COUNTRY REPORT

CLIMATE RISK MANAGEMENT IN MONGOLIA

By Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES)

May, 2013

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Under the
Climate Risk Management - Technical Assistance Support Project (CRM-TASP)

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CONTENTS

LIST OF ABBREVIATIONS AND ACRONYMS

BCPR	Bureau for Crisis Prevention and Recovery
BDP/EEG	Bureau for Development Policy Energy and Environment Group
CC	Climate Change
CCA	Climate Change Adaptation
CNDS	Comprehensive National Development Strategy
CO	Country Office
CCO	Climate Change Office
CRM	Climate Risk Management
CRM TASP	Climate Risk Management Technical Assistance Support Project
DRR	Disaster Risk Reduction
EWS	Early Warning System
GCM	Global Climate Model or General Circulation Model
GDP	Gross Domestic Product
GHG/s	Greenhouse Gas/es
GIZ	German Cooperation (GTZ)
MDG	Millennium Development Goal
MFALI	Ministry of Food, Agriculture and Light Industry
MMRE	Ministry of Mineral Resources and Energy
MNET	Ministry of Nature, Environment and Tourism
MOFA	Ministry of Food and Agriculture
NA	Not allocated
NAMEM	National Agency for Meteorology and Environment Monitoring
NEMA	National Emergency Management Agency
NAPCC	National Action Programme on Climate Change
NCC	National Climate Committee
NSO	National Statistical Office
NWP	Numerical Weather Prediction
PCC	Pasture Carrying Capacity
PUR	Pasture Utilization Rates
RIMES	Regional Integrated Multi-hazard Early Warning System for Africa and Asia
SDC	Swiss Development Cooperation
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework on Climate Change

FOREWORD

Climate change has the potential to exacerbate conflict, cause humanitarian crises, displace people, destroy livelihoods and set-back development and the fight against poverty for millions of people across the globe.

For example, it is estimated that over 20 million people in the Mekong Delta and 20 million in Bangladesh could be forced to move as their homes are affected by saltwater incursion from rising sea levels. Entire populations of some low lying island states, such as Nauru or the Maldives may have to be relocated. In countries like Honduras, where more than half the population relies on agriculture, climate induced risks, such as hurricane Mitch in 1998, which caused over USD 2 billion in agricultural losses, will continue to pose a staggering potential for damage. Similarly, climate risk assessments in Nicaragua show that changes in rainfall patterns, floods and drought could put human health at risk by increasing the prevalence of respiratory and water borne diseases and malnutrition.

Long-term incremental changes will mean that people everywhere must learn to adapt to weather or rainfall patterns changing, or to shifts in ecosystems that humans depend upon for food. Perhaps more worrying however, is that climate variability and change will also bring unpredictable weather patterns that will in turn result in more extreme weather events. Heat waves, droughts, floods, and violent storms could be much more common in the decades to come. Climate change is "loading the dice" and making extreme weather events more likely. These disasters will undermine the sustainability of development and render some practices, such as certain types of agriculture, unsustainable; some places uninhabitable; and some lives unliveable.

As climate change creates new risks, better analysis is needed to understand a new level of uncertainty. In order to plan for disasters, we need to understand how climate change will impact on economies, livelihoods and development. We need to understand how likely changes in temperature, precipitation, as well as the frequency and magnitude of future extreme weather will affect any sector, including agriculture, water-use, human and animal health and the biodiversity of wetlands.

This report is a product of the *Climate Risk Management – Technical Assistance Support Project*, which is supported by UNDP's Bureau for Crisis Prevention and Recovery, and Bureau for Development Policy. This is one in a series of reports that examine high-risk countries and focus on a specific socio-economic sector in each country. The series illustrates how people in different communities and across a range of socio-economic sectors may have to make adaptations to the way they generate income and cultivate livelihoods in the face of a changing climate. These reports present an evidence base for understanding how climatic risks are likely to unfold. They will help governments, development agencies and even the communities themselves to identify underlying risks, including inappropriately designed policies and plans and crucial capacity gaps.

This series is part of a growing body of climate change adaptation resources being developed by UNDP. The Climate Risk Management – Technical Assistance Support Project has formulated a range of climate risk management assessments and strategies that bring together disaster risk reduction and climate change adaptation practices. The project is designing a common framework to assist countries in developing the necessary capacity to manage climate-induced risks to respond to this emerging threat. The climate risk assessments discussed in this report and others in the series will feed into a set of country-level projects and regional initiatives that will inform the practice of climate risk management for decades to come.

Addressing climate change is one of UNDP's strategic priorities. There is strong demand for more information. People at all levels, including small communities want to understand the potential impact of climate change and learn how they can develop strategies to reduce their own vulnerability. UNDP is addressing this demand and enabling communities and nations to devise informed risk management solutions. UNDP recognises that climate change is a crucial challenge to sustainable development and the goal of building resilient nations.

As the full effect of climate change becomes apparent, it is assessments such as these that will become the lynchpin of national responses and adaptation strategies for many years to come. Like the threat from many disasters, there is still time to prepare for the worst impacts of climate change in developing countries if we expand our understanding now.

This knowledge must be combined with real preparedness and action at all levels. Only then will we be able to stave off the worst impacts of climate change in the most vulnerable and high risk countries of our world.

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The Project, its methodology and analytical framework was conceptualized by Maxx Dilley, Disaster Partnerships Advisor and Alain Lambert, Senior Policy Advisor, Disaster Risk Reduction and Recovery Team (DRRT), BCPR with key inputs from Kamal Kishore, Senior Programme Advisor, DRRT, BCPR and Ms. Bo Lim, Special CC Advisor, Environment and Energy Group (EEG), BDP.

Within BCPR, the Project implementation process has been supervised by Alain Lambert and Rajeev Issar who provided regular inputs to ensure in-depth climate risk assessments and identification of tangible risk reduction and adaptation options. From BDP, Ms. Mihoko Kumamoto and Ms. Jennifer Baumwoll provided their inputs and comments to refine the assessment and recommendations. The climate risk assessment has also benefitted immensely from the strategic guidance provided by Jo Scheuer, Global Coordinator, DRRT, BCPR and by Ms. Veerle Vandeweerd, Director, EEG, BDP.

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The climate risk assessments under the CRM-TASP project have been undertaken with the funding support of the Government of Sweden.

EXECUTIVE SUMMARY

Mongolia is a landlocked country with a population of circa three million people spread over about 150 million hectares, of which the density of population is less than two inhabitants per km^2. The economic diversification of Mongolia is very narrow with the mining and animal husbandry sectors contributing by more than percent 70 percent to the GDP. Around half of the total population lives in rural and the other 50 percent in urban areas. Poverty levels in Mongolia are about 46 percent for the rural and 27 percent for the urban areas.

Mongolia has a large reserve of mineral resources with copper, gold, coal and uranium. Since 2000 the global commodity boom prompted the Mongolian GDP to grow by eight percent. However the contribution made by the extractive sector to alleviate rural poverty has actually has widened the gap between rich and poor.

The livestock sector, in contrast, supporting roughly 40 percent of the population, constitutes 30 percent of GDP and 15 percent of export earnings. This taken into account, especially animal husbandry is at constant risk of recurring extreme weather events that are due to a highly variable climate. During the collective system of the Soviet Era, livestock risk was managed by collectives. Collectives, as part of their risk management strategy, maintained the livestock population at a threshold level of 25 million. However, with the emergence of a market economy in the 1990s, the collectives collapsed and, as a consequence, ownership of livestock as well as the related economic risk have been transferred to individual herders. As part of their risk management strategy, herders tend to maintain large numbers of livestock as safety net and as an insurance against climate risks. These development trends have resulted in the doubling of livestock to estimated 40-50 million.

The succession of adverse climatic events called 'dzud' causes livestock mortality of 3.5 percent annually, 5-10 percent every five years and of more than 30 percent once in a decade. These periodic climate shocks entail a huge impact on developmental gains made during the so-called normal years. For example the dzud in 2000 increased rural poverty from the prevailing 37 to the much worse 47 percent. Dzud 2010 caused a similar deterioration – letting poverty rates soar from 46 to 50 percent – in some regions. Hence, the Mongolian Government's has declared efforts to protect livestock and the herders' welfare from the recurrent severe climate shocks to its major development and Climate Risk Management concerns.

Due to higher exposure, livestock heads beyond 25 million increase the risk factor exponentially. Also, large numbers of livestock cause a deteriorating impact on soil fertility, water quality and biodiversity. Biomass is estimated to have declined by 20 to 30 percent during the last 40 years. Water resources have declined due to the loss of several water points, lakes and rivers. Forest cover has shrunk at a rate of at least 60,000 ha every year. The observable climate change trends of increasing temperatures, change in rainfall pattern and snow distribution is expected aggravate the ongoing environmental degradation because Mongolia is highly exposed and vulnerable to these phenomena.

The Government of Mongolia is concerned with the increasing number of livestock and the impacts that this trend has on the environment, livelihoods and the economy. As an outcome it has designed an MDG-based comprehensive national development strategy to advance sustainable environmental development – in particular by incorporating matters of Climate Change Adaptation.

Meanwhile there is also the need to institutionalize an alternative climate risk management strategy that is in consonance with the MDG-based national development strategy and that addresses more particularly the sustainability of pasture systems and the environment from the perspective of livelihoods and economic opportunity. Several experiments have been undertaken during pilot projects and there is a learning process underway to promote community-based livestock management, to improve environmental quality and herders' livelihoods.

As part of the CRM TASP project, risk patterns related to livestock population were assessed and policy options to gradually reduce livestock numbers to an optimal level of 25 – 30 million explored. The transfer of a significant number of livestock herders to agro-processing, crop-based agriculture and the booming mining sector was discussed. However, although absorbing large numbers of herders, modifying the economy structurally that way, would first of all require major policy changes, adapted institutional arrangements and capacity building efforts. Considering the gradual impact of climate change, it is suggested to undertake entry-level adaptation options and then move to encompass the strategic directions mentioned above.

CRM TASP has established a herder-need-based climate risk information system to anticipate and manage climate risk at different timescales. This pilot experiment has proved to be popular and acceptable among herders and the Mongolian Government alike, thus providing a way forward for expansion and replication.

INTRODUCTION

BACKGROUND

Climate risk management (CRM) is an inter-disciplinary, multi-stakeholder process that involves analysis of climate-related risks leading to consensus-based identification and prioritization of actions to better anticipate and manage both existent and emerging climate risk.

Climate Change (CC) is likely to alter the observed climate mean values. It is already causing changes in the nature of weather extremes and slow onset disasters. Severity, frequency, spread, duration and timing of climatic threats have become less predictable. Hence, CRM is drawn upon to facilitate measures that help build resilience to long-term CC. Past experiences lead to ways to deal with extreme climate events that may also guide responses to climatic uncertainties associated with CC. From a policy point of view, developing the capacities of those institutions and systems that are currently managing climate extremes and variability, will allow to also enhance a more resilient development in terms of CRM.

CRM has been developed by the United Nations Development Programme (UNDP), through its Bureau for Crisis Prevention and Recovery (BCPR) and its Bureau for Development Policy - Energy and Environment Group (BDP/EEG) to assist countries in their endeavor to develop capacity to better manage risk associated with climate variability, disaster risk reduction (DRR) and CC. The Climate Risk Management Technical Assistance Support Project (CRM TASP) integrates CCA and DRR at Government, regional and local levels.

APPROACH AND METHODS

CRM TASP was initiated through a regional inception meeting organized for the UNDP focal points and key Government representatives from the six countries at Pondicherry, India in July 2010. In Mongolia, the project involved the National Agency for Meteorology and Environment Monitoring (NAMEM), UNDP, JASIL, an NGO and herder communities, through the implementation process outlined in Table 1.1.

TABLE 1.1 PROJECT STEPS AND METHODS

ACTIVITY AND PURPOSE		SPECIFIC TASKS
1. Initiation	• Explain CRM TASP • Country engagement in Mongolia facilitated by NAMEM	• Inception Meeting and discussions with key stakeholders. UNDP CO was involved in the national forum climate information providers and users organized in collaboration with the National Agency for Meteorology and Environmental Monitoring (NAMEM), to assess the information needs of stakeholders at different time-scales. • NAMEM prioritized information flow to herding communities for the project
2. Institutional Mapping	• Identify stakeholder needs to integrate CRM into sector planning and practices	• An assessment undertaken of the communities involved in nomadic herding operations identified their readiness to integrate CRM into the operational practices as well as key challenges
3. Climate Risk Information Generation and Application	• Generation of community-specific information to meet requirements of herding operations	• Climate information system established from regional to national to the local levels to link the communities with the required climate information, on pilot-basis • CRM Community profile and CRM risks and options document prepared and shared with stakeholders

TABLE 1.1 CONTINUED

ACTIVITY AND PURPOSE		SPECIFIC TASKS
4. Integration of CRM into Government Systems	• Integrate CRM process into herding operations	• Seasonal Forums discussed the feedback as well as possibilities of replication in other locations- Kotonot Sum, Itchbhulag Sum and locations where NAMEM stations exist were identified as possible sites. • A CRM proposal aimed at strengthening NAMEM capacities to generate required information, as well as users to incorporate climate and weather information for decision-making has been drafted through the project, to take the process further developed by NAMEM in collaboration with RIMES
5. Development of Tools for Capacity Building	• Address stakeholder needs to integrate CRM into herding	• Capacity building of users – i.e. herders to utilize information undertaken through JASIL, a local NGO. • Capacity building of the NAMEM to generate information through NWP techniques also undertaken, which contributed to the investment of NAMEM for high performance computing system.
6. Documentation and Report Writing	• Documentation and finalisation of CRM TASP report	• Report for Mongolia drafted to incorporate these developments for submission to the UNDP CO and NAMEM

Mongolia proposed some key priorities for CRM TASP at the regional inception workshop in July 2010. Subsequent discussions during missions to Ulaanbaatar with UNDP, NAMEM, Agriculture and National Emergency Management Authority, identified and confirmed herding operations as the priority. This sector contributes significantly to the national economy and supports the livelihoods of the majority of the Mongolian population.

NAMEM and UNDP Country Office facilitated discussions with stakeholders, and NAMEM was involved in all these discussions to ensure project implementation and follow-up.

REPORT STRUCTURE

The introduction explains the various steps of the selected process and the adopted methods. Chapter 2 outlines the development context by focusing on those trends in Mongolia that have required prioritization of development sectors that are exposed and vulnerable to the severing climate. Chapter 3 focuses on geo-physical, environmental and climatic risk features in Mongolia, by differentiating between past, current and projected future events. An assessment of climatic threats to achievements in development in the context of past climate risks followed by an anticipation of CC impacts are covered in Chapter 4. Current CRM processes, policy and institutional systems to address the identified threats, are discussed in Chapter 5. Chapter 6 focuses on ownership of CRM within the Government, the assessment of capacity needs, and makes recommendations for future actions.

DEVELOPMENT PROFILE

Vulnerability and exposure of a society to climate risks are closely linked to the current status of its development as well as its future trends. Emerging future trends indicate an increase of climate risk as applying to major economic sectors such as livestock rearing that supports around 40 percent of Mongolia population.

CURRENT DEVELOPMENT CONDITIONS, TRENDS AND CHALLENGES

Mongolia is a landlocked country, spanning 2,392 km (west to east), and 1,259 km (north to south). The country's average altitude is 1,580 metres above the mean sea level. The population is of about three million with 40 percent of the people living in Ulaanbaatar, the capital city. Circa 10 percent live in smaller urban centers and the remaining 50 percent are spread throughout the large rural areas thus often accounting for a population density of less than one person per km2.

Mongolia is divided into 21 *aimags*. *Aimags* are divided into *soums*, of which there are more than 330 as shown in Figure-2.1. *Soums* are further divided into *bags*, which is smallest administrative unit.

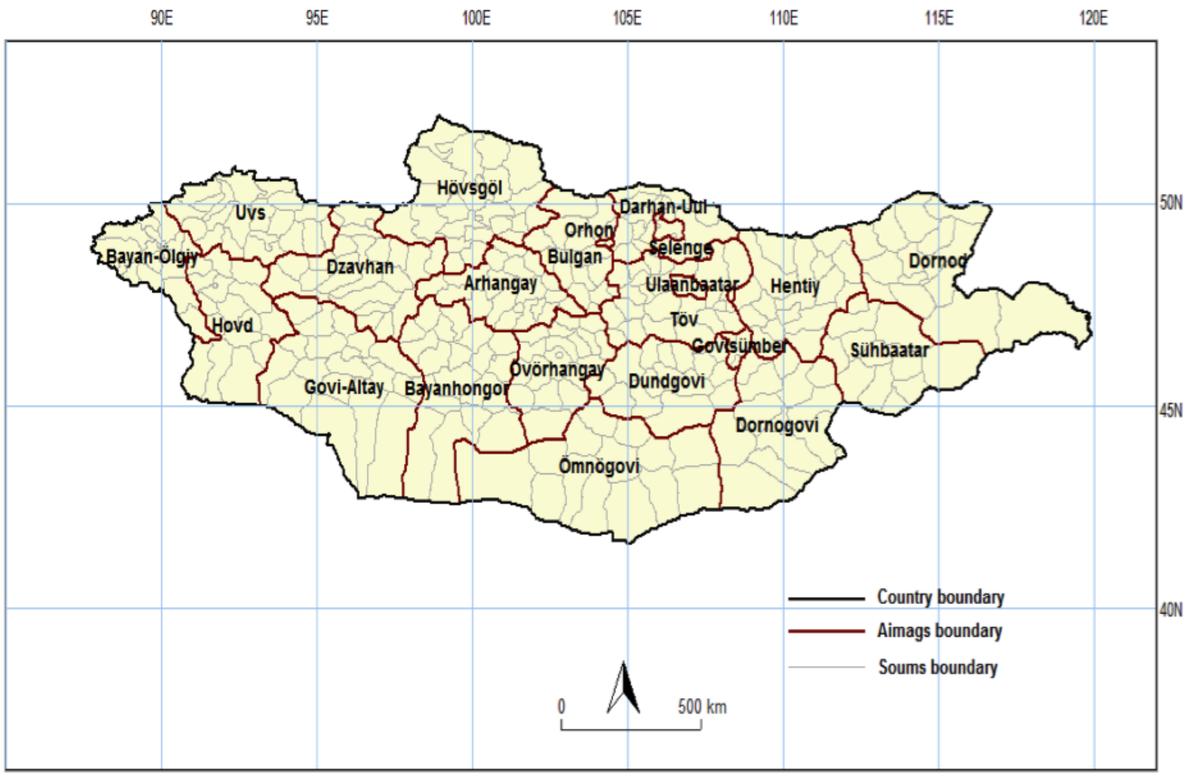
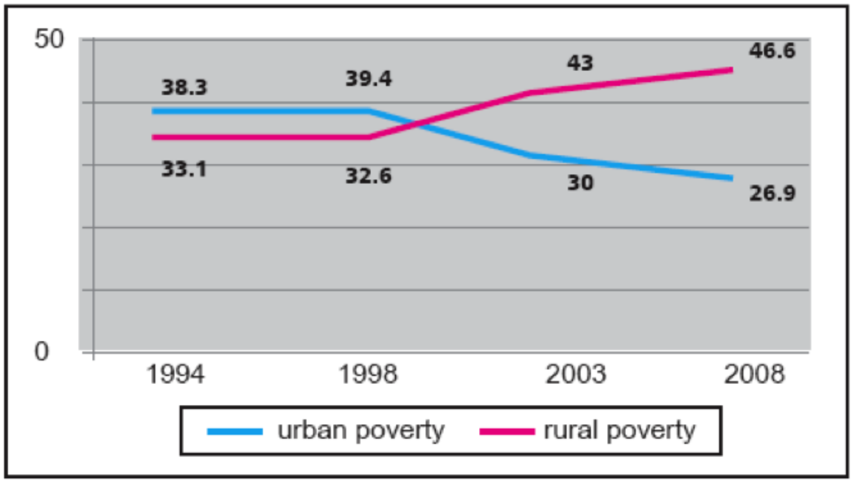


Figure 2.1: Administrative Boundary of Mongolia

Poverty and Human Development

The poverty level in Mongolia is at 35 percent. While the urban poverty level is around 27 percent, the rural poverty level at 47 to 50 percent is significantly above the national average. (Figure 2.2)



Source: UNICEF, 2009

Figure 2.2: Urban and Rural Poverty Trends (percent) in Mongolia

The literacy rate in Mongolia was 99.1 percent in 2003 (Figure 2.3) due to the citizens' right to education guaranteed by the Constitution, with a mandatory allocation of 20 percent of annual tax revenues.

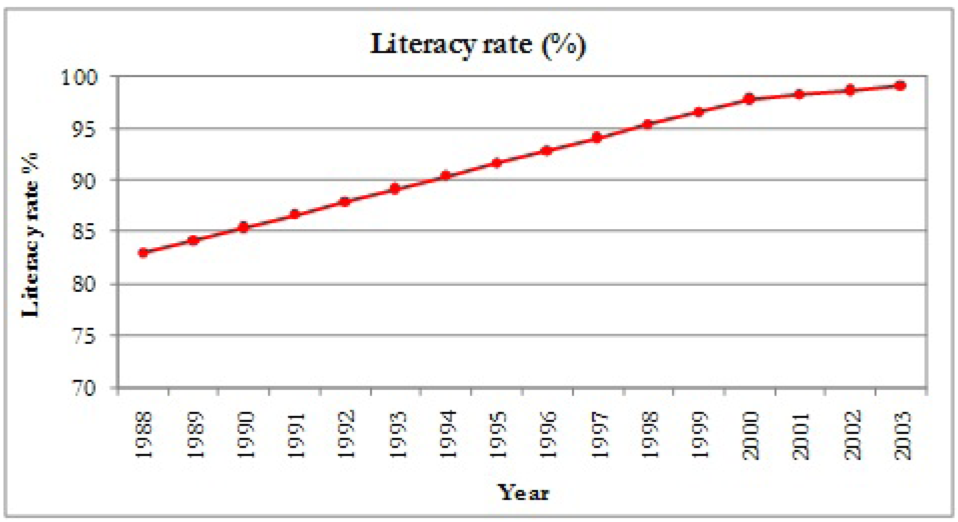


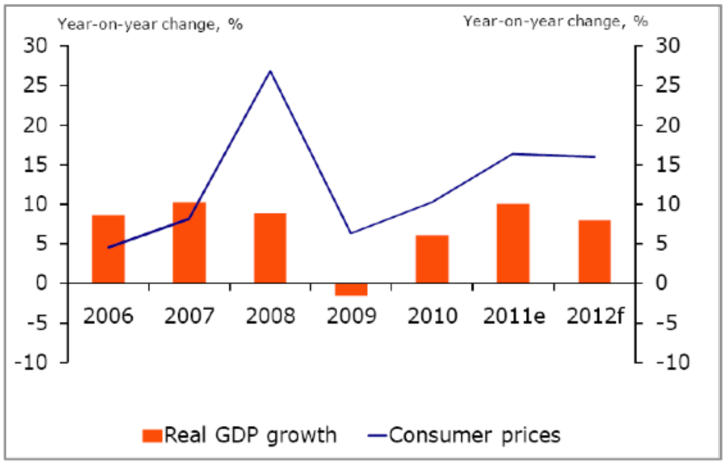
Figure 2.3: Literacy rate (in Percent) in Mongolia

Net Enrolment is quite high for the primary and only slightly lower for secondary levels, with ratios at 94.5 percent and 92.6 percent respectively. This ratio at the same levels is higher for girls than for boys. The Government of Mongolia allocated 7.5 percent of GDP to education in 2010 (UNICEF, 2009[1]).

Average life expectancy in Mongolia is at around 68.31 years. Total expenditure on health is about six per cent of the GDP. According to the World Bank, public expenditure on health as a percentage of total Government expenditures was nine percent.
In 2007, the part of the population with no access to safe water was 90 percent in rural areas and 48 percent in urban areas. Only 30.8 percent of Mongolia's population have access to a centralized water supply system. 64 percent people in urban areas have access to sanitation as opposed to 31 percent in rural areas.

Economic Structure and Growth

Herding and agriculture are the traditional economic sectors. In the recent decades, the global commodity boom has acted as the main driver of economic growth in Mongolia with GDP rising to up to 8.8 percent between 2003 and 2008 (Figure 2.4) However, the Mongolian economic structure is narrow with only agriculture and mining performing as the bulk contributors towards GDP. These sectors are prone to external shocks, mainly from natural disasters, climatic variability and market volatility.



Source: IHS Global Insight cited in Rabobank, 2011

Figure 2.4: Economic Growth Performance

The share of the agricultural sector in the GDP is 25 percent. Essentially, it supports around 50 percent of the population and constitutes 12 percent of foreign exchange. The secondary sector with mainly mining, manufacturing and construction contributes to about 30 percent of GDP. The tertiary sector with wholesale trade, retail trade, transport, communication and a few other, less important ones, contribute to 45 percent (NSO, 2011[2]).

Environment

Environmental degradation is traditionally of a great concern in Mongolia because of its highly variable climate with relatively low rainfall. Desertification and land degradation affect 71percent of its surface. As a consequence of the trend towards a decreasing number of water points, access to safe water has been reduced by 30 percent. The problem of environmental degradation in Mongolia also becomes evident through the steady reduction of forest cover. Annually at least 60,000 ha are deforested, thus leaving current and future generations with at best 12 percent of the surface that was initially covered by forest. Since 1992, the Parliament of Mongolia has passed several laws for protecting the environment.

NATIONAL DEVELOPMENT VISION, OBJECTIVES AND PRIORITIES

The Parliament of Mongolia approved in February 2008 the MDG-based Comprehensive National Development Strategy of Mongolia (CNDS). CNDS promotes and plans development up to 2021, integrating the MDGs and development planning. The fifth priority area is '*to create a sustainable environment for development by promoting capacities and measures on adaptation to climate change, halting imbalances in the country's ecosystems and protecting them*'. Adaptation to climate change is thus of the highest priority in Mongolia. Also Climate Change (CC) is one of the Government's central concerns.

The salient features of Mongolia's development plan are to:

- Undertake a science-based CC-assessment, study its effects, estimate prospective impacts and recommend policies in line with the concept of sustainable development;
- Assess areas affected or areas at the risk of being affected by drought and erosion due to environmental degradation and CC;
- Enhance the capacity of the affected groups to adapt to the peculiarities of CC;
- Choose and cultivate those varieties of grain, potato and vegetables, fodder plants which are sturdy and capable to adapt to environmental degradation and CC, develop new sorts, and introduce advanced methods and technologies in crop-farming;
- Develop and implement a policy to regulate the population and structure of livestock in accordance with the capacity of pastures;
- Develop, both, nomadic and intensive animal husbandries thus enabling this sector to adapt to environmental degradation and CC (this would also improve productivity through biological capability), and;
- Increase public participation in the activities related to preventive CC and desertification activities. This would help to define and introduce adaptation measures, find means to cope with CC-impact. It would also help to provide the public with related knowledge and information.

CONDITIONS, TRENDS AND SECTOR PRIORITIES

The population of Mongolia has tripled from one million in 1960s to almost three millions in 2012. The growth rate of the population is at 2.5 percent. Until 1960s, 90 percent of the population lived in rural areas. After 1960s due to rapid urbanization, the trend increased to 75 percent in urban and 25 percent in rural areas. Over the years, the overall livestock population has increased from 26 million in 1990s to 38 million concomitant with the increase in the number of herders from 1990 to 2001 (Table 2.1).

TABLE 2.1 SELECTED INDICATORS OF HERDER HOUSEHOLDS IN MONGOLIA

INDICATORS	1990	1995	1999	2000	2001
Number of herders, thousand	147.5	390.5	417.7	421.4	407
Number of herder households, thousand	74.7	169.3	189.9	191.5	185.5
Share of herder households with electricity, percent	15	11.3	13.5	10.6	13.4
Share of herder households with a TV set, percent		9.9	16.3	12.8	15.7
Share of herder households with an automobile, percent		2.9	6.7	8.7	9.5
Share of herder households with a motorcycle, percent		15.8	15.7	16.6	18.3
Share of herder households with a tractor, percent			1.6	1.5	1.5

Sources: National Statistics Office. cited in Shagdar, undated

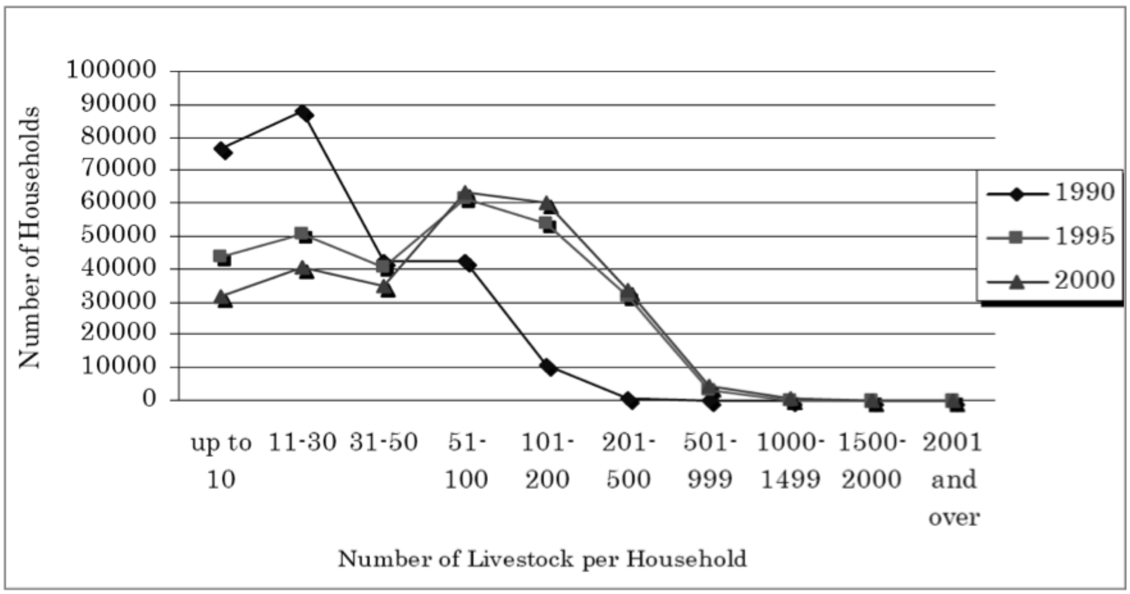
The goat population has increased from 18 percent in 1970 to 36 percent in 2001, whereas other animal populations shrank at the same time (Table 2.2).

TABLE 2.2 MONGOLIAN LIVESTOCK BY TYPE, THOUSAND HEADS

YEAR	TOTAL	OF WHICH PERCENT				
		CAMELS	HORSES	CATTLE	SHEEP	GOATS
1970	22,574.9	2.8	10.3	9.3	59	18.6
1980	23,771.4	2.5	8.4	10.1	59.9	19.2
1990	25,856.9	2.1	8.7	11.0	58.3	19.8
2000	30,227.4	1.1	8.8	10.2	45.9	34
2001	26,075.2	1.1	8.4	7.9	45.8	36.8

Source: National Statistics Office, cited in Shagdar, undated

The number of households owning less than 200 animals has increased (Figure 2.5). These households are considered to be living below the poverty line.



Source: National Statistics Office, cited in Shagdar, undated

Figure 2.5: Grouping of Herder Households by the Number of Livestock

Evolution of Pasture Regimes

The pasture system on which the herding operations are dependent has evolved over the past several centuries, and has transformed as described below:

The khoshuun system (1300s–1950s)

Traditionally in order to maintain herds in fragile grasslands of Mongolia, herders themselves organized in groups called Khoshuun. Herders under this system shared labour resources and managed grazing in accordance with pasture endowments. They kept the goat to sheep ratio at about 1:4. Ruling nobles, monks from Buddhist traditions were rallying points for Khoshuuns.

The collective system (1950s–1990)

During collective era, the Khoshuun system was completely destroyed. The livestock ownership was taken over by collectives and the entire operation was controlled centrally. The herders could keep up to 75 heads of livestock for themselves. This system did not reward efforts of individual herders. Hence this was not popular among herders

Current pasture regime (1990s-present)

Current pasture regime completely privatized livestock ownership as there is no regulation to manage pastures. Pastures are common, free resources to individual herders. Few herders care about pasture management. This resulted in substantial increase of livestock population from 20 million to 40 million. Though the land laws stipulate that local Government could regulate pasture utilization, there is no capacity within local Government to do so. Within the national Government structure Ministry of Agriculture goal is to increase the herders' income and the Ministry of Environment goal is preservation. The policy harmonization process between these two ministries is underway *(Naidansuren & Bayasgalan, 2011[3])*.

Ownership of livestock has transferred from collectives until 1990s to individual herders now.

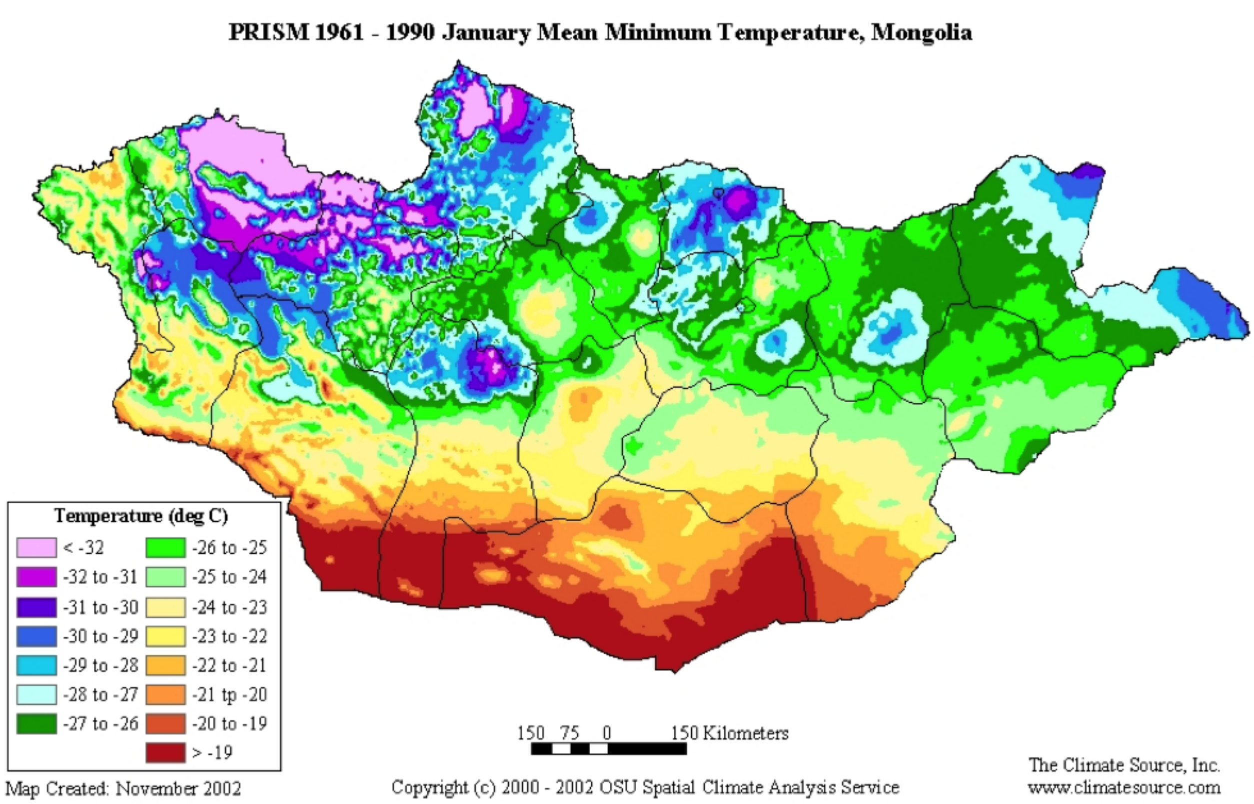
KEY MESSAGES

- The structure of the Mongolian economy is largely relying on mining and livestock and thus exposed and vulnerable to external shocks. Of the most dangerous external shocks, there are the external commodity price variations and periodic climate risks.
- The rural poverty is very high at around 46 percent. The Government is challenged by efforts to reduce poverty while at the same time trying to regulate the environment to better control climate risks.
- Due to collapse of the Soviet collective system, individual herders are more directly exposed to climatic threats.
- As their risk management strategy, individual herders keep a large number of livestock, thus hoping to reduce the vulnerability of their livelihood. Large number of livestock, in particular the large numbers of goats, cause environmental degradation, which is again detrimental to the herders' agro-environment.
- The Government of Mongolia is confronted with a complex challenge at the policy level where goals to preserve the environment and to protect the herders' livelihoods need to be harmonized.

CLIMATE PROFILE

NATIONAL WEATHER AND CLIMATE CONTEXT

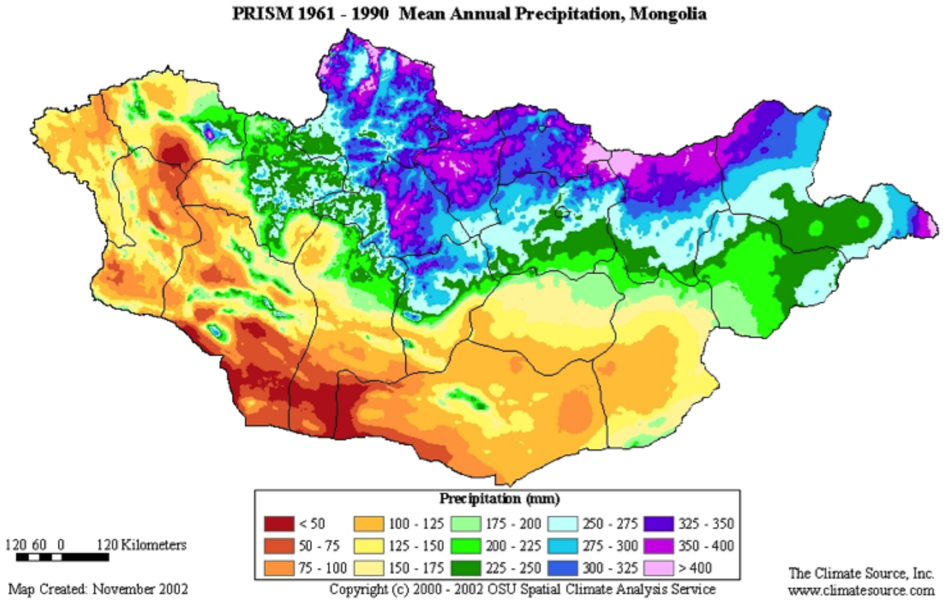
The Mongolian climate is the world's most typical continental climate with warm and relatively wet summers and long, dry and very cold winters and with extreme diurnal and annual variations of temperature. The average temperature is below zero from November to March and close to zero from April to October. Winter nights of -40 °C are common in most years with a minimum recorded of -58 °C at Uvs lake basin. Summer extremes reach as high as +40 °C in the Gobi Desert and +33 °C in the capital Ulaanbaatar. The average summer temperature is +20 °C and winter temperature is -20 °C. *(Figure 3.1)*



Source: Climate Source Inc., 2002[4]

Figure 3.1 January Mean Minimum Temperatures

Mongolia is situated at an average altitude of 1500 m above sea level, landlocked far away from the oceans and surrounded by high mountain chains that block the wet winds. Total annual precipitation ranges from 600 mm in the Khentii, Altai, and Khuvsgul Mountains to less than 100 mm in the Gobi. In some parts of the Gobi, no precipitation may fall for several years in a row. The average rainfall is 200-220 mm. In Mongolia there are 250 sunny days a year, often without the formation of clouds. Yet, the Mongolian climate has the four seasons of spring, summer, autumn and winter (Figure 3.2).



Source: Climate Source Inc., 2002

Figure 3.2 Mean Annual Precipitation

CURRENT CLIMATE VARIABILITY AND CLIMATE EXTREMES

Within last 60 years, important deviations from the average climate have been observed in Mongolia including an increase of climate hazards such as dzud, drought, cold waves, heat waves, snow storms and floods (Batima, 2006).

Drivers of Climate Variability

Mongolia, a vast, dry and windswept land, is located between the Siberian Steppe and the Gobi desert. The landscape, occurrence of heat, the westerly winds combined with low precipitation and soil moisture are the main driving factors of climate variability. Mongolia has a climate with four distinctive seasons, high annual and diurnal temperature fluctuations, and low rainfall. Because of the country's average altitude, it is generally colder than other countries at the same latitude. Average annual temperatures range between 8.5°C in the Gobi and -7.8°C in the mountainous areas and average annual precipitation is comparatively low with 200 to 220 mm.

The natural ecosystems are relatively fragile, given that they are highly susceptible to degradation by both natural and human impacts. Most precipitation occurs in the months of June, July and August; the driest months are between November and March. Drought in the spring and summer occur about once every five years in the Gobi, and once every ten years in other parts of the country. A significant portion of the land resources in Mongolia are threatened by overgrazing, deforestation, erosion and desertification, most of which for anthropogenic reasons. Climatic variability appears to be the major driving factor of livestock dynamics in Mongolia.

Climatic Hazards

Mongolia is exposed to various climatic hazards such as dzuds, droughts, heat wave, snow storms, floods and windstorms etc., which affects various economic sectors.

Dzud:

The dzud is a complex and slow onset natural phenomenon that is mainly caused by sudden spurts of heavy snowfall, long-lasting or frequent, extremely low temperatures, or drifting windstorms that reduce or prevent animals from finding fodder. Most dzuds are thus related to summer droughts, which have a negative impact on livestock fattening, i.e. their capacity to overcome the winter. The CRM-TASP analysis supports the definition of the Mongolian dzud phenomenon, in particular with regard to the herder's economic situation, as recently provided by the '2009-10 dzud Winter Disaster' report on 'Lessons Learned' published by UNDP, the National Emergency management Agency (NEMA) and SDC in December 2010.

It is widely accepted that there are two root causes of the dzud. The first one is meteorological conditions, such as blizzards, heavy snow, extreme cold, and ice-bound pastures. The second one is lack of available pasture due to droughts and overgrazing. Herders have named that meteorological phenomenon or hazards differently, depending on their cause i.e. a white dzud (caused by heavy snow fall), a black dzud (due to a lack of water during summer, followed by a lack of snow during winter) and an iron dzud (coverage of pasture by a sheet of ice). The frequency of droughts and dzuds has increased over the years and dramatically heightened risks of poverty for rural people (UNDP/NEMA/SDC, 2010).

Drought

Drought has increased significantly in recent years in Mongolia. The worst droughts occurred in the consecutive summers of 1999, 2000, 2001, and 2002, which affected 50-70 percent of the territory. Such long-lasting and severe droughts had not been observed in Mongolia in the last 60 years. During those four years of drought, about 3,000 water sources including 680 rivers and 760 lakes, dried up. Such environmental degradation in turn has affected agricultural fauna and water resources, which support livestock as well as human populations (Batima, 2006).

Heat Wave

Average air temperatures of above 25-30 °C are considered as hot. In recent years, there is an increasing trend of heat waves which causes negative impact on the human health, rise in vector borne disease, decrease in soil moisture, forest fire, increase in evaporation and water shortage.

Windstorm

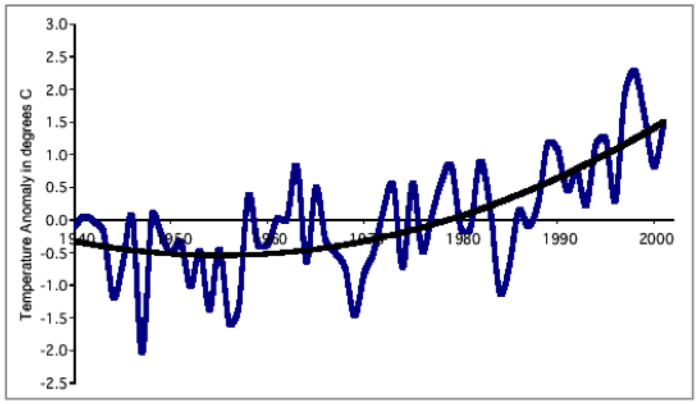
Windstorms during winter, or during the coldest time of the year, are characterized by strong drifting winds over a large area. These are very dangerous because the cold forces animals to stay mobile over long distances and thus may cause them to die from exhaustion.

Other hazards

The importance of a range of other hazards has been acknowledged for Mongolia. Snowstorms, flash floods, thunderstorms and hail also result in considerable loss of life and properties. Spring flash floods occur in rivers due to snow melt draining from the Altai, Khentii and Khangai mountains.

OBSERVABLE CHANGES IN CLIMATE VARIABLES AND HAZARDS

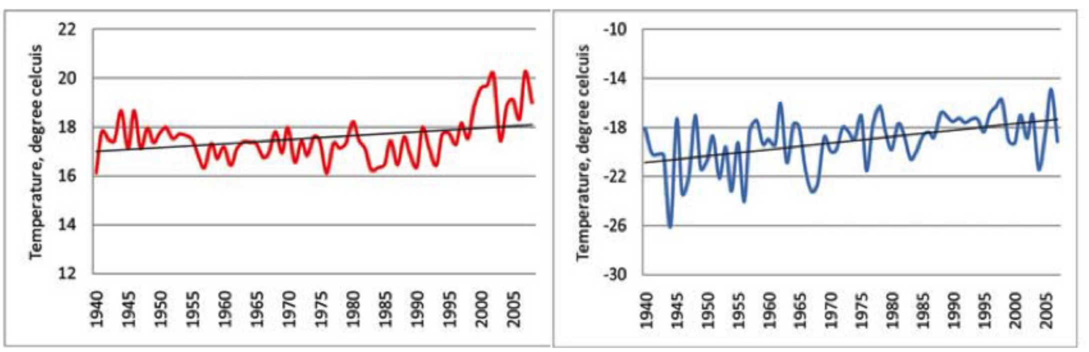
During the last 60 years, the annual mean air temperature in Mongolia has increased by 1.56°C. Winter temperatures have increased by 3.6°C and spring-autumn temperatures by 1.4-1.5°C. In contrast, summer temperatures have decreased by 0.3°C predominantly in June and July. Changes in temperature are indeed spatially variable: winter warming is more pronounced in the high mountains and wide valleys between the mountains, and less so in the steppe and Gobi regions. There has been a slight trend of increasing precipitation during the last 60 years. The country's average precipitation rate has increased by six percent between 1940 and 1998. This trend is not seasonally consistent: while summer precipitation has increased by 11 percent, spring precipitation has decreased by 17 percent. Though rainfall is generally very low, the number of days with precipitation varies between 42 and 132. Adverse impact of changing climate on pasture availability threatens forage yield, livestock productivity and local and national food production capacity.



Source: (MNET, 2009[5])

Figure 3.3: Observed temperature trend in Mongolia (1940 – 2001)

An analysis of the prevalent trend shows that the annual mean surface air temperature in Mongolia has risen by 1.66°C, warming faster in winter than in summer, during the 1940-2001 period (Fig.3.3). Warming is more pronounced in the high mountainous areas and their valleys, and less in the Gobi desert. The intense drought spells that have taken place in recent years are most likely due to increased temperature and decreased precipitation. (Figure 3.4)

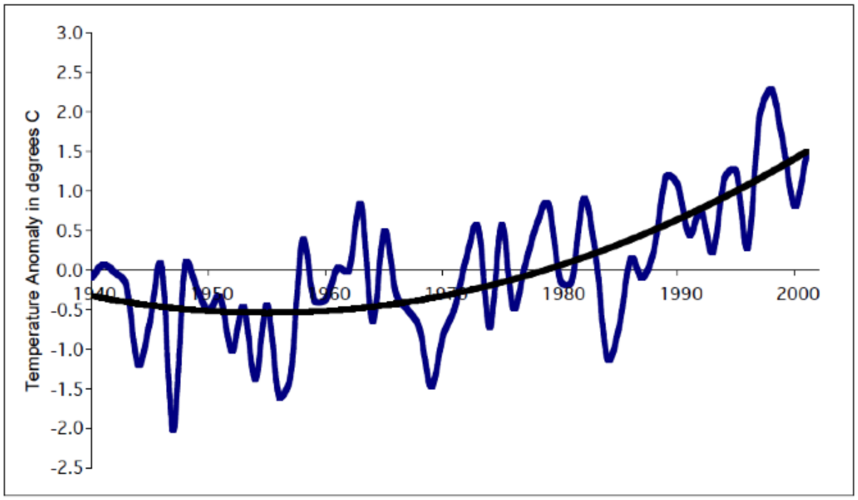


Source: MNET, 2009

Figure 3.4 Average summer and winter temperature trend for 1940-2005 (MNET, 2009).

The analysis (Batima, 2006, *MNET, 2009*) of meteorological data from 60 sites across Mongolia for the duration 1940-2003 revealed the following findings:

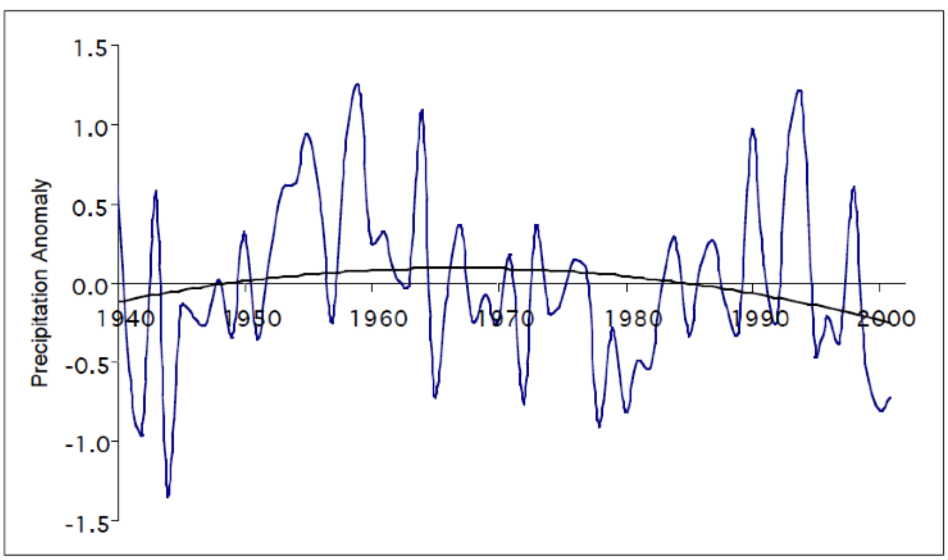
- Annual mean temperatures have risen by 1.8 °C between 1940 and 2003. Warming has been most pronounced in winter, with a mean temperature increase of 3.6 °C, while spring, autumn, and summer mean temperatures have risen by 1.8 °C, 1.3 °C, and 0.5 °C respectively. The annual mean temperature trend is 0.029°C/year, winter temperature trend is 0.051°C/year and summer temperature trend is 0.011°C/year *(MNET, 2009) (Figure 3.5);*
- The heat wave duration increased by 8-18 days, depending on the geography;
- The cold wave duration has shortened by 13 days.



Source: MNET, 2009

Figure 3.5 Mean annual temperature trend for 1940-2001

Annual precipitation changes are quite variable. Seasonally, autumn and winter precipitation has increased by 4-9 percent, while spring and summer precipitation has decreased by 7.5-10 percent. The magnitude of variation in precipitation regardless of increase or decrease is 5-25 percent. *(Figure 3.6)*



Source: MNET, 2009

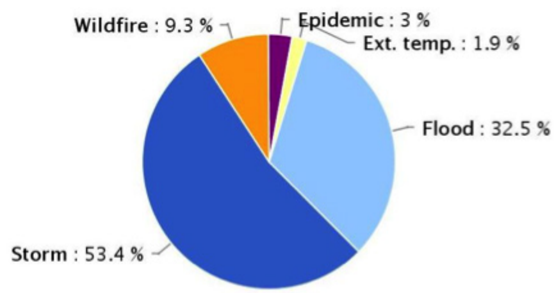
Figure 3.6 Mean annual precipitation trend for 1940-2001

There was no statistically significant change in the maximum number of average consecutive dry days which increased slightly in central Mongolia, where the annual mean precipitation decreased. It decreased in south-eastern Mongolia, where annual mean precipitation increased. The maximum number of consecutive wet days remained unchanged in most of the area.

Climatic hazards

Mongolia is prone to climatic hazards such as dzuds, droughts, heavy snowfall, windstorm, flash floods, cold, heat waves and wildfires. Existing records show that storms and extreme temperatures are common during winter while floods occur during the spring and summer.

This array of hazards can easily cause a disaster when it affects people and result in considerable loss of life and properties. Each year about nine people die and more than 100,000 people are affected in Mongolia due to climate-induced disasters. The related economic damage per year is estimated at about 64 million USD *(EM-DAT[6])*. Loss of human life due to climate induced disasters accounts for about 97 percent of total disaster loss (EM-DAT, 2012).



Source: EMDAT

Figure 3.7 Percentage of people killed by disaster type in Mongolia

PROJECTED CLIMATE TRENDS

Rising temperatures and uncertainties in rainfall associated with global warming are likely to increase the frequency and magnitude of climate variability and extremes. Mongolia's CC-future as anticipated for the periods 2000-2040 and 2040-2070 have been determined on the base of the selected General Circulation Models (GCM) scenarios. The results show a range of 3 - 4.6ºC increase in monthly mean temperatures and a small increase in precipitation. All of the models predict winter warming that would be more pronounced than summer warming, especially after 2040. In general, temperature increases were given for summer (1.0 ºC -3.0 ºC by 2040 and 2.0 ºC -5.0 ºC by 2070), for winter (1.4 ºC -3.6 ºC by 2040 and 2.2 ºC -5.5 ºC by 2070) and for annual mean temperature (1.8 ºC -2.8 ºC by 2040 and 2.8 ºC -4.6 ºC by 2070). The simulated results of precipitation change in the 21st century cannot be summarized as easily as the temperature results, because the scenarios are very different. For instance, the CCCM model indicated a precipitation decrease in the Gobi while other models indicated an increase. Changes in snowfall were also inconsistent. Annual precipitation was projected to increase by 20-40percent.

Global warming will have a significant impact on natural resources such as water resources, natural rangeland, land use, snow cover, permafrost, and major economic activity of arable farming, livestock.

Almost all the model analysis of climate change scenario in Mongolia broadly shows that temperatures increase in all seasons and precipitation increases in most cases, though these changes are very small. The HadCM3 model has been found performing best for the base period 1971-1999 (MNET, 2009). Its results show that the annual precipitation will generally increase. However, there will be small decline in the summer season between 2011-2030 according to A2 and A1B GHG emission scenarios. Precipitation in the summer season will increase by less than 10 percent, which is smaller than the rise in winter precipitation compared to the normal climate. Due to climate change, it is anticipated that winter is becoming milder and more snowy, while summer is becoming hotter and drier even though there will be a slight increase of precipitation based on overall climate change assessment. The projected evapotranspiration is much higher than the projected increase in precipitation. Accordingly, soil moisture to rehabilitate plant growth is going to be insufficient.

The average changes projected by the HadCM3 model in terms of winter and summer surface temperatures and percentages in precipitation for three scenarios (A2, A1B and B1), are summarized in Table 3.1.

TABLE 3.1 TEMPERATURES AND PRECIPITATION PROJECTIONS FOR MONGOLIA

Period	Scenario	Temperature change (°C)			Precipitation change (percent)		
		2011-2030	2046-2065	2080-2099	2011-2030	2046-2065	2080-2099
Annual	*A2*	1.0	2.7	5.0	2	9	15
	A1B	0.9	3.0	4.6	0	7	16
	B1	0.8	2.1	3.1	3	6	11
Winter	*A2*	0.7	2.3	4.2	14	19	55
	A1B	0.2	2.5	3.8	0	23	41
	B1	0.2	1.6	3.0	7	14	32
Summer	*A2*	1.1	3.1	6.3	-2	4	7
	A1B	1.4	3.6	5.6	-4	3	11
	B1	1.2	2.7	3.7	2	0	8

Source: MNET,2009.

Overall, though, temperatures seem to be rising steadily. In 2009, UNEP declared that annual average temperatures in Mongolia have risen by 2.1 degrees Celsius over the last 70 years. The agency also reported a 30 percent decline in surface water over the past 15 years, adding that 90 percent of Mongolia is at risk of becoming desert.

STATUS OF CLIMATE AND HAZARD INFORMATION AT NATIONAL AND REGIONAL LEVELS

A relatively complete picture of current and future climate hazards and trends can be obtained from the available data and information and the various studies conducted by Ministry of Nature, Environment and Tourism, Government of Mongolia (MNET, 2009). The main driving factors and general characteristics of today's climate variability are well understood and the main zones of influence are known for key hazards such as dzuds, droughts, heavy snowfall, windstorm, flash floods, cold and heat waves. Recent and robust climate projections are available for temperatures and rainfall although large gaps prevail.

For example, continuous data is only available for a few decades, making it difficult to discern current climate trends with certainty. Early warning systems are in very early stage of development. The Institute of Meteorology and Hydrology lacks experts in the field of modelling. Other issues relate to the lack of computational tools and models. Climate projections rely on global circulation models with a coarse resolution of 250 by 250 km and cannot project changes in hydrological cycles at regional scales. Regional climate models have not been used as they are still being tested and developed. As a result, local projections are uncertain, particularly for rainfall, where spatial variation is high.

Recently, the Ministry of Nature, Environment and Tourism published its Second National Communication of Mongolia under the United Nations Framework Convention on Climate Change (UNFCCC). It provides information on current climate trends, future climate projections, vulnerability to climate change and its magnitude, impact assessment and adaptation options in Mongolia (Ministry of Nature, Environment and Tourism, 2010[7]).

In summary, large gaps remain, some of which have to be addressed at the international level (climate models, for instance), while others, such as more and better equipped weather stations and climate experts, have to be dealt with in the country. The IPCC's 'Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation' states with 'virtual certainty' that increases in the frequency and magnitude of warm daily temperature extremes and cold extremes will occur in the 21st century at the global scale. It is 'very likely' that, 'length, frequency, and/or intensity of warm spells or heat waves will increase' in Central Asia while the recurrence of rainfall events will decrease (IPCC SREX 2012).

KEY MESSAGES (CLIMATE PROFILE)

- Climatic variability in Mongolia has mainly been driven by the unique vast, dry and windswept landscape and the westerly winds.

- Key hazards include dzud, droughts, floods, windstorm, cold and heat waves which have resulted in considerable loss of human life and livestock.

- Climate models project a rise in temperature and uncertainty in annual rainfall resulting in hotter and drier future climates. Temperature trends are more extreme in the higher altitudes of western Mongolia.

- The rainfall projections indicate a decrease in summer rainfall and winter precipitation. It is anticipated that winters will become milder and snowier, while summer are becoming hotter and drier. The projected evapotranspiration rates are much higher than the projected increases in precipitation. Accordingly, soil moisture capacities to sustain vegetation could become insufficient.

- Considering the spatial and temporal variability of climate parameters, the current monitoring network is inadequate. There is a need to build observation systems, particularly in the southern and western regions.

CLIMATE IMPACTS AND RISKS

PAST CLIMATE IMPACTS

Mongolia suffers the impacts of extreme climate events almost every month. The hazard calendar (Table 4.1) illustrates the spatial distribution of major disaster events in 2006 and demonstrates high frequency of severe weather events and in particular the dominance of forest and steppe fires:

TABLE 4.1 HAZARD CALENDAR OF MONGOLIA

HAZARDS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Drought			■	■	■	■	■	■	■	■		
Dzud	■	■	■	■							■	■
Hails storms						■	■	■				
Hot weather							■	■				
Flash floods				■	■	■	■	■	■	■		
				■	■	■	■	■	■	■		
River floods						■	■	■	■			
Heavy snow	■	■	■									■
Steppe fire			■	■	■	■			■	■	■	
Forest fire			■	■	■				■	■	■	
Dust storm					■	■	■	■				

Source: NEMA

Increased frequency of severe weather events: The frequency of severe snow and dust storms has increased several-fold in recent times. In 2004 fourteen events were reported, while in 2005 similar incidents occurred 22 times. Water and rainfall related disasters like thunderstorms and flash floods have also caused substantial damage. Flash floods have occurred nine times in 2004, while in 2005 this type of event occurred 20 times. Desertification is considered as a slow on-set disaster as its magnitude is increasing. The frequency of wind and dust storm is also increasing. Infectious disease like anthrax, foot and mouth disease pose a major threat to humans and livestock.

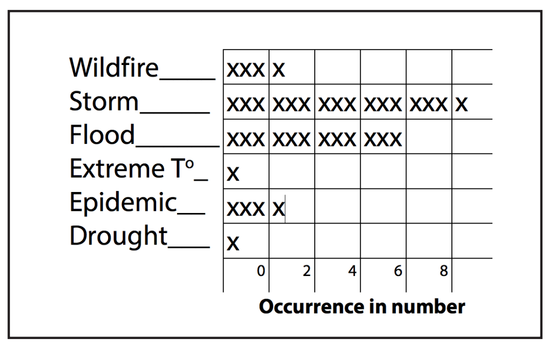


Figure 4.1 Disaster frequency and hazard summary from 1980-2010

Dominance of forest and steppe fire: Forest and steppe fire predominate among the registered disasters. These occur mainly during spring and autumn due to dry weather. There is a connection between these events and CC as mentioned by IPCC SREX (2012) and brought out in the present analysis. About ten percent of the country was covered by forests until 2000. Coverage has reduced to eight percent. Droughts and dzud, becoming increasingly commonplace, influence livestock management styles, undermine rural livelihoods, induce forced migration and negatively impact agriculture, environment and thereby the overall economy.

Droughts

Mongolia is in a low rainfall area with averages of around 260 mm and an annual variation of 140 to 160 percent. Many low rainfall years on record were caused by drought – occurring particularly between May and August. Low rainfall reduces pasture capacity in terms of cattle feeding and further curtails the ability of livestock to withstand the forthcoming winter season. The following five figures show that almost every alternate year is drought year and that the role of drought, snowfall and reduced growing season, in different combination, cause livestock mortality.

Figure 4.2: Percentage deviation from long-term mean annual precipitation at GTBNP, 1939-1983, 1990-1997

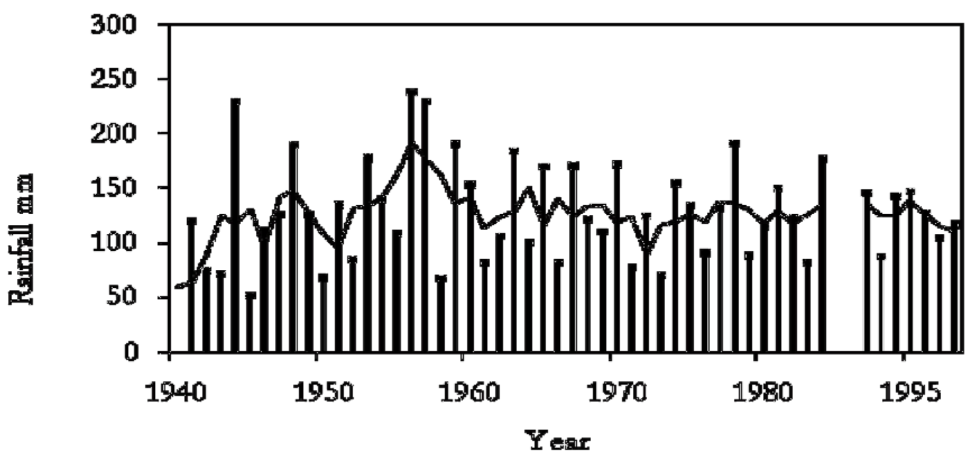


Figure 4.3: Annual precipitation, GTBNP, 1939-1983, 1990-1997 with 3- year running mean

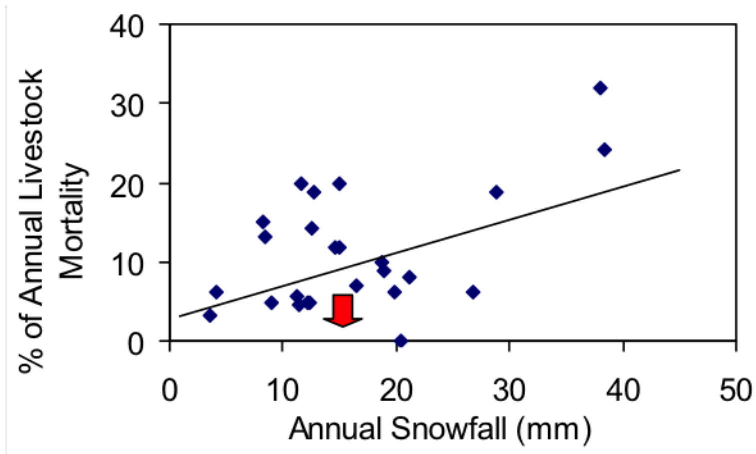


Figure 4.4: The relationship between a. livestock mortality and snowfall; b. Livestock mortality and annual growing seasonal rain. The downward pointing arrow denotes the mean annual snowfall

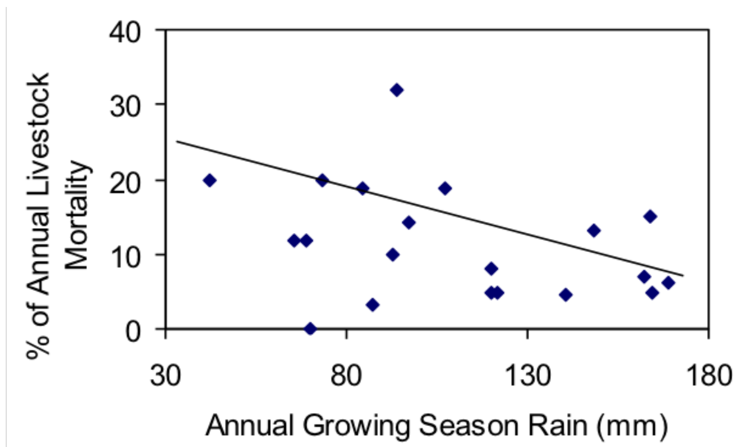


Figure 4.5 Relationship between livestock mortality, snowfall, and mean rain values for growing season

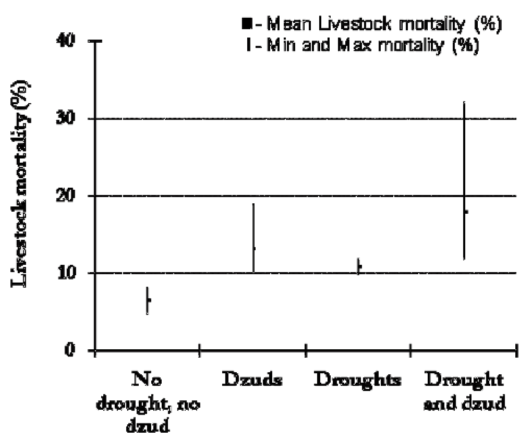


Figure 4.6 Annual livestock mortality in relation to drought and dzuds occurrence

Dzuds:

The dzuds that occurred in the years 1944-45, 1967-68, 1978-79, 1993, 1999-2002 and 2009-10 caused a severe impact on development in Mongolia. The one in 1999-2002 resulted in a loss of 8.8 million livestock and economy losses to the tune of USD 330 million (Bensen, 2011[12]) which equals 30 percent of the GDP of 2002. The losses arising from the dzud in 2009-2010 also were substantial, with 8.8 million livestock losses at the value of US$ 477million *(Goodland, Undated[8])* which is 4.4 percent of 2009 GDP. The livestock deaths due to dzud from 1999 to 2010 are presented in Table 4.2. Its causes and impacts are shown in Table 4.3 *(Bensen, 2011)*.

TABLE 4.2: LIVESTOCK THAT DIED DURING DZUDS

YEAR	NO. OF LIVESTOCK LOST
1999-2000 total	2.24 million
2000-2001 total	3.40 million
2001-2002 total	2.07 million
2010 - 5 January Start of official dzud count	0.05 million
2010 - 1 February	1.8 million
2010 – 18 March	3.8million
2010 – 26 April	7.2 million

Number of livestock at the end of 2009: 19,651,500 goats; 19,274,700 sheep; 2,599,300 cattle; 2,221,300 horses and 277,100 camels (Source: UNICEF, 2010[9])

TABLE 4.3 DZUD 2010, CAUSES AND IMPACT

	CAUSES	IMPACT
1.	Summer drought affecting many parts of the country, especially key pastoral areas	Lack of household-conserved hay production due to drought
		Poor body condition of animals with low fat reserves
		Lack of hay available on the private market
2.	Increasing national herd	Lack of alternative income-generating opportunities leads more people to keep livestock
		Significant increase in goat population, as herders expect to sell cashmere, not necessarily successfully
		Resultant environmental degradation and over-grazing contribute to poor body condition of animals
3.	Unusually cold winter follows	Temperatures below -45°C in many areas for long period
4.	Frequent and heavy snowfall is experienced, preventing access to winter grazing	Early snow thawed and refroze as an ice cover over pasture
		Thick layer of snow affecting mobility of herders and livestock
		Frequent snowstorms
5.	Lack of stored hay for distribution and sale Source: UN Mongolia, 2010[7]	The role played by former state fodder reserve is now left to market forces
		A series of good summers resulted in poor market for hay, so private merchants reduced production in summer 2009

The detailed cases of the 1999-2000 and 2009-2010 dzuds are discussed in Boxes 1 and 2 respectively.

BOX 4.1: 1999-2000 DZUD CASE STUDY

Characteristics

The1999-2000 dzud has affected more than 70 percent of Mongolia by repeatedly causing damage to livestock. First, livestock got exhausted due to a black dzud (lack of precipitation which leaves livestock without any water supply) and then a white dzud (causing a snow cover too thick for livestock to reach the grass) at the arrival of winter. As a result of the summer drought, cattle could not get fattened, which caused weakness of livestock. The situation was further aggravated by poor pasture management and lack of hay. Heavy snowfall in November and December was followed by melting and icing, leading to the so-called iron dzud, i.e. an impenetrable ice-cover. Due to the extreme coldness in January and February and insufficient bodyweight, several thousands of livestock died from starvation and freezing.

Impacts

- 13 aimags and 157 soums of Dundgovi, Zavkhan, Khovd, Uvurkhangai and Tuv aimags were affected;
- 33.5 million heads of livestock pertaining to about 190 thousand households were on winter pastures in 1999-2000 throughout the country. Of these populations, 80.9 thousand households, i.e. 452.0 thousand people, and 7 million heads of livestock endured a disastrous condition;

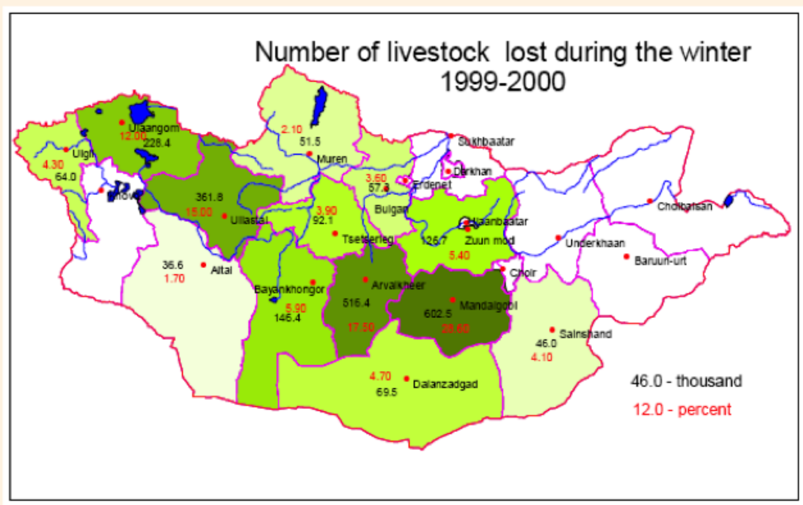


Figure: Livestock lost during the winter 1999-2000

Source: (NAMHEM, JEMR, UNDP & GCS, 2000[11])

- Around 2,399,000 heads of livestock were lost i.e. an equivalent of 91.7 billion tugrugs according to local market prices as of June 2000;
- 2369 households have lost livestock entirely and over 10000 households were left with less than 100 heads of livestock;
- Living standard of rural people rapidly plummeted contributing to an increase of unemployment and poverty in rural areas.

BOX 4.2: 2009-2010 DZUD CASE STUDY

Characteristics

The 2009-2010 dzud was one of the most severe ones in terms of its impacts. 70 percent of the population and the economy were affected. It started with the drought in summer 2009. Further on in the year, heavy snowfall made grazing on pasture difficult until December. At that point of the dzud cycle, herders ran out of fodder. Extremely low temperatures in January and February 2010 further aggravated the livestock situation, causing losses.

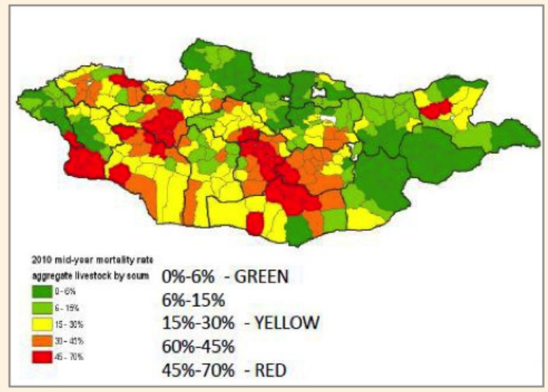


Figure : 2010 Mid-year mortality rate aggregate livestock by soum
(source: Goodland, Undated)

Impacts:

- 8.5 million livestock lost and 220,000 households affected by mid-May 2010;
- Around 8,700 households lost all their animals;
- 40,000 herders lost 50 percent or more of their livestock;
- 1,500 herder households had migrated to soum or aimag centers or to Ulaan Baatar;
- The loss of livestock deaths was approximately US$192 million which is 4.4 percent of GDP;
- Livestock reproduction rates were also significantly reduced by the dzud, implying further indirect livestock losses;
- Productivity of surviving livestock, in terms of production of milk, wool and other products is lowered until cattle regains weight;
- A national inflation of 11.6 percent was observed during May 2010 compared to less than two percent in December 2009. This stark inflation caused a 36 percent increase in average meat prices, reflecting the shortages of meat.

Source: Bensen, 2011

Livestock mortality

Figure 4.7 shows the increasing trend of exposure to weather hazards of livestock.

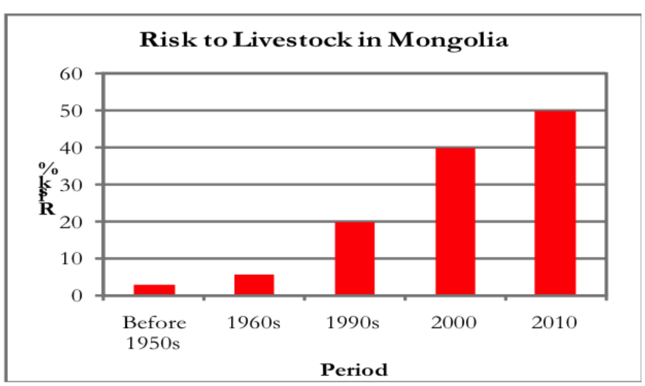


Figure 4.7: Increasing trends of risks to livestock

Box 4.3 explains the complex relationship between dzud-related risks and the often resulting disasters.

BOX 4.3: COMPLEXITY OF DZUDS *(AFTER SKEES & AMGALAN, 2002)*

Numerous theories have emerged as to why the losses from the above mentioned dzuds were so high. No doubt, a combination of explanations gives insights into the problem. Two general categories of explanations dominate: 1) the weather; and 2) macro-economic factors.

- The weather-related events include: drought prior to winter; heavy snow; cold temperatures; freezing and thawing of snow causing ice and the combination of these events;
- The economic side of the explanations includes: the lack of experience of the herders that have returned to herding after reform; the breakdown in infrastructure of wells for water along the traditional routes; the lack of forage reserves that were supplied by the former regime; a general lack of capital to purchase fodder during the dzud.

PROJECTED IMPACT OF CLIMATE CHANGE

Change in land use pattern

The current distribution of the high mountain and taiga areas is projected to decrease at a range of 0.1 to five percent by 2040 and by four to 14 percent by 2070 as the boundary of the high mountain zone shifts northward. The area of the forest steppe (Khangai, Khentei, Khuvsgul, and Altai mountain ranges) is estimated to decrease by a range of 0.1 to 5.2 percent by 2040 and by 3.7 to 13.6 percent by 2070. Changes in the steppe area are not expected to be significant at a range between 0.1 and 3 percent. However, it is expected that by 2040 the dry steppe zone that currently occurs in the country's eastern parts will spread northwards.

In sum, a decrease of high mountain and forest-steppe zones and an increase of the steppe areas are expected. Furthermore, by 2070 the area covered by steppe may expand to occupy the lower and middle slopes of the Khangai and Khentei mountains and the western slopes of the Change mountain- as well as the Gobi-Altai mountain areas. The desert steppe areas may decrease by 2.5 or even 11.8 percent in 2040 as it is further transforming into steppe-like conditions. The desert area is projected to increase by a value lying between 6.9 and 23.3 percent of the actual area by 2040 and by somewhere between 10.7 and 25.5 percent by 2070.

Impact on freshwater resources

The findings of GCM scenarios show that water resources will tend to decrease by mid-century. According to the simulation results, almost one third of the country could then become defined as a very vulnerable region.

Impact on grassland eco-systems

When temperatures increase by 3°C, as projected, carbon and nitrogen levels in soil organic matter are expected to decrease by a value between 10 percent and three percent, respectively, and peak-standing biomass may be reduced by 23.5 percent. Soil carbon decline is expected to be more dramatic in the desert steppe and desert by 2040, declining by at a range of 14.2 to 48.9 percent in the desert steppe and four to six percent in other regions. The decline in soil carbon could continue until 2070, according to the same model. Soil carbon would thus be below the current level by a percentage falling between four and 26. By 2070, soil nitrogen will decrease in all regions, except for the Altai Mountains. Peak standing biomass would be higher by 2040 and lower in all regions by 2070.

Snow cover

Monitoring snow cover is important in Mongolia because, in winter, it can have, both, positive and negative impacts on animal husbandry. Long lasting, thick snow cover adversely effects the situation of cattle by limiting the pasture size. On the other hand, snow provides a water source in a season when all surface water is frozen. For that reason it allows access to areas that could not otherwise be used as pastures.

Global warming scenarios indicate that the area that can be used for grazing may decrease by an average of 22.6 percent by 2070. The number of days with stable snow cover is projected to decrease. Accordingly, in the middle of the 21st century, shortages of animal watering opportunities during winter are expected in the western part of the country. Those parts include the Orkhon and Selenge river basins and the Lakes basin. The same basins currently account for a major portion of the arable land. Later formation and earlier melting of snow cover would also lead to a decrease in soil moisture capacity that could adversely affect crop yield.

Impact of climate change on key livelihood activities

Livestock rearing

In general, Batima's impact assessment (2006) has indicated that temperature increase will have a negative impact on ewe weight gain in all geographical regions because the hot temperature at daytime will cause a reduction of grazing time. According to the simulation and different scenarios of climate change, under unchanged management, ewe live-weight gain may be lower, as the higher temperatures may lead to reduced grazing time in summer of 0.7-2.0 hours per day from May till September. This effect will be more pronounced for the forest-steppe zone than for the steppe and Gobi desert. Significantly lower weight gains are predicted for the high mountain regions.

The expected higher temperatures in the summer season will have a slightly positive effect in the high mountain region, resulting in reduced weight loss in the winter-spring period, but because of the higher snowfall in the forest and steppe regions, grazing time will be shorter (on average 0.2-0.4 hours per day) with stronger negative consequences. Additional average daily weight loss could be four to eight grams, leading to an estimated increase in the total weight loss over the winter-spring period of 0.3-0.4 kg. Animal productivity strongly depends on animal body condition. Therefore, it may be expected that the lower weight at the end of the winter-spring period will also negatively affect the production of milk, wool, and other products. Livestock milk production is likely to be lower, because of the reduced daily intake during the hot summer period. A reduction of the cold period may also negatively affect both wool and cashmere production.

Crop agriculture

The potential wheat yield is expected to increase by a range of 8 to 58 percent by 2040. The maximum increase will occur in the western region (15-58 percent), and the minimum will occur in the eastern region (8 to 19 percent). By 2070, potential wheat yields in most parts of the central cropland region will decrease by a range of 5 to 35 percent. Nevertheless, the wheat yield potential is expected to rise by 8 to 22 percent in the western and north-western part of the Central region, by 8 to 16 percent in the Dornod region, and by 20 to 28 percent in the Western region.

The maximum rise of potato yield would occur in western areas (13-26 percent) and the minimum will occur in the central cropland region with a 2-8 percent range. By 2070, the potential potato yield is projected to be slightly higher (in a zero to 14 percent range) than current level in the Eastern and Western cropland regions, but this projected yield will be much less than the yield in 2040. Mongolia's yield per hectare is already very low. Any small reduction in crop yield will therefore have significant impacts. In summary, climate change is expected to have positive results on crop yield in the first forty years of the 21st century.

CLIMATE SENSITIVITY

Agriculture, including the animal husbandry sector, supports 40 percent of the population and accounts for 35 percent of GDP. These sectors are sensitive to climatic conditions. Climate or weather risks are a normal part of herders' livelihoods. Grasslands are intermediary biophysical systems that transmit climatic risks to livestock and livelihoods.

Herders' livelihoods depend on the quantity and quality of the grasslands they can access and the seasonal timing. This has not changed in the past hundreds of years over which pastoralism has been at the heart of Mongolia's socio-economic set-up. Yet, the precise features of this inter-dependency have undergone important changes – not least as a result of the changing climatic dynamics. At national level, one of the most dramatic changes has been the significant reduction of grassland biomass production, of about 20-30 percent in the last 40 years and of fodder losses of circa 30 percent compared with 1986. Another major change has been the expansion of desert areas which are steadily moving northward from the Gobi region, at an estimated rate of 150 km every 20 years (RIMES, 2010c).

Key features of the natural cycles of the grasslands' ecology change due to weather dynamics, land-use patterns, and their combined impact. This means that there is no absolute threshold against which the impact of interventions can be measured. In ecological terms, grasslands are subject to both equilibrium and non-equilibrium dynamics (Vetter, 2005 cited in RIMES, 2010c). All four seasons are critical concerning vulnerability to grassland dynamics:

Summer: The short summer season arrives in June and ends in late August. Its agricultural value depends on the patterns and intensity levels of rainfall and sunshine, as well as on the grazing practices of previous years. During the summer months dairy production is at its peak. Proper processing and commercialization will normally allow households to generate income for the rest of the year. As households stay near a water source during this time, women and children can carry water easily. However, lots of firewood is used for cooking, milk processing and for storing dairy products for winter and spring consumption. Both water and wood resources have become scarcer in recent years, contributing to increased stress on households, and, increasingly, to conflicts about water rights in particular between households and communities.

Autumn: Autumn starts in September or, as the herders say, after '*Naadam*'. Effectively that means that by mid-July when the work to produce and store enough hay and fodder for winter and spring use starts. The quantity and quality of hay and fodder depends on the weather pattern of previous months as well as on past grassland management practices. Drought can have a dramatic negative impact on hay and fodder production, while very dry summers can lead to no hay and fodder production at all. In a normal year, herders sell their livestock for meat in autumn and require proper livestock management practices.

During summer and autumn, in the case of drought or other adverse circumstances, some herders move to so-called *otor* or 'special fattening pastures' i.e. pastures held in reserve under normal conditions with collective acceptance and action at the community and supra-community levels requiring all households in an area to not use otor pastures prior to the summer or autumn seasons in accordance with a detailed usage agreement collectively enforced. As well as the seasonal pastures, nearer pastures are kept for weak and newborn animals to be kept during bad weather, and the farther pastures are used for stronger animals such as horses and cattle.

Winter: In winter, which lasts from November until February, the grassland is 'asleep.' However, winter conditions have a direct impact on the potential for grassland development and health in the following seasons. Extreme winter conditions delay and hamper adequate spring growth, which will directly impact summer and autumn grassland health. Therefore, herders are very concerned about the particular weather conditions that mark winter, most notably snowfall and frost. Little snowfall can lead to spring drought. Massive amounts of snowfall can make spring grazing extremely difficult for livestock. Extreme frost in terms of temperature or duration will have similar, negative effects on livestock rearing. The main labour tasks like herding, protecting sheep, goats and cows, bringing-in firewood from the forest, fetching water remain weather dependent during winter.

Spring: Spring starts at the onset of the Lunar New Year and ends in late May. New grass grows if there has been no dzud and winter ends on time. It can be a time of scarcity because most herders will have used all food and hay/fodder reserves by then and have to monitor livestock closely to prevent them from freezing. In late spring, as it gets warmer, herders cut the goats' fell which is later used for cashmere wool and begin shearing the sheep. After the hard winter time, they thus hope to be able to gain some extra income by selling cashmere, pay debts and buy new items. The climate sensitivity of annual pastoral activities is shown in Table 4.4.

TABLE 4.4: HOW CLIMATE SENSITIVITY DETERMINES THE HERDERS' CALENDAR

LIVELIHOOD ACTIVITIES	DURATION
Mow and prepare hay	August-September
Move livestock to new pasture	Circa August 20
Repair damaged and build new fences	September-October
Move with livestock to summer camp	July-September
Harvest potatoes and other vegetables	September

TABLE 4.4 CONTINUED

LIVELIHOOD ACTIVITIES	DURATION
Pick fruits and herbs	August
Prepare fuel and firewood, fetch water	October
Sell livestock	November
Clean winter shelters, warm them up, shelter livestock, prepare and warm the ger	November
Sew, make handicrafts	November-January
Prepare winter meals (for whole season)	December
Household chores	All year long
Prepare for and celebrate *Tsagaan Sar* (White Moon)	February
Prepare for the arrival of baby animals	Feb-Mar
Receive baby animals	End of March-June
Comb goats and cattle	May
Cut sheep's wool	July
Prepare milk and other dairy products, sell dairy products	June-September
Cut lamb's wool	Circa August 20
Make felt	August-September

Source: RIMES 2010a[12]*, b*[13]

As the chart indicates, herders are engaged in different kinds of work in tune with climatic variations. Yearly activities based on the seasons go hand in hand with seasonal movements of people and livestock. Moving is a central activity that herders have to carry out every season. Herders say that, 'in order to survive, we have to follow the grass'. Moving involves careful planning, disassembling and rebuilding their ger, packing and unpacking all belongings, finding adequate means of transportation and moving. The study in Ikhbulag showed that households move about 4 times a year on an average. (RIMES 2010a,b). The average moving distance is summarized in Table 4.5.

TABLE 4.5: MOVING DISTANCES OF IKHBULAG HERDERS (IN KM)

SEASONAL MOVEMENT	MOVING DISTANCE (KM)		
	MINIMUM	MEAN	MAXIMUM
Spring to Summer	5	10	15
Summer to Autumn	5	10	20
Autumn to Winter	3	5	10
Winter to Spring	3	7	10

Source: RIMES 2010a

Winter camps include livestock shelter, which is located in the shield of the mountain protected from the cold wind. When spring arrives and the weather gets warmer they move a little further down the mountain where they have a spring campsite with warm shelters.

Field research done as part of CRM-TASP in 2010 in the Ikhbulag forest steppe community, Khotont sum, provides another example of how trends are 'read' by herders at the local level. This illustrates the trends that have been observed across the country (RIMES, 2010c). An analysis of the major impacts caused by the most extreme climatic or weather events since 2000 as observed by herders in Ikhbulag is given in Tables 4.6 and 4.7.

TABLE 4.6: MAJOR EXTREME WEATHER EVENTS SINCE 2000: IKHBULAG COMMUNITY, KHOTONT SUM

EVENT	FREQUENCY (SINCE 2000)	REMARKS
Summer drought	Often	2009 was very dry. Drought aggravated the impact of the winter *dzud* that followed. Spring and summer of 2010 (post *dzud*) were rainier than usual. This had a positive effect on grassland recovery, but huge animal losses had already occurred.
Heavy rain	Often	Heavy rainfall events are of increasing frequency. These have a severe impact on grass growth. Soil often cannot absorb large quantities of rain because of compaction.
Wind/dust/snow storm	Often	There are more and more frequently recurring. Dust storms can seriously affect animals and lead to cattle loss. Sheep and goats are particularly vulnerable. Herders do not receive early warnings about storms. They often have no time to shelter animals.
Hail storms	Rarely	
White deep *dzud*	2010	The drought of summer 2009 aggravated the impact of the *dzud* itself. Already weakened animals did not have the force to dig through the snow to find grass. Herders did not receive early warning information on time and were thus poorly prepared.
Black *Dzud*	2000-01	This *dzud* followed a prolonged drought in spring and summer.

Source: RIMES 2010c[11]

Table 4.7 indicates the impact of extreme weather events over a longer period of time in the Ikhbulag community.

TABLE 4.7: MAJOR IMPACTS CAUSED BY EXTREME WEATHER EVENTS:

IMPACT	RESPONSES
Price increase of animal fodder and veterinary treatment	During and in particular after a *dzud*, feeds are in high demand but often scarce due to lack of adequate preparation. Medicines are in high demand too then.
Increased disease incidence among livestock	Surviving animals are extremely weak after a drought or a *dzud*.
Decreased benefits from livestock	Drought and *dzud* reduce herd size leading to reduced production of wool, cashmere, hair, milk and meat. The quality of products is also negatively affected.

TABLE 4.7 CONTINUED

IMPACT	RESPONSES
Decreased number of young and pregnant animals/changes in herd composition	Drought and *dzud* affect the young and pregnant the most. This has immediate impact on herd composition in year of the event and following years. Most vulnerable are horses followed by yak, cows, sheep and goats.
Feed (hay, fodder) shortage	Extreme cold winters exhaust feed supply quickly. Many herders were not well prepared for the 2010 *dzud* in terms of feed stocks.
Water shortage	Water sources are drying up in the valley. Herders have to search farther away for scarce water. Some conflicts have emerged in recent years over water access and use.
Insufficient fuel sources	Although to date the forest surrounding the community supplies abound in firewood, extreme winters cause the burn-up of household supplies more quickly than usual. Since 2007 all households have a solar panel supplying a small amount of electricity. Solar energy has not been affected by extreme weather events.
Shortcomings in sheltering of livestock	Heavy snowfall causes damages. Herders have not been well prepared for *dzuds*.
Psychological impact	Loss of animals has dramatic impacts on economic and social aspects of livelihoods. Herders mention that the absence of baby/young animals post *dzud* not only leaves them without milk but also deprives them of much joy.
Migration	After the 2010 *dzud*, six out of the studied 32 households decided to migrate to urban centers. Rural exodus thus affects the social fabric of the herder communities.

Source: RIMES, 2010c

ADAPTIVE CAPACITY

The transition to a market-based economy guided by capitalist principles and democratic governance in 1990 has meant a dramatic rupture with the past for most Mongolians. Material, institutional and human aspects of livelihoods were all affected in some ways. The opening-up initiated a societal process of *un-learning* old habits and acquiring new ones through trial and error in all spheres of socio-economic and political organization, for herders in rural areas as well as for those in the cities (Ykhanbai et al. 2004[15], Ykhanbai et al. 2009[16], cited in RIMES, 2010c). However, the scope of the change process has certainly been of unprecedented nature for most people. One of the consequences has been that herders have become more vulnerable to ecological changes and to climatic / weather variations.

Before 1990s, the State played a major role in assisting herder households to deal with all kinds of risks and thus reduce vulnerabilities. But after 1990s, herders were more or less left 'on their own' by the State, although in recent years, some have benefitted from project-based collaboration and support. This has impacted on all key material aspects of nomadic livelihoods, from income sources to employment opportunities. Market prices tend to go up and down, and production and processing are, more than ever, influenced by climatic change and extreme weather events, compounding economic uncertainty.

Privatization has impacted many institutional aspects of herder's livelihoods, leading to greater risks and vulnerabilities. With dismantling of state-backed Collectives, the transportation, fodder and water management infrastructure provided by the State in support of nomadic movements was discontinued. The model of market development instituted since 1990 has failed to recognize and support key elements of pastoralist adaptive strategies (Janes 2010[14]) based on mobilization of social relationships, intimate knowledge of local context, and dynamic and flexible interactions among households at local and supra-local levels based on kinship and friendship ties.

A retreating State presence has also led to the collapse of regulatory regimes needed to safeguard critical natural resources. The cumulative effects of these changes have produced considerable social differentiation in the countryside, a breakdown in cooperative institutions, and an increasing recurrence and ferocity of conflicts over water and pasture. In a context of increasing climate change, these societal changes seriously threaten the sustainability of the rural economy, leading to livelihood insecurity, growing rural poverty, and increasing rates of migration to the shantytowns surrounding the capital city of Ulaanbaatar.

The processes have rendered herders more vulnerable to external risks and have diminished their adaptive capacity.

THREATS TO DEVELOPMENT

Mongolia's livestock based livelihood system supports 40 percent of the population. The periodic extreme climate events render the population's economic activities highly vulnerable. The 1999-2000 dzud increased poverty levels from 39 percent to 47 percent. The 2010 dzud increased poverty levels from 35 percent to 46 percent. The efforts of the Government to reduce poverty to 15 percent at the end of 2015 as a part of the mid-term Millennium Development Goals (MDG) appears improbable due to climate-induced risks and impacts.

The herders keep large number of livestock as safety nets against climate risk. The livestock population, though decreasing tremendously by around 10 million in the aftermath of each major dzud episodes, is replenished by the herders to keep them as safety nets against future episodes. This tendency resulted in a record level of livestock population of 50 million as of June 2012. The Mongolian pasturelands carrying capacity could be around 25 to 30 million. Doubling of livestock leads to land degradation and other environmental problems. So the Mongolian environment to sustain the livelihood in the long run is at risk.

Climatic risk disproportionately impacts women as shown in the box below.

BOX 4.4: IMPACT OF THE DZUD ON WOMEN

The dzud has had a particularly significant impact on female herders, who represent 51 percent of the total. Situational assessments have found that women are facing enormous hardships as a result of the loss of livestock, increased workloads, the depletion of household food supplies and the lack of adequate clothing to withstand the persistently cold weather, and are hence suffering from anxiety, stress and psychological trauma. The depletion of food supplies places pregnant women at risk of foetal growth retardation. Access to water is another area of concern: 57.4 percent of the female herders reported difficulties in accessing drinking water due to blocked paths to wells, and/or wells covered by snow or ice. The trek to wells has also become more arduous and time-consuming.

While women represent the majority of herders, they have fewer opportunities to start new businesses and face more obstacles than men, making it difficult for them to seek alternate forms of income. Women are also hindered by the persistence of traditional gender stereotypes that define men as breadwinners and leaders of households. According to the rapid needs assessment, 55 percent of those questioned thought that men should have ownership rights over economic assets, including livestock; the same percentage believed men were the key decision-makers in households.

Particularly vulnerable are female-headed households (FHH). According to the last Living Standard Measurement Survey, FHH are the societal group most prone to poverty in Mongolia. At present, 24.6 percent of very poor households and 18.3 percent of the total number of poor households are headed by females, although FHH comprise only about 12-13percent of the total number.

Source: UN Mongolia, 2010

KEY MESSAGES

- Due to its geo-physical location, Mongolia suffers from different climatic hazards. While catastrophic dzud events could occur once in ten years, low and moderate dzud events endanger livelihoods of herders more frequently.
- Economic losses from the 1999-2002 dzud amount to around USD 450 million, representing 30 percent of the agricultural GDP. Losses due to the 2010 dzud are around USD 350 million amounting to five percent of overall GDP. These events aggravated food security concerns, poverty levels and malnutrition significantly.
- Climate change could aggravate risk patterns by rendering natural resource systems like pasture lands less productive in the future.
- Animal husbandry is sensitive to climate features and herders', particularly those with less than 200 heads of livestock, have much lower adaptive capacity.
- The safety net based on livestock management that is surpassing the carrying capacity of pastures cause environmental degradation.

CURRENT CLIMATE RISK MANAGEMENT

The current CRM system needs to integrate exposure risk to climatic hazards, thus establishing an institutional system and preserving the natural environment.

INSTITUTIONAL AND POLICY ARRANGEMENTS FOR CRM

Disaster Management Framework

NEMA is the lead agency for disaster mitigation, preparedness and emergency management activities in Mongolia. NEMA, commissioned in June 2004, is a paramilitary organization with four major divisions:

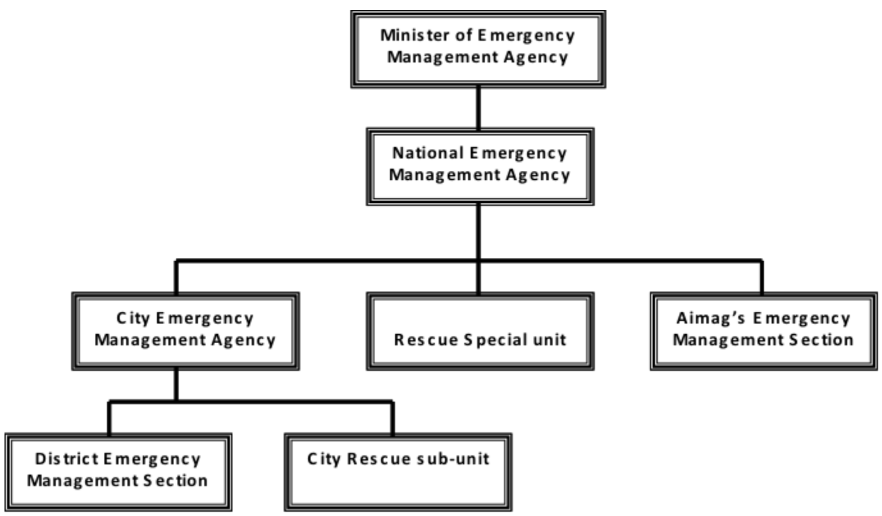
(I) Emergency Management Department;

(II) Emergency Management Institute;

(III) Communication and information division, and;

(IV) Specialist centre responsible for natural and ecological issues.

NEMA has developed a mission framework 2050, with support from UNDP Mongolia, which outlines actions related to development of institutional and technical capacity on disaster risk management. As part of the national framework, NEMA is working on capacity building for emergency management and strengthening the equipment base for (i) early warning and (ii) creation of disaster data base. UNDP has been supporting capacity building both at the national and provincial and local levels since 2002. However, DRR still needs to be integrated into development programmes. NEMA has emergency management operations up to district (soum) level coordinated by city emergency management agency in Ulaanbaatar *(Figure 5.1)*.



Source: NEMA

Figure 5.1. Organisational structure of the National Emergency Management Agency

Climate change Framework

The Government of Mongolia has established an interdisciplinary and inter-sectoral National Climate Committee (NCC) led by the Minister for Nature, Environment and Tourism to coordinate and guide of national activities and measures aimed to adapt to climate change and to mitigate GHG emissions. The NCC approves the country's climate-related policies and programmes, evaluates projects and contributes to the guidance to these activities. A Climate Change Office (CCO) is proposed to be established under the supervision of the Chairman of the NCC to carry out day to day activities related to implementations of responsibilities and commitments under the UNFCCC and Kyoto Protocol. The organizations responsible for climate change measures and actions are the Ministry of Nature, Environment and Tourism (MNET), the Ministry of Mineral Resources and Energy (MMRE), the Ministry of

Food, Agriculture and Light Industry and the Ministry of Foreign Affairs and Trade. The National Agency for Meteorology, Hydrology and Environment Monitoring, which is directly under the supervision of the Minister for Nature, Environment and Tourism, has been designated as an operational organization for climate monitoring and research. [Source: MNET, 200918]

The Government has also adopted the Mongolia National Action Programme on Climate Change (NAPCC) aimed not only to meet the UNFCCC obligations, but also to set priorities for action and to integrate CC-concerns into other national and sector development plans and programmes. The implementation strategies in the NAPCC include institutional, legislative, financial, human resources based, education and public awareness based, research based types of integration into other national and sectoral development programmes and plans. The programme also considered several adaptation measures for animal husbandry and rangelands, arable farming agriculture and water resources. Research activities will be focused on systematic observation and monitoring of the climate, development of climatic scenarios, vulnerability and risk assessment, potential impacts on ecosystems and society, and possible measures to adapt to climate change and to mitigate CC at the national level. [Source: MNET 2009]

Development Planning Framework

The Millennium Development Goals-based CNDS (discussed in Chapter-2) recognizes climate change as one of the key factors and defines its policy (up to 2021) aimed at promoting human development in Mongolia, in a humane, civil, and democratic society, and developing intensively the country's economy, society, science, technology, culture and civilization in strict compliance with global and regional development trends. In Mongolia, the Ministry of Agriculture is mandated to address the risks of livestock herders from climate change as per the Great Khural (Parliament) of Mongolia Resolution of 12 February 2008.

The Ministry of Food and Agriculture (MOFA), established in 1987, coordinates activities related to agriculture and industrial food processing, development of state farms of agro-industrial complexes and providing rural services to manage cereal and livestock production systems in Mongolia.

MOFA currently consists of six departments under the State Secretary for Agriculture. There are six major divisions under this ministry – of these, four are service divisions directly involved in agriculture related livelihood development. Animal husbandry and crop production, agriculture machinery and technology division are major focal points for disaster risk management. (Figure 5.2) National agriculture extension centres coordinate the activities related to extension services at provincial and district levels. There are agriculture specialists at district administrative office having close linkages with district disaster management department of NEMA.

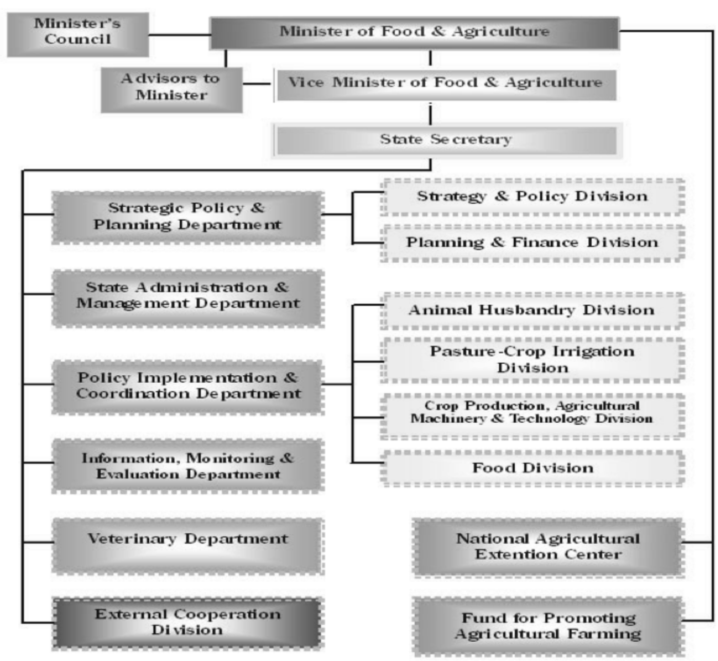


Figure 5.2: MOFA organisational chart, source: MOFA

There are more than 7000 specialists engaged in agriculture and livestock service activities (Table 5.1). Livestock specialists and veterinarians are about 2900 in 2003. There are about 500 agronomists engaged in providing services in the crop sub-sector, most of which are specialists.

TABLE 5.1 AGRICULTURAL SPECIALIST IN MONGOLIA

Staff categories	1996	2000	2003
Livestock specialist	400	1100	900
Veterinarian	1500	2000	2000
Agronomist	200	500	500
Mechanic	6200	4300	3700

Source: National Statistical Office of Mongolia

The main CC-related national level policies and related documents are tabulated in Table 5.2:

TABLE 5.2 KEY GOVERNMENTAL POLICIES AND REPORTS, INCLUDING ADAPTATION NEEDS, PRIORITIES AND PLANNED ACTION

	NATIONAL POLICY ACTION	RESPONSIBLE DIVISION	STATUS	SECTORS OF FOCUS	SUMMARY DESCRIPTION
1	National Action Programme on Climate Change	Air Quality Office, assisted by the Government of the Netherlands	Three phases: (2000-2005), (2006-2015), (2015-2021)	Multi-sectoral heavy- agriculture focus	Sets priorities for actions and defining policy on mitigation and adaptation. A number of pilot projects and studies have been carried out under this action program, which is now in the midst of its second phase. Much of the adaptation work is done in the area of agriculture, improving resilience and production methods to increase the ability of farmers to adapt to changing climates.
2	Mongolia's Initial National UNFCCC Communication	Ministry of Environment	Submitted November 2001	Multi-sectoral	Provides details on national circumstances with respect to Climate Change, an inventory of greenhouse gas emissions, as well as identification of impacts of climate change and potential options for adaptation actions.
3	Mongolia Second National UNFCCC Communication	Ministry of Nature, Environment and Tourism	Submitted December 2010	Multi-Sectoral	Focus is largely the same as that of the initial National Communication, but with more in-depth information as well as updates on policy and national circumstances.
4	National Climate Committee	Ministry of Nature, Environment and Tourism	Currently in operation	Multi-sectoral	Coordinates and guides national adaptation measures and mitigation activities. Approves policies, evaluates projects and guides activities.

Source: IISD, 2011[18]

MAJOR CRM-RELATED ACTIVITIES – COMPLETED AND ON-GOING

Table 5.3 shows the recent, ongoing and planned projects contributing towards improved forms of adaptation.

TABLE 5.3 CURRENT ADAPTATION PROJECTS AND PROGRAMS IN MONGOLIA

NAME AND DURATION	OBJECTIVES	FUNDED BY	IMPLEMENTED BY	TYPE OF PROJECT	PRIORITY SECTOR/S
Dryland Development Paradigm Application for the most vulnerable to climate and land use change of pastoral systems (2010 – 2011)	To develop a policy framework for sustainable development of drylands in the Tuin and the Baidrag river basins of Bayanhongor Aimag	APN	Dr. Chuluun Togtohyn	Research; Policy formation and integration	Pastoralism; Ecosystem conservation
Mongolia Livestock Sector Adaptation Project (2010 – 2014)	To increase the resilience of Mongolian livestock system to changing climatic conditions by strengthening the adaptive capacity of the livestock system as well as the capacity of herders' groups to cope with climate change impacts.	Special Climate Change Fund; co-finan-cing	IFAD, with Ministry of Nature and Environ-ment of Mongolia, and Ministry of Food and Agriculture	Capacity building	Pastoralism; Disaster risk management
Ecosystem-based Adaptation Approach to Maintaining Water Security in Critical Water Catchments in Mongolia (2011- 2017)	To 'maintain the water provisioning services supplied by mountain and steppe ecosystems by internalizing climate change risks within land and water resource management regimes'.	Adapta-tion Fund Budget: USD 5.5 million	UNDP	Capacity Develop-ment; Community based adaptation	Watershed management
Advancing Capacity for Climate Change Adaptation (ACCCA) (2007 – 2010)	To identify and prioritize climate risks; assess available knowledge about risks and adaptation opportunities; develop, test, and disseminate risk communication materials that are designed to assist adaptation decisions; and identify critical knowledge gaps that impede effective adaptation decisions.	IDRC, DEFRA, Swiss Federal Office for the Environment, NCAP, Europe-an Commis-sion	UNITAR, ENDA, SEI, CSAG and START	Assessment; Capacity building; Policy formation and integration	Multi-sectoral
Health Vulnerability and Climate Change Adaptation Assessments (2008-2010)	To provide national level evidence of the linkages between climate and health; improve understanding of local and specific health risks and vulnerabilities; provide the opportunity for capacity building; and serve as a baseline analysis to monitor how health risks may be influenced by a changing climate over time.	World Health Organization	National Ministries	Assessment	Human health
Cities and Climate Change Initiative (2010-)	The project aims at advising and supporting cities and towns prone to the different impacts of climate change by offering innovative approaches and solutions for national and local development planning. In 2010, efforts were initiated to up-scale lessons from this initiative with UN-HABITAT partners in Mongolia to carry out participatory assessments of their vulnerabilities to climate change.	Government of Norway	UNEP, UN-HABITAT	Knowledge communica-tion; capacity building; Assessment	Urban areas
Climate Risk Management Technical Assistance Support Project: Phase II (2013-2015)	Building capacities for climate risk management among national stakeholders.	Sweden, SIDA, UNDP	ADPC, Internatio-nal Institute for Sustainable Develop-ment	Research; policy formation and integration	Multi-sectoral

Source: IISD, 2011

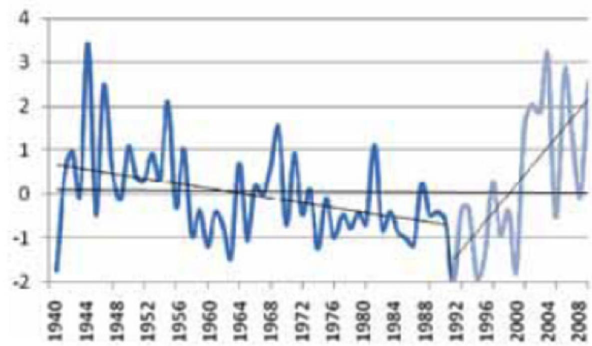
CAPACITY ASSESSMENT

A CRM-capacity has been undertaken utilising the World Resources Institute's National Adaptive Capacity framework (WRI, 2009). The assessment results are as follows:

Assessment function

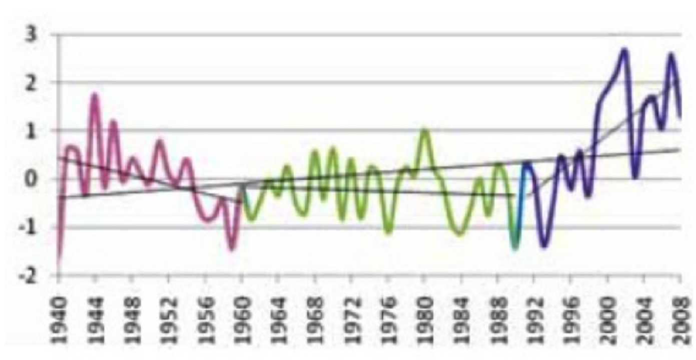
Risk assessment lacks event-based assessment, connecting meteorological data with socio-economic data, based on past occurrences, particularly for minor (less severe) but frequent events.

For climate risk assessments, climatic data is a key prerequisite. Even within NAMEM, no capacity exists to link a synoptic event to community risks. For example, the severe snow storm event of April 1980, that killed 43 humans and 800,000 livestock is a spring season event and not classified as dzud (MNET 2009). These synoptic events that occur during seasonal transitions are not systematically investigated. A decadal climatic risks pattern could provide diagnostics that could enable better risk assessment (Figures 5.3 and 5.4).



Source: MNET, 2010

Figure 5.3: Multi-year average dzud index



Source: MNET, 2010[19]

Figure 5.4: Multi year drought index

For example, 1940s had serious dzud and drought events and again during 2000-10. The intermittent periods had only minor events. The consecutive catastrophic events entail high risk and need to be captured in the risk assessment process.

BOX 5.1: CLIMATE CHANGE THREATS TO CASHMERE PRODUCTION

Cashmere wool is one of Mongolia's most prized animal-product exports. The second-largest cashmere producer (after China), Mongolia accounts for 28 percent of the world's total supply, according to the Mongol Cashmere Association. The wool brings around USD180 million annually into the country. For the 36 percent of Mongols who still adhere to a nomadic lifestyle, cashmere is often an integral part of their livelihood. 'Eighty percent of our income is from cashmere. It is the money we earn in spring that we rely on for the entire year -- to send our kids to school, to stock food, repair things', says one herder.

Cut off from milk and meat buyers in the former Soviet Union, the herders turned to raising cashmere as one of the only profitable activities available. At the same time, volatile international cashmere prices have pushed many herders to keep larger flocks as a hedge against falling prices. In 2011-12, the prices dropped 29 percent to 50,000 tugriks (about USD37) per kilo. 'It's very hard to plan for the year ahead because the prices are always changing. So many herders keep more animals as insurance against fluctuating market prices', says the same herder.

Changing weather patterns are also prompting herders to keep larger flocks, as for example the 2009-2010 dzud led to the deaths of over 9 million animals.

Since the last dzud more herders are talking about the need to increase the quality of their animals rather than increase the quantity. The challenge for herders is a lack of access to quality breeding stock. Moreover, they would need to find a market for the finer wool.

Source: MNET, 2009

The assessment function has to incorporate changing socio-economic conditions that contribute to risk so as to reflect the role of climate in configuring risk in Mongolia. The assessment also needs to consider herders' experience in managing livestock and their risk management practices. For example, herders could treat climate as a resource in normal years to build up stocks that serve as safety nets for dzuds *(Naidansuren & Bayasgalan, 2011)*.

Prioritization function

In the absence of practical yet robust assessment capacities, prioritization function is also quite low. There are numerous surveys and studies providing a portfolio of adaptation options, as shown in Table 5.4:

TABLE 5.4: ADAPTATION PORTFOLIO

ADAPTATION OBJECTIVE	ADAPTATION MEASURES
Improved integrated pasture management	Improve grazing management
	Introduce cultivated pasture
	Improve pasture yield
	Improve pasture water supply
	Legislate possession of pasture
	Introduce taxation of pasture
	Livestock population control according to the pasture capacity

ADAPTATION OBJECTIVE	ADAPTATION MEASURES
Increased strengthening animal bio-capacity	Improve shelter for animals
	Increased supplementary feed
	Improve per animal productivity
	Introduce genetic engineering
	Improve veterinary services
	Introduce highly productive cross breeds
Enhanced livelihood of rural communities	Promote collective communities
	Develop / transfer new technologies
	Expand access to credit and generate alternative income
	Expand the supply of renewable energy applications to herders
	Promote and support the establishment of different enterprises
	Establish insurance system of animals
	Establish risk fund
	Prepare educated herders
	Training of young herders
Increased food security and supply	Expand dairy and meat farms close to big cities to meet the demand of milk and other dairy products
	Promote and expand other food supply farms / egg, vegetables
Climate Change study	Establish climate change monitoring stations
	Improve forecasting system of extreme events

Source: Batima. P, 2006

Even though adaptation portfolios were identified, implementation requires the capacity development of institutions, relevant technologies and financial resources. A study on policy options advocates promotion of community organizations and pasture land usage fees. The Government of Mongolia has still not identified priority options for managing livestock and pasture. A number of pilot projects supported by GIZ, UNDP, World Bank and Switzerland are ongoing to promote institutionalization of community organizations to interface between herder groups and the State.

Policy options

Currently there are about 170,000 households maintaining some 50 million heads of livestock. This livestock population is considered as a safety net for livelihoods although it stretches the environmental carrying capacity, as shown in Table 5.5.

TABLE 5.5: PASTURE CARRYING CAPACITIES (PCCS) AND PASTURE UTILIZATION RATES (PURS) FOR SELECTED REGIONAL UNITS

COUNTY	CURRENT SEUS ('000)	CURRENT PCCS ('000 SEUS)	PURS (PERCENT)	EXCESS SEUS ('000)
Bayanundur	321.6	156.0	206.1	165.5
Sant	298.5	120.8	247.2	177.7
Hujirt	310.4	129.6	239.5	180.8
Hairhandulaan	246.9	114.1	216.4	132.8
Bayanlig	196.4	227.9	86.2	0
Jinst	127.3	150.8	84.4	0
Bogd	193.4	108.4	178.4	84.9
Ulziit	247.2	277.1	89.2	0

Sources: Naidansuren & Bayasgalan, 2011(2008 baseline)

Considering the seriousness of overstocking livestock, herders need to have a diversification-of-livelihood-option that allows them to take up another occupation. Risk management issues and possible solutions are shown in Table 5.6.

TABLE 5.6: POLICY PROBLEMS AND SOLUTIONS RELATED TO PASTURE MANAGEMENT

PROBLEMS IDENTIFIED:	SUGGESTED SOLUTIONS:
Lack of pasture regulation	Regulate pastures such that carrying capacity is not exceeded or establish a communal pasture management system for herding groups
Exclusion of herders from income tax	Tax herders based on their income
Exclusion of herders from land use (pasture) fees	Charge herders for pasture use
Lack of investment in strengthening the capacity of local governments	Hold more training workshops to strengthen the capacity of provincial and county governments
Lack of incentives to promote business in the countryside	Provide incentives to encourage herders to set up small and medium-sized enterprises
Promotion of goat population growth	Promote goat productivity instead of goat population growth
Inappropriate rewards that promote livestock population growth	Change the reward system to one that solely promotes environmentally-friendly herding practices

Source: Naidansuren & Bayasgalan, 2011

Coordination function

Policy goals of Environment Ministry (to mitigate land degradation) and Agriculture Ministry (to promote livestock) still need to be harmonized through improved policy legislation and institutional mechanisms.

Information management function

Climate-related observation, monitoring and processing capacities need significant development. NAMEM, the responsible agency for weather and climatic hazards, generates weather-related information of different time scales. The Ministry of Food and Agriculture (MoFA) is a key NAMEM client. This Ministry also has close collaboration with NEMA while the Ministry of Nature and Environment in receiving early warning information.

Early warning bulletins on winter forecasts are being received in September and on summer forecasts are received in March every year. The Ministry of Food and Agriculture receives monthly, a ten-days and a weekly forecast-product from NAMEM. There is a lack of capacity in MOFA to translate the forecast products from NEMA into potential impacts and provide tailor made information for herders.

The use of quality forecast information varies with the season. During summer, the climate information would be useful for decision making about planting, use of pasture land for grazing and to decide the stocking density. In winter, the information would be useful for preparing hay, fodder etc. The information can be useful for deciding the logistics for livestock to avoid possible impacts of extreme low temperature. Forecast information needs to take into account household level preparedness strategies in response to anticipated risks for:

- Preparing for food, especially meat during winter;
- Keeping more livestock for meat in severe winters, as advisable;
- Accessing additional numbers of well and water resources during summer, and;
- Protecting from insects both animals and plants during summer and winter.

NAMEM has established a herder-need based information system in collaboration with RIMES in two pilot communities that comprises the following components:

- Generation of location-specific herder-need-based weather information -Table 5.7;
- Dissemination of information at soum level to herder-groups;
- Capacity development of the herder groups in understanding and making use of the forecast information in collaboration with a local NGO as shown in Figure 5.5;
- Provision of feedback by the herder groups on validity of the forecast system and its accuracy and usefulness.

TABLE 5.7: LEAD TIME REQUIREMENT AND TIMING OF FORECAST FOR HERDERS' ACTIVITIES

LIVELIHOOD ACTIVITIES OF HERDER COMMUNITIES	TIMING FORECASTS	LEAD TIME OF FORECAST
To prepare hay and mow	Aug-Sep	Precipitation 5 days
To move with livestock to autumn camp	Aug 20	Precipitation 5 days
To fix and build fences	Sep-Oct	Precipitation 5 days
To move with livestock to summer camp	Jul-Sep	Precipitation 5 days
To harvest vegetables	Sep	Precipitation 5 days
To pick fruits / cumin	Aug	Precipitation 5 days
To prepare fuel and firewood	Oct	Several days
To move to winter camp	Nov	3 - 5 days
To prepare/repair the shelters	Nov	3 - 5 days
To warm up the ger (yurt)	Nov	3 - 5 days
To prepare for winter meals	Dec	3 - 5 days
To prepare for Tsagaan Sar (White Moon)	Feb	3 - 5 days
To celebrate Tsagaan Sar	Feb	1 - 3 days
To prepare for the arrival of baby animals	Feb-Mar	5 days
To receive baby animals	Mar 26 – Jun	1 - 3 days
To comb goats / to comb cattle	May	1 - 3 days
To cut sheep's wool	Jul	1 - 3 days
To prepare milk and dairy products	Jun-Sep	Several days
To cut lamb's wool	Aug 20	1 - 3 days
To make felt	Aug-Sep	1 - 3 days

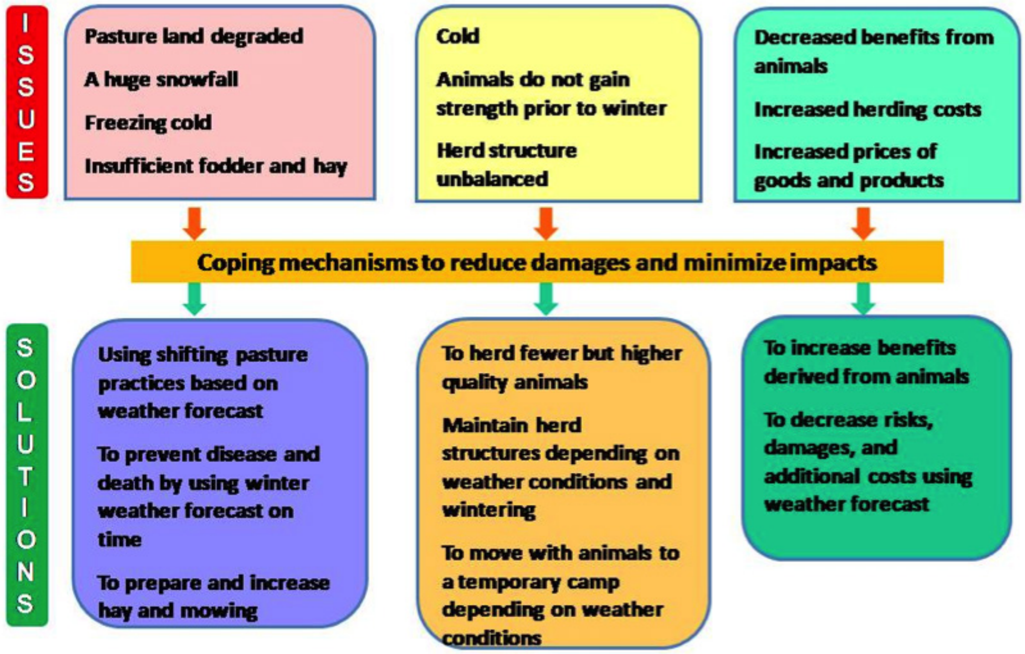


Figure 5.5 Local coping mechanisms to address climate issues based on forecasts

This herder-need based information system has proved to be very successful and NAMEM has received very positive feedback from the communities.

Early warning for preparing contingency plan in agriculture

Early warning information should be provided four weeks in advance about severe winter and would be highly useful for contingency and preparedness planning. Moreover, current forecast products are difficult to understand for preparing area-specific impact outlooks and current lead time and nature forecast products do not meet this requirement. There is a difficulty to receive the forecast information in time.

Preparedness in agriculture sector depends on (i) qualified personnel and (ii) availability of reliable information generated from good quality instrumentation and observational systems. Satellite-derived spatial information is also considered useful and remote sensing technology needs to be integrated into DRM in agriculture. Early warning network has to be established for agriculture to ensure timely delivery of information. The short range forecasts need to be disseminated through radio and television. Dissemination through internet will also be helpful, but there is no existing facility for this kind of dissemination. Dedicated information exchange systems at *bag*-level would enable staff to prepare contingency planning.

In order to apply long-lead forecasts for preparing policy measures, the essential pre-requisites enlisted by MoFA include coordination and institutional arrangements at local levels. It has to be emphasized that an accuracy of 60 percent is enough to make decisions based on the forecasts. Long-lead forecasts help to: (i) analyse the risk and vulnerability, (ii) to prepare action plan, and (iii) to implement the action plan.

The long lead forecasts in Mongolia would also help to take up preparedness activities in public health. Nomadic type of agriculture warrants planning about cloth, health and other logistics. Herders need to spend significant amount of money for their winter clothing and hence forecasts ensure optimal planning. It is perceived that the current vulnerability assessment would be improved through long-lead forecast information, thus giving greater confidence to implement preparedness activities.

Factors limiting use of early-warning information in agriculture/livestock sector are:

(I) General nature of forecasts;

(II) Availability of forecasts for larger spatial scales only;

(III) Non-dissemination at bag level;

(IV) Lack of applicability at bag level;

(V) Lack of accurate prediction*.

*(*at least one week in advance would be highly useful).*

The MoFA's emphasis is not only to increase the accuracy but also the application for (i) vulnerability and risk assessment (ii) application to manage the hydro-meteorological disasters.

Disaster data in agriculture sector

Disaster-related information data-bases need to be developed in MoFA. Accurate information can help to assess the damaged bases by drawing on the material of past disaster impact information. Though data-bases on drought and dzud are available from 1930 onwards, this type of information is not properly used at local level. For other disasters, data is only available for the past seven years. Detailed information about climate change is available from 2000 only. Household level data is available from 2003 only. Through CRM-TASP, Mongolia organized a Seasonal Forum with the following objectives:

- To ensure that forecast-products, including their uncertainties and limitations are understood by and communicated to users;
- To encourage climate-forecast applications for mitigating risks in various climate-sensitive sectors, and;
- To provide a platform for inter-agency coordination of policies and programs for dealing with potential impacts of climate-related hazards during the winter season.

Seasonal forums were led by NAMEM, in partnership with the National Emergency Management Agency of Mongolia (NEMA), MOFA, MNET and other stakeholder departments. This seasonal forum provided a start-up process of information sharing among departments concerned with climate risk.

Climate risk reduction function

No systematic effort has been undertaken to reduce climate risks based on climate risk assessment. CRM is undertaken by different departments and mostly through pilot projects. There is a considerable effort required to put in policy institutions, capacities and resources to reduce climate risk.

KEY MESSAGES

- There is no CRM approach, strategy or systems in Mongolia as climate risks are addressed in three different domains – i.e. in DRR, development planning and CCA.
- The current climate risk assessment capacity is inadequate to capture climate risk patterns.
- In the absence of robust climate change assessment diagnostics, the Government of Mongolia needs to build institutional and policy environment for improving assessment and prioritizing CRM options.
- A number of pilot experiments undertaken at the community levels through donor support and lessons learned from these initiatives are not integrated into governmental policy or even institutional processes.
- The governmental coordination function in managing climate risks is to harmonise two seemingly conflicting policy goals: Protecting herders' welfare and preserving their environment.
- A herder risk based information system has been established on a pilot basis and this experience could be up-scaled to establish an institutionalised CRM system in Mongolia through appropriate capacity development activities.

RECOMMENDATIONS

1. DEVELOPING A CRM INSTITUTIONAL FRAMEWORK

Currently, Mongolia does not have the institutional framework that could manage the current climate variability, associated risks and future climate change risks in a holistic and comprehensive manner. There is a need to create an institutional framework to formulate policies, coordination frameworks and implement CRM programs.

At present, the Ministry of Environment's Climate Change Division coordinates all CC-related activities. The Ministry of Agriculture and NEMA are responsible for long term risk reduction and emergency management issues respectively. However, there are other ministries which are concerned with CRM-issues that are not integrated into the system both in terms of policies and programs. A CRM institutional framework needs to be developed around the Ministry Environment's Climate Change Division to build the required capacities for CRM in Mongolia.

2. CAPACITY BUILDING OF NAMEM

The technical capacities of institutions are very weak for managing CRM both in terms of short-term variability and long-term change. NAMEM is mandated to provide climatic data for managing risks at all time-scales. However, even for managing short-term weather-related risks, the capacity of NAMEM is very weak.

A concerted capacity development effort is required for strengthening NAMEM and that is focused on increasing observation systems, data communication and processing systems. This would allow to generate actionable CRM information for managing climate risk both in the short-term and long-term.

3. CLIMATE INFORMATION SYSTEM

The outcome of UNDP's national seasonal forum initiative as part of CRM-TASP needs to be further continued and supported for providing weather and climatic forecasts and climate risk information in a dynamic manner, so that climate risk is managed holistically on all time scales. The establishment and institutionalization of a user-relevant climate information system involves:

a. *Assessment of users' information requirements*. Different users have different climate information requirements. Within the same group of users, information requirements are guided by the planning horizon, which could vary from 20-25 years at the organizational / ministerial level to five years and below at the Directorate level;

b. *Customizing climatic data to users' needs*. Forecast resolution and lead-time vary from one user type to another. For example, climatic projections covering 20-25 years lead-time and at a spatial scale are required for adaptation;

c. *Characterizing and packaging uncertainties associated with climatic information of different timescales*. Uncertainties inherent in longer-lead climatic information need to be characterized and communicated to facilitate application in a risk management framework;

d. *Interpretation and translation of climatic information*. Climatic information should be interpreted in terms of sector-specific thresholds that are jointly determined by institutional users and the concerned communities;

e. *Application in a risk management framework*. Climate information is applied in planning and decision-making, cognizant of the risks that are due to uncertainties in the information;

f. *Demonstration of the economic benefits of the usage of climatic information and of adopting the CRM framework*. The appreciation of economic and social benefits that derive from investing in an end-to-end CRM system should be demonstrated. In terms of time, human resources, and finances it will help institutionalize the CRM system.

4. CLIMATE RISK ASSESSMENT

Climate risk assessment capacities in Mongolia are currently very weak while severe weather events occur annually and even monthly. A single synoptic system could benefit up to 30 percent of the country, even in a normal year.

Considering this aspect, different thresholds need to be constructed, i.e. such that are specific to livestock management. And, based on these thresholds, CRM intervention activities need to be designed and used in a way that risks are, both, accounted for and provide a basis for evolving assessment systems. Such climate risk assessment processes also need to adopt an integrated approach by including data from all climate-sensitive sectors/departments and NAMEM.

5. POLICY AND LEGISLATIVE ENVIRONMENT

The 2009 NPCC emphasises a need for integrating various policies and legislations to incorporate climate change mitigation and adaptation concerns. The capacity needs that are to be built up should ensure that CRM is addressed in the policy and legislative documents.

6. LINKAGES OF PASTORAL RISK MANAGEMENT WITH OTHER GOVERNMENT POLICIES

CRM efforts to address livestock-related issues are not articulated in the existing land use planning, environmental management, disaster management or other policy documents. The recent draft of a Law on Pasture provides an opportunity to incorporate CRM for an effective pastoral risk management.

7. INSTITUTIONAL ENVIRONMENT

In recent decades, efforts have been made to organize or group herder communities according to interests. Such a community-based institutional system supports individual herders in managing climate-related risk. Yet, no model to build community-based institutions has been recommended so far. There is a need, though, of evaluations of various pilot experiments undertaken by UNDP, Switzerland, World Bank and GTZ etc. Also, the IDRC-supported co-management experiments have some promising features, as this co-management system involves herders, local governments and supports NGOs and the civil society at once. It could thus be examined for its appropriateness in building up community- based institutions.

8. CAPACITY TO GENERATE LOCALLY RELEVANT AND ACTIONABLE WARNING

Currently, herders are spread over a vast area and the seasonal movements vary from place to place. And so does the resource potential of herder groups. Herder groups need to make decisions to manage livestock and pasture at critical times. The capacity needs, to be developed under NAMEM, to generate locally relevant actionable information to address the specific needs of herders is felt. NAMEM initiative to establish a herder-need-based information system has been well received and could be expanded and replicated in phases across all other communities.

9. CAPACITY TO INTERPRET WARNING INFORMATION, TRANSLATE INTO POTENTIAL IMPACTS AND PREPARE CONTINGENCY PLANS AND RESPONSE OPTIONS AT ALL GOVERNMENT LEVELS

If NAMEM is to generate location-specific climate-related information, the capacity needs to be developed should make scientific data usable. Data should also take into account the herders'/local level and, both, the formal and informal institutional level.

Simultaneously, capacity needs to be developed to enable local Government units to develop contingency plans for managing climatic risk with forecast, pasture availability and livestock features. There is no contingency planning at national and local Government levels to anticipate different risk scenarios and to provide relevant risk information. Seasonal variation and its impacts on pasture availability and livestock health etc. are not considered. Hence, capacity needs to be developed to enable local Government institutions to get ready for summer, winter, autumn and spring preparedness reports. These reports should include key indicators such as livestock conditions and health, pasture status, household feed result, state of household winter preparation, likely household disposal of livestock etc. Such seasonal preparedness reports could be prepared at bag level and submitted to aimag and national levels. Capacity needs to be developed at all levels for this particular purpose.

10. CAPACITY OF AT-RISK POPULATION TO RESPOND TO WARNING

At present, the local herders depend on traditional environmental clues to undertake decisions on herd management. There is a need to build capacity for herders to make use of scientific data to be able to come up with appropriate response options.

11. MECHANISM ALLOWING FEEDBACK FROM HERDER COMMUNITIES TO WARNING PROVIDER

A system needs to be built that allows forecast agencies to receive feedback from herders on the usability of advanced risk information with regard to the applicability of data for their decision making. Such feedback will enable institutions to refine their forecast products.

12. GOVERNMENT SUPPORT RISK MITIGATION ACTIVITIES

The Government needs to have policy and financial support mechanisms in place to regularly update contingency plans. This will enable enhanced emergency response.

13. STRATEGIC FODDER RESERVES

Highly variable climate of Mongolia with significant spatial and temporal variations, strategic fodder reserves need to be built to meet demands in different regions.

14. TRAINING, EDUCATION, INFORMATION EXCHANGES AND DRILLS

Contingency plans have to be updated regularly. Drills and adequate capacities would be needed at all levels to operationalize such plans.

15. EMERGENCY RESPONSE INSTITUTIONS AND SYSTEMS

At the national level NEMA should be granted adequate capacities in order to be able respond to emerging crisis situations. Capacities at the aimag and local levels are currently also inadequate. As a result, capacities need to be developed at all for dynamically adjusting contingency plans and undertaking response options.

16. EMERGENCY FACILITIES FOR AFFECTED COMMUNITIES

Every year at least 3.5 percent of livestock is lost due to weather events. Over five years, livestock mortality could go up by a range of seven to ten percent. In extreme years, the same number could increase by up to 30-40 percent. Emergency reserves for animal health care, stations for psycho-sociological care, emergency shelters and other facilities could be built to reduce livestock mortality.

17. INVOLVEMENT OF NGOS/CIVIL SOCIETY ORGANIZATIONS

The involvement of NGOs / Civil Society Organizations is most urgently required in a crisis situation. Capacities at the local institution level need to be built to better integrate NGOs / Civil Society Organization for preparedness and prevention aspects.

18. LIVESTOCK INSURANCE SYSTEM

An index-based livestock insurance system has been experimented with by the World Bank with an involvement of about 6,000 herders. This index-based insurance system could be evaluated and considered for further application.

19. LIVELIHOOD DIVERSIFICATION

The optimum level of livestock population in Mongolia could be 25 to 30 million, i.e. to support 170,000 households. One of the policy options could be to maintain the livestock population at this level by transferring 50,000 herder households to crop-based agriculture, agro-processing, mining and other sectors. This would require policy changes, different institutional arrangements and capacity development efforts.

Agro-processing industry:

The major incentive for herders to keep large numbers of goats is cashmere export. However there are inadequate processing facilities in Mongolia. Similar problems surround milk and other products, while this type of value-added agro-industries could be developed which will also help improve the quality of herds.

Agriculture:

There is high potential in diversifying and intensifying agriculture production as, currently, most commodities are imported. There is a possibility to improve agricultural diversification by encouraging herders towards this sector.

Mining:

The Government of Mongolia has embarked on large-scale mining projects and herders have already been transferred to this sector. This transfer would ideally be complemented by re-skilling activities.

20. PASTURE TENURE SECURITY

The pasture tenure security needs to be guaranteed to enable herders to benefit from an ownership statute and thereby an incentive to maintain pastures sustainably. Capacity development activities would be required to operationalize this kind of security policies and legislations for pasture tenure.

21. PASTURE MANAGEMENT

As mentioned above, a pasture management system has to be established according to the carrying capacity as assessed on the basis of a study of different pasture systems in different ecological zones. Plans, institutions and systems have to be effectively established for managing pasture for sustainable development and to enable the conservation of natural resources.

22. STRENGTHENING ANIMAL CAPACITY

There is significant scope for enhancing the biological and resistance capacity of animals to better withstand climatic shocks and improved productivity through improved veterinary services. For this purpose, sufficient technical and financial resources have to be allocated to research institutions.

23. ADDRESSING REGIONAL IMBALANCES

The western and eastern regions in Mongolia are resource-poor regions. Poverty levels among the local population are very high and so is the vulnerability to climatic risks. Hence, a special effort needs to be undertaken to build capacities to integrate CRM tools and practices addressing regional imbalances.

24. LIVESTOCK INSURANCE

The World Bank in collaboration with Japan and Switzerland has established pilot projects of weather-index-based insurance systems for transferring livestock-related risks. It appears that, based on successful implementation in four provinces, the scheme would be expanded to cover all 21 provinces in 2012. This provides an opportunity for integrating climate risk information and forecasts, thereby making the scheme more attractive for herders and the Government of Mongolia.

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