown the potential to facilitate adaptation and resilience building if such organizations are based on and respect existing cooperation of customary *nutag* neighborhoods. However, traditional *nutag* knowledge must be renewed and reorganized to survive, transform and develop as a basis of community resilience building. Community-based rangeland management offers structures that contemporary pastoral society needs to have in place to stimulate new learning for constructive change.

While a resilience framework is all about creating space (Walker & Salt, 2006), resilience could also be understood as peace of mind about change. Peace of mind about change is possible when communities are self-aware, remember principles gleaned through past experiences to apply them to new situations, gain sufficient confidence to ask new questions to guide further learning of and adaptation to the ongoing change processes happening in social-ecological complex systems.

This research was an attempt to apply a theory of resilience to understand how pastoral social-ecological systems respond to change, and the potential role of formal CBRM institutions in this process. At the same time it proposes an alternative traditional framework, the *nutag* framework. In this perspective this research is an attempt to meet the expectations of scientific and traditional knowledge carriers towards understanding the specifics of pastoral social-ecological resilience building.

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