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VULNERABILITY OF THE MONGOLIAN STEPPE AND NOMADIC CULTURE TO CLIMATE CHANGE: ADAPTATION OR CATASTROPHE?
- Brief Introduction of Mongolia
- Climate Change and Its Impact
- Land Use Change
- Vulnerability of Pastoral Community
- Adaptation
- Choice
Dryland systems, history, geography, population & economy

MONGOLIA
Critical concern: Dryland systems

+ Dryland systems with the lowest NPP and GDP per capita experienced the highest population growth rate in the 1990s
The Great Wall is a line drawn by nature, which distinguishes lands suitable for agriculture from those that are not. It was a frontier of the nomadic culture.

- 198 BC, agreement between the Han Empire and the Hun nomadic empire.
- 1206, foundation of Mongolia by Chingis Khaan, a ruler over the largest land Empire and a founder of globalization.
Population dynamics in Mongolia

- High population growth until early 1990 (2.8%);
- The urban population over-exceeding in mid 1970s;
- The rural population is relatively stable.
Drop of the GDP per capita after 1990 and slow recovery during a decade;

Recent sharp increase of GDP per capita due to global market price increase of copper and gold.
Global warming, water resources, NPP trends & plant onset trends

CLIMATE CHANGE AND ITS IMPACTS
TEMPERATURE TREND (1940-2001)

Figure 2.5: Temperature trend for the period 1940-2001
Glacier melting
PLANT ONSET TRENDS, 1982-1991

Ellis et al. 2002
Regions with Changes in Green-up Dates overlaid upon a representation of Topography and Elevation

Changes in green-up at 4.2 km x 4.2 km resolution, elevation at 1 km x 1 km resolution. Layers are shown in a Lambert Azimuthal projection, with a sphere of reference of 6,370,897 m, longitude of center projection of 100 00 0.0, and latitude of center projection of 46 00 0.0, with no shifts. Graticules overlaying the layers depict 100 km x 100 km blocks.

Overlay of the plant green-up trends over topography map

CHULUUN & OJIMA
(NSF / AIACC)
Agriculture, livestock dynamics & vulnerability of rangelands

LAND USE CHANGE
• Self-sufficiency in flour supply before 1990;
• Agriculture’s collapse since 1990: 4 times decrease of sown areas and fodder cropping failure.
Livestock dynamics in Mongolia

• Relatively stable (20-25 million) livestock numbers before 1990;
• The goat number tripled since 1990 due to cashmere value.

\[ V = \Delta S + \Delta N \]

dN - relative index of pasture use

Chuluun & Altanbagana, 2005
Participatory method, cultural landscape, land degradation, water limitation, sacred lands, adaptation options

VULNERABILITY OF PASTORAL COMMUNITY
RESEARCH COMMUNITIES: “POLICY FRAMEWORK FOR ADAPTATION STRATEGIES OF THE MONGOLIAN RANGELANDS TO CLIMATE CHANGE AT MULTIPLE SCALES” (PARCC)
Participation of local government

Young cowboy
Cultural Landscape

Four seasonal pastures, long-distance pasture, reserve pasture, hay land and sacred land

Economic input

Low

Winter

Nomadic culture
State policy
Land ownership
Land use

High

Economic input

Spring

Summer

Fall

Winter

Ecological and socio-economic

Complexity
Sustainability
Biodiversity
Health
Rangeland state
Livestock fitness
Adaptive capacity
Herders’ well-being
Entrepreneurship opportunity
Ecological and cultural tourism

Landscape fragmentation

Jim Ellis, Т. Чулүүү, М. Алтанбагана, 2005
The whole is more than the sum of its parts!
Land use change: Batsumber community

Winter-spring

Summer-fall

4-5 км
Riparian ecosystem degradation
Land degradation near the well. Altaganat comunity, June-July 2007
Vulnerability of springs
3 springs and 1 lake shrunk in the Ihburd valley during the last decade.

Now only one spring is running in the Ihburd valley, giving services worth of US$ 400,000 a year to herders and ecosystems free of charge.
Forest steppe
Hustai Nuruu National Park
Nomadic culture in the Information Era & cultural landscape fragmentation with administrative-territorial division

ADAPTATION:
COMMUNITY AND COUNTRY
ADAPTATION OPTIONS FOR COMMUNITIES

- Restoration of traditional cultural landscapes:
  + Seasonal pastures;
  + *Otor* and reserve pastures;
  + Haylands.
- Protection and improvement of water sources;
- Community ownership of pastures with protection of sacred lands and sustainable use of natural resources;
- Economic development:
  + Farming;
  + Increased meat export;
  + Cultural and ecological tourism;
  + Introduction of productive livestock breeds.
Strengthening of traditional pastoral networks:
- Renewable energy;
- Wireless satellite communication;
- Distance learning;
- Mobile medical services with distance diagnosis;

Restoration of cultural landscape and its traditional management
- Enlargement of administrative-territorial units.
SHS for Ger, Now ....
5 yrs later ?! .... GIPV – Ger Integrated PV
An administrative territorial division of Mongolia was fragmented during the socialist period of last century, often breaking traditional Cultural Landscapes:

159 sums out of 330 don’t have 1-2 seasonal pastures.
Asian Seasonal Land Cover

overlaid by
Regions with Changes in Green-up Dates

James Ellis and Chultum Tojtoyn
Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, Colorado, USA

In recent analyses (see Yu et al. 1999), our research team found that some regions of Mongolia, northern China, and surrounding areas are exhibiting changes in the dates when the onset of green-up of local vegetation occurs. Some areas, such as those distributed by the Desert Steppe, are shifting earlier growing season periods from 1982 to 1991. Other areas, such as portions of the Desert Steppe, the onset of green-up occurred later in the later years of that same period (see description, far left). Areas of Typical Steppe show varied responses, with much of that region not showing marked changes in the dates of the onset of green-up. Changes in green-up dates may have profound effects upon local pastoral production systems. To help identify fine-scaled responses, we will be making field visits to selected sites to ground-truth vegetation and local conditions.

Present administrative-territorial division
Newly proposed division of administrative units, 2005

Territory vulnerable to climate change comprises a small part of the entire territory of hoshuus, thus enlarging administrative territorial units will serve as a factor to reduce the vulnerability of the rangelands to climate change.
Concluding remarks, sustainable development & brunch point

**CHOICE:**

**ADAPTATION OR CATASTROPHE**
CONCLUDING REMARKS

- Abrupt changes in ecosystem function and services already are happening in Mongolia due to interacting climate change and human activities;
- Adaptation strategies at pastoral community, local administrative unit, river basin, sub-regional and country levels should be developed with participation of all stakeholders;
- Adaptation strategies to GEC need to be linked with the SD and MDGs.
Global Environmental Change and Development – at a branch point?

Branch Points

Periods of Gradual change ... and abrupt change

Incremental change ... and social transformations

Johan Rockström
Stockholm Environment Institute
Stockholm Resilience Centre
A technological society has two choices. First it can wait until catastrophic failures expose systemic deficiencies, distortion and self-deceptions...

Secondly, a culture can provide social checks and balances to correct for systemic distortion prior to catastrophic failures.
CYCLE LEADING TO THE COLLAPSE

1. Unemployment
2. Poverty
3. Corruption
4. Environmental Degradation
5. Brain Drain Env. Refugees
SUSTAINABLE DEVELOPMENT

- Develop economic, social and political systems in comprehensive way, conserving ecological and cultural capitals;
- Base on uniqueness of ecology, culture and history;
- Adapt to globalization, including climate change;
- Develop global citizen - human capital;
- Cooperation for development.

Chuluun et al., 2004.
OPTIMISTIC NOTES

- Human capacity (with literacy rate – 99%);
- Rising economy (with GDP per capita - $1,060 in 2006, and $1,500 in October 2007);
- New opportunities in Tavan Tolgoi (coal) and Oyu Tolgoi (copper and gold);
- Emergence of an active civil society;
- Increased awareness about the environment;
- Cultural integrity;
- Positive signs in corruption reduction;
- Finally, friendship of Japan and Mongolia:
  + Japan is number one donor country, assisting my country during its transition to democracy and market economy!
BAYARLALAA!