



MOR2 Policy Brief No.1

Are Mongolian Rangelands at a Tipping Point?

Executive Summary

Rangelands cover 75% of Mongolia's land area, support livelihoods of 33% of Mongolia's human population, provide a home to major wildlife populations, and contribute ~14% of GDP and most of Mongolia's meat supply via livestock production. Climate change and increasing grazing pressure from a growing national herd are leading to changes in available forage reserves, plant composition and diversity on Mongolia's rangelands, although much of the land can likely recover. In particular, many winter-grazed pastures are in relatively healthy condition, and these account for about 25-30% of Mongolia's rangelands. Although much of Mongolia is not overgrazed, 37% of the country exceeded recommended forage use levels of 50% in at least 10 years out of the last 15 years, and 11% of the country is consistently overgrazed. When high stocking levels and drought coincide, both rangelands and livelihoods are at risk, leading to massive livestock die-offs during subsequent cold winters



and potentially, to irreversible degradation. This combination of conditions appears to be getting more frequent and widespread in Mongolia, suggesting that Mongolian rangelands may be at a tipping point. These changes signal an urgent need to implement policies that will sustain Mongolia's "green gold" over the coming decades for the benefit of future generations. The first need is to initiate a national, bottom-up conversation to identify policy options to avoid tipping rangelands into degradation and to maintain healthy rangelands and herder livelihoods for future generations. Soum- and aimag-level rangeland monitoring, community-based rangeland planning and co-management, and improved coordination of pastoral mobility are essential steps to greater sustainability and resilience to future climate shocks. Collective pasture possession rights and economic incentives to improve livestock quality and pasture management are important policy tools to maintain rangeland health. These measures, in turn, call for improved training and education of rangeland management professionals, and better information distribution to herders and local governments and civil society organizations. The most immediate attention should be placed on assessing conditions and managing grazing on pastures grazed during the growing season (summer pastures).

Policy Recommendations

- 1) **A national, bottom-up conversation is urgently needed to identify policy options to avoid tipping rangelands into degradation** and to maintain healthy rangelands and herder livelihoods for future generations. Policy options to discuss might include:
 - a) Economic incentives to improve livestock quality and pasture management, and reduce animal numbers, such as payment for ecosystem services and sustainability certification.
 - b) Improved livestock marketing infrastructure and value-added for herders.
 - c) Improved coordination of pastoral mobility to manage climate and degradation risks.
 - d) Collective pasture possession rights held by herder communities.
- 2) **Improve and coordinate soum-, aimag-, and national-level rangeland assessment and monitoring**, using consistent methods across soums

and over time, to detect and respond to changes and avoid undesired long-term vegetation shifts and possible irreversible degradation.

- a) Local-level monitoring should be at the species level because diversity declines before other changes are detected.
- b) A clear and widely agreed-upon definition of degradation is needed, with associated indicators and metrics to measure the extent and severity of rangeland changes, and determine their reversibility/irreversibility.
- c) Use real-time monitoring of forage availability based on remote sensing and modelling (e.g. LEWS) combined with soum-level livestock density data to predict when district-wide forage use is likely to exceed 50%, signaling that local government and herders should act together to reduce grazing pressure and avoid major livestock losses and increased degradation risk.

- 3) **Strengthen local institutional capacity to implement rangeland management changes in response to monitoring results (adaptive rangeland management).** Options for building institutional capacity include:
 - a) Expand community-based rangeland management and co-management to other soums.
 - b) Support soum-level professional positions responsible for rangeland assessment, planning and monitoring (separate from and in addition to existing positions focused on livestock, environment and land use planning).
 - c) Strengthen extension services and technical support for rangeland and livestock management at the soum level.
- 4) **Improve and expand professional training for rangeland management specialists, outreach for herders, and opportunities for peer-to-peer knowledge exchange and learning**
 - a) Strengthen the rangeland ecology and management curriculum at the National Agricultural University.
 - b) Provide in-service training for current soum and aimag staff responsible for rangeland assessment, planning and monitoring.
 - c) Provide training in rangeland ecology & management, plant identification and monitoring to soum teachers, students and herders, to build local community-based monitoring and management capacity.
 - d) Hold regular soum- and bag-level forums to discuss rangeland conditions and management, and to encourage greater informal knowledge exchange.
- 5) **Immediate focus of improved management and monitoring should be summer- and fall-grazed pastures,** as winter-grazed pastures appear relatively healthy, and grazing during the growing season has the greatest impact on future rangeland productivity.

Background

Mongolia's grasslands cover 75% of its land area and support globally important wildlife populations as well as a vibrant nomadic culture whose herds depend on the steppe for their sustenance. The average annual temperature in Mongolia has risen by 2.1°C over the past 60 years, one of the steepest increases on Earth. Since the transition to a democracy and market economy in 1992, poverty in rural areas has grown from zero to over 35% of the population. As a result, herding families are increasingly vulnerable to severe weather events, such as the winter disasters (dzud) of 1999-2002 and 2009-2010, as well as volatility in world markets. At the same time, the number of livestock grazing

Mongolia's steppes has increased, leading to concern for the future sustainability of the steppes and the people and animals that depend on them. Despite many estimates, the extent and causes of rangeland degradation remain uncertain. In this brief, we define rangeland degradation as *undesired changes in the composition, diversity and productivity of plant communities, and in extreme cases, irreversible loss of land potential due to permanent loss of soil or soil quality.*

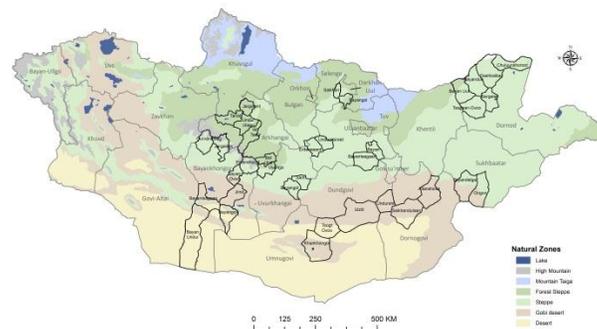


Fig 1. Locations of MOR2 study sites.

From 2008-2015, the MOR2 (Mongolia Rangelands and Resilience) Project used multiple methods and data sources to:

- Assess climate changes and impacts on rangelands and herders using instrument records and herder observations
- Determine stocking densities in relation to forage availability over time across all of Mongolia, to determine if Mongolian rangelands are overgrazed
- Measure rangeland changes over time based on repeated sampling of field plots, analysis of satellite imagery coupled with climate and livestock records, and herder observations of change
- Assess rangeland conditions on winter-grazed pastures in 10 aimags and 36 soums across the mountain and forest steppe, eastern steppe, steppe and desert steppe to assess current rangeland conditions in winter pastures and how vegetation is affected by historic livestock grazing (Fig 1)

Key Findings

Climate Change

- Over the past 50 years mean minimum annual temperatures have increased significantly across all of Mongolia, from 0.2 to 0.6° C per decade depending on location. Mean maximum temperatures have increased over most of Mongolia from 0.2 to 0.7° C per decade. Mean annual precipitation has decreased significantly over about 30% of the country, primarily in eastern and central Mongolia (-7 to -21 mm per decade).

- A survey of 120 herders in 6 soums across the mountain and forest steppe, steppe and desert steppe showed that herders observed significant changes in temperature, precipitation and pasture conditions over the past 20 years. The greatest changes and highest agreement among herders was in the steppe, where herders observed hotter, drier summers and colder winters, and declines in rangeland production. These herder-observed changes aligned with meteorological records and satellite imagery for these areas.

Extent of Overgrazing

- Contrary to reports of widespread overgrazing, excessive forage use was pervasive on only 37% of Mongolia's rangelands, with 11% experiencing consistent overgrazing (more than 70% use for 10 or more years out of the 15 year period assessed). Overuse is more widespread in the mountain and forest steppe and steppe than in the desert steppe and desert, and has increased over time. More of Mongolia was overgrazed in 2014 than in any year since 2000. This widespread heavy use puts Mongolian livestock populations and rangelands at great risk.
- When forage use exceeded 50%, rangeland vegetation dynamics were driven more by livestock than by variation in rainfall in the steppe and mountain and forest steppe zones. When high stocking levels and drought coincided, there was increased risk of extreme livestock losses if a hard winter followed. These episodes of very heavy grazing, especially when combined with drought, could potentially cause significant long-term changes in pasture productivity and quality. We do not know if these changes are irreversible.

Evidence of Rangeland Changes 1994-2013 Based on Field Samples in Bayankhongor Aimag

- Significant changes in plant species and functional type (grass, shrub, forb, sedge) composition, and diversity has occurred over time, even where forage use has exceeded 50% in only a few years out of the past 20. This suggests that even if overgrazing is not common, infrequent episodes of extremely heavy grazing can cause important changes in rangelands.
- Rangeland changes that were most associated with grazing, such as a decline in grasses and increase in grazing-tolerant sedges, were most common in the mountain and forest steppe and steppe, and less common in the desert steppe.
- Rangeland changes consistent with climate change, such as an increase in a drought-tolerant grass species (*Stipa krylovii*) and decrease in typical mountain steppe grasses (*Poa attenuata*), were also most common in the mountain and forest steppe.

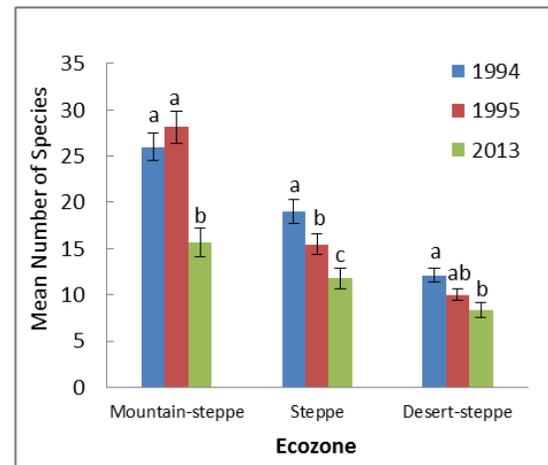


Fig 2. The average number of plants per plot declined significantly over 20 years in 3 ecological zones in Bayankhongor Aimag.

- Although significant changes in plant species and diversity were observed, total plant cover and biomass did not change, suggesting that important ecological functions are still intact, and rangelands are not irreversibly degraded in these study sites.

Condition of Winter-grazed Pastures across 10 Aimags and 4 Ecological Zones

- In a study of 143 winter-grazed pastures (total of 428, 50 m x 50 m plots) distributed across 4 ecological zones in 10 aimags and 36 soums, we found little evidence of degradation, indicating that these pastures are relatively healthy.
- Where grazing affected rangeland plants and soil conditions, these impacts were greatest close to winter shelters, where livestock densities and grazing/trampling pressure are greatest. Livestock effects on vegetation were most prevalent in the steppe zone, moderate in the mountain and forest steppe and desert steppe zones, and nearly absent in the eastern steppe.



Fig 3. Many winter-grazed pastures are in healthy condition.

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The Mongolian Rangelands and Resilience (MOR2) Project is a collaborative, interdisciplinary research, education and outreach project that seeks to understand the impacts of climate and socio-economic change on Mongolian rangelands and pastoral people, and to identify the management practices and institutions that build rural community resilience and improve rangeland sustainability. This project grew out of a collaborative research planning meeting held in Ulaanbaatar in June 2008, in which herders, Mongolian and US scientists, donors and policy-makers met to identify critical questions facing Mongolia's rangeland systems and pastoral communities. At this meeting, participants collaboratively designed a country-wide research program to understand how livestock grazing and climate change are affecting the condition of Mongolia's rangelands across multiple ecoregions, and whether and how institutional innovations such as formally organized community-based rangeland management (CBRM) are affecting rangeland health and pastoral livelihoods and social conditions.

MOR2 Partners: Colorado State University, Texas A&M University, Institute of Geo-ecology, Institute of Meteorology and Hydrology, Research Institute of Animal Husbandry, Center for Ecosystem Studies at the Mongolian National Agricultural University, Nutag Partners, Center for Nomadic Pastoralism Studies, Mongolian Society for Range Management, Wildlife Conservation Society.

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For Further Information

Dr. María E. Fernández-Giménez, Professor
Rangeland Social-ecological Systems Lab
Dept. of Forest and Rangeland Stewardship
Campus Mail 1472
Warner College of Natural Resources
Colorado State University
Tel: 970-491-0409
Maria.fernandez-gimenez@colostate.edu

Dr. Batkhishig Baival
Nutag Partners
Office #2005, Nomun Building
5th khoroolol
Ulaanbaatar-28, Nomun Box 670
tel: 70130135
batkhishig@nutagpartners.mn;
batkhishig.baival@yahoo.com