

Towards Sustainability, Livestock on the Move

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Conducting Policies for Sustainable Nomadic Herding:

Adapting to climate change of Pasture Livestock:
Needs, Opportunities and Challenges

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Pastoralism – dependency on weather and climate

- Nomadic pastoralism is an unique way of life and civilization that is well suited and adapted to the environment, climate and weather of Mongolia for many Centuries.
- However, country's harsh weather and climate condition is perpetually cause substantial barriers and risks to engage animal husbandry.
- In other word, animal husbandry is directly dependent on the weather and climate conditions.
- Livelihood and revenue of herders and local communities are determined by the livestock production which is highly dependent on weather.
- Frequent disastrous weather and climate extremes such as drought and dzud lead to massive loss and damages in livestock number, production and herders livelihood.

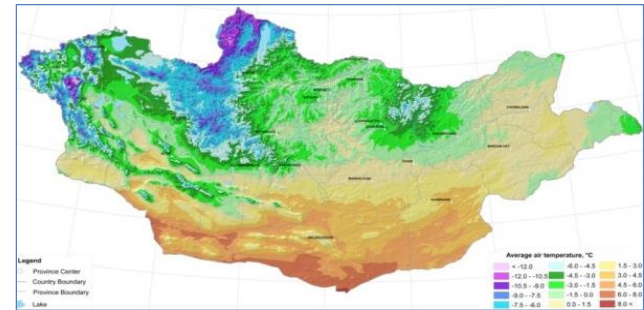


Mongolia's weather and climate specific features (1)

Mongolia has severe continental climate with high temperature fluctuations; four seasons; long and cold winters; short and relatively hot summers.

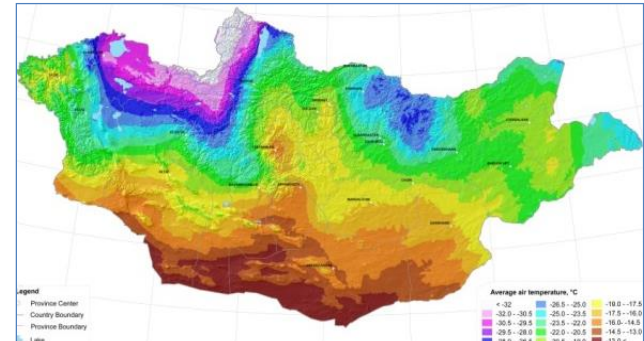
Annual average air temperature:

- Mountainous area: colder than -4°C ,
- Valleys of mountain ranges, large river basins: -6°C - 8°C ,
- Desert steppe zone: warmer than $+2^{\circ}\text{C}$,
- Southern Gobi: warmer than $+6^{\circ}\text{C}$



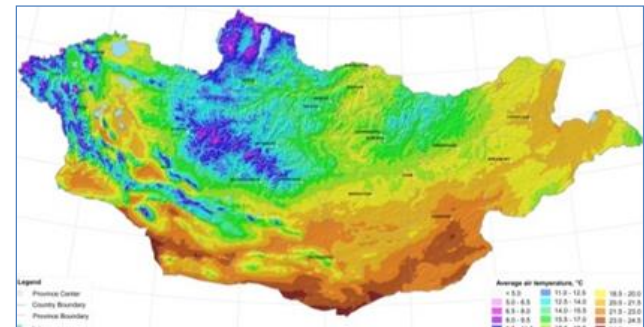
Average temperature of January:

- Great lake depression & Khangai mountain valleys - 30°C ... -34°C ,
- High mountains: -25°C ... -30°C ,
- Steppe zone: -20°C ... -25°C ,
- Gobi and desert zones: -15°C ... -20°C .



Air temperature of July:

- High mountain ranges cooler than 15°C ,
- Great lake valleys, depression in mountain ranges, large river basins: 15°C - 20°C ,
- Southern part of Dornod steppe, Gobi and desert zones: 20°C - 25°C .

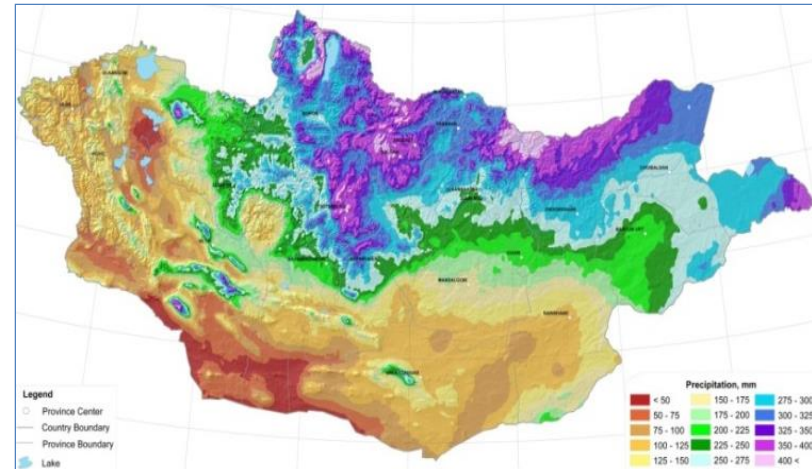


Mongolia's weather and climate characteristics (2)

Mongolia has arid and semi-arid climate; low annual precipitation, 85% of annual precipitation is in warm season; High sunny days; windy in spring and autumn, high frequency of dust storm days.

Annual precipitation:

- High mountain Alpine zones- **more than 400 mm**,
- High mountain ranges and far east Khalkh river basin - **300mm -400mm**,
- Mongol Altai and forest steppe zone - **250mm -300 mm**,
- Steppe zone - **150mm -250 mm**,
- Gobi and desert zone - **150mm -50 mm**,
- Southern Gobi of Altai mountain, desert zone - **less than 50mm**.

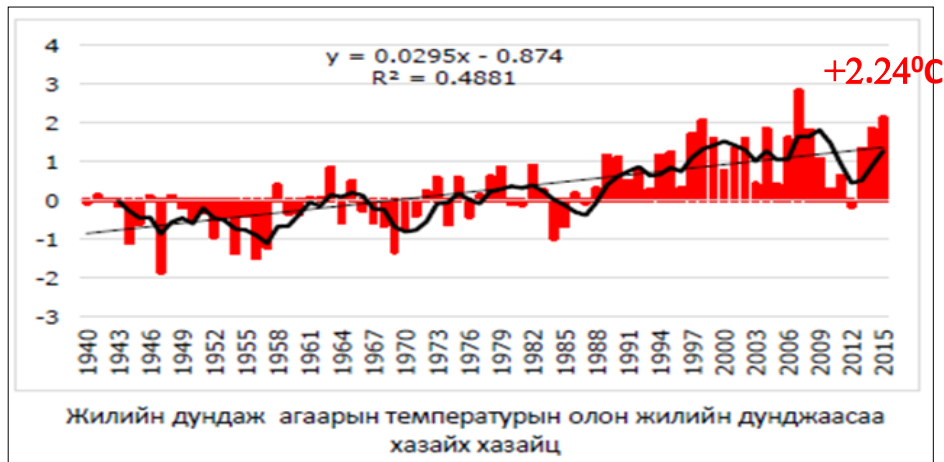


Other parameters of climate

- Less cloudiness, high frequency of sunny days: annually 230-260 sunny days and 2600-3300 hours of sunshine. High resource of solar energy.
- Mongolia's steppe, Gobi and desert areas are windy. Annual mean wind speed is 4-6m/s in these areas. In other areas are 1-3 m/s. However, in some areas wind speed is more than 4.0m/sec in some seasons.
- Dust storm days are fewer than 10 days in mountainous area and more than 50-90 days in Gobi and desert areas. High resource of wind energy.

Mongolia's current climate change (1)

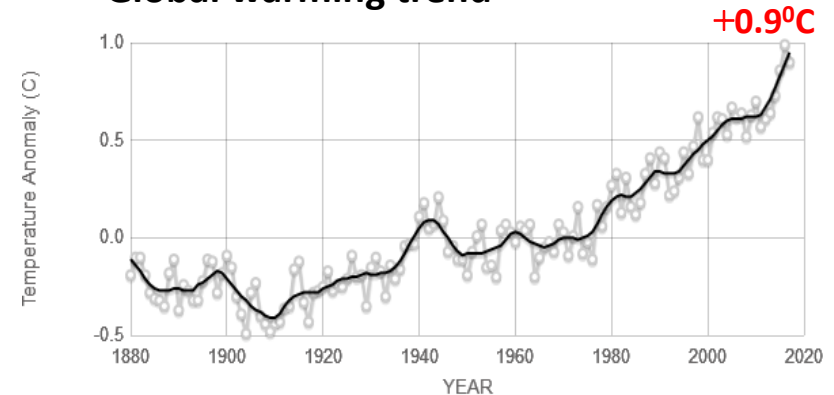
Mongolia's annual mean temperature change, 1940-2016



Mongolia is located at the epicenter of global warming thus climate of Mongolia is changing drastically in a short-term. Based on the study using the information of meteorological observations from 1940 to 2016, annual mean temperature has been increased by **2.24°C**. This is a much higher than global average.

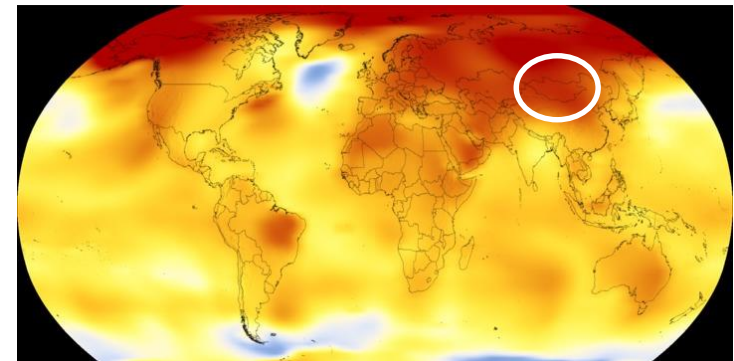
This warming trend is occurs intensely in the mountainous areas in warm seasons.

Global warming trend



Source: climate.nasa.gov

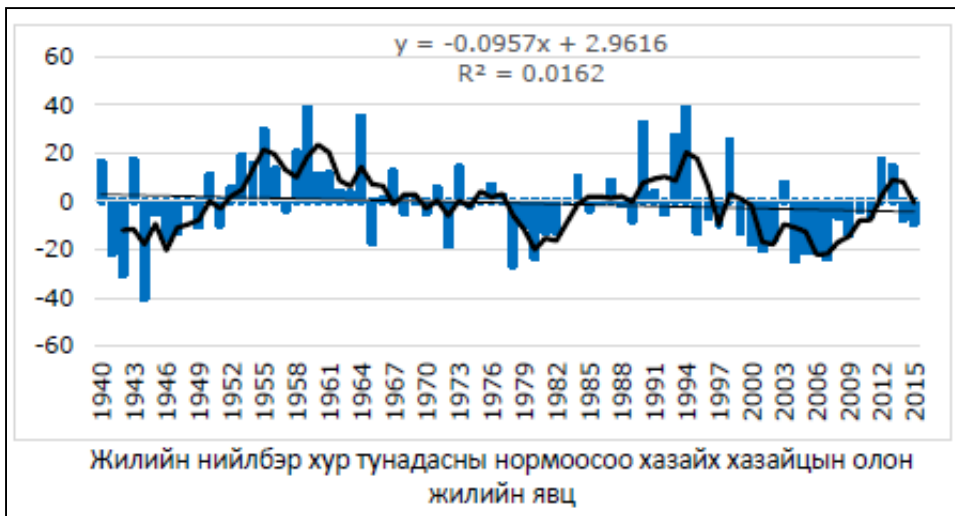
As of 2017



The average air temperature of the earth's surface and the surface of the ocean increased by 0.9°C between **1880-2017** (source: WMO, 2018)

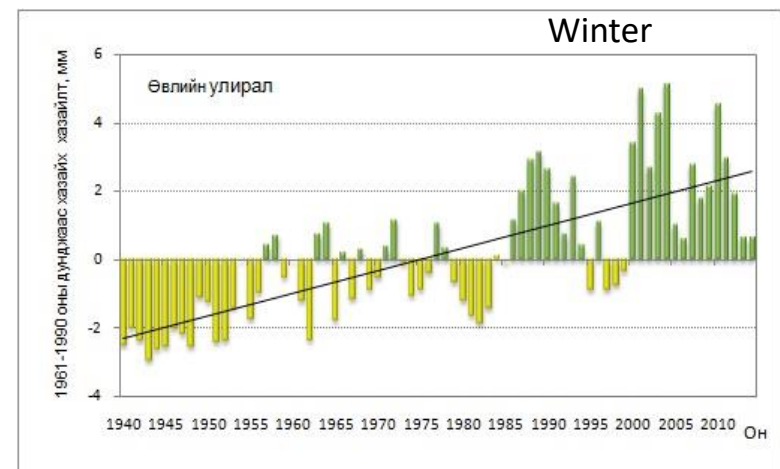
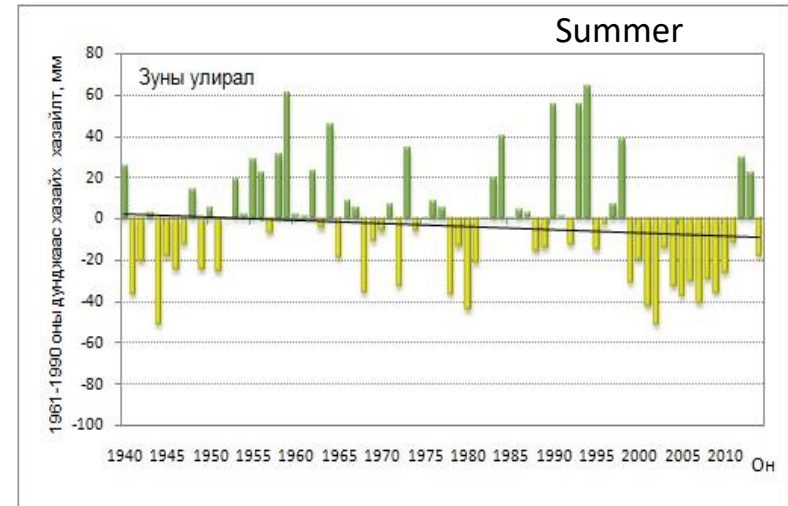
Mongolia's current climate change (2)

Mongolia's precipitation change, 1940-2015



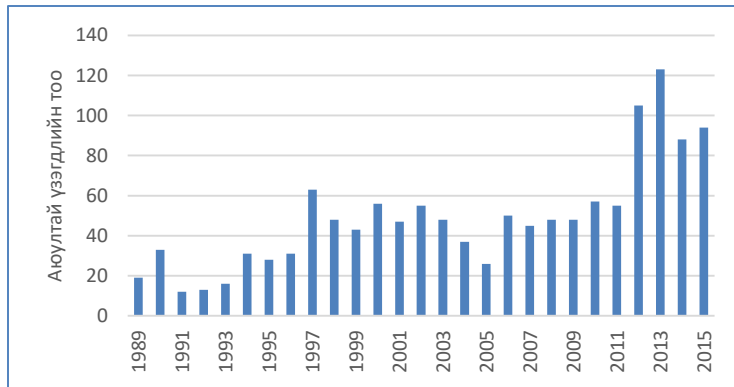
Studies suggest that since 1940, annual precipitation of Mongolia has not changed significantly, although it shows slightly decreasing trend (~7%).

This decrease on precipitation is occur in summer more intensely. Apparently winter precipitation has increasing tendency.

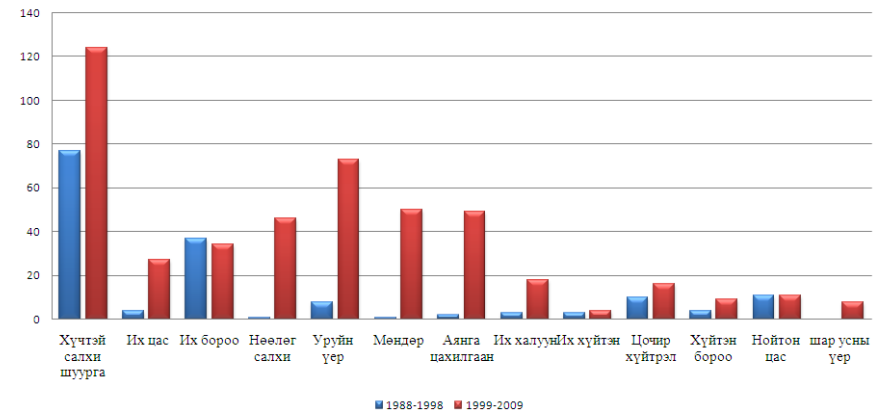


Frequency and magnitude of disastrous and hazardous phenomena

Frequency of disastrous and hazardous events in Mongolia



Changes of occurrence of disastrous weather events by types during the last two decades



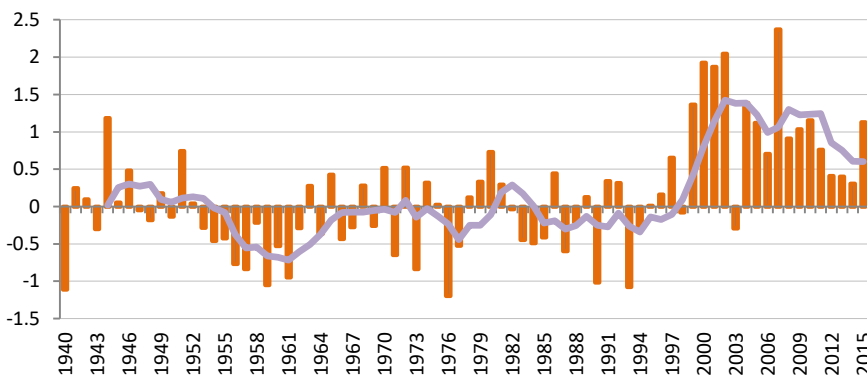
In Mongolia, there more than 10 disastrous weather and climate events that cause losses and damages to county's social and economic sectors are drought, dzud, forest and steppe fire, snow storm, flood and extreme cold. In last decade loss and damage caused by natural disasters is roughly estimated as 50-70 billion Tugrug which is 10-14 times higher compared to the previous 10 years.

Hazardous of drought and dzud

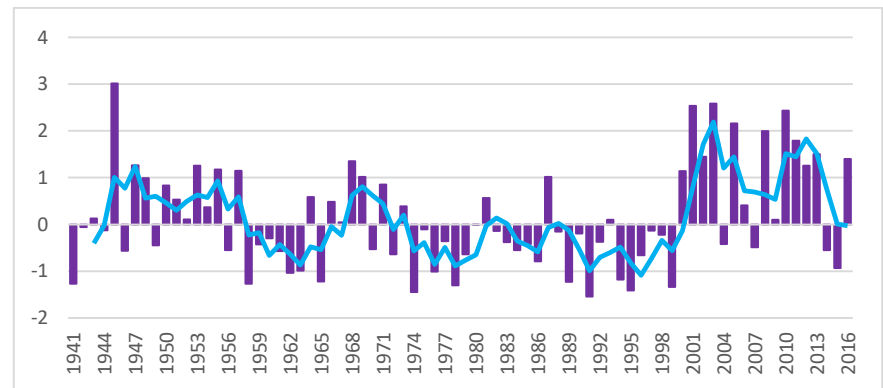
Drought and dzud are a long-lasting climate extreme phenomena with massive losses and damages for socio-economy of the country.

Drought: Drought is likely to occur in the high mountain, forest steppe and steppe zones 1-2 times in 10 years, and in the desert steppe areas once in three years. Frequency of dryness has been increased since 1940. Droughts occurred in 2000, 2002, and 2005 have recorded as the cause of highest damage in the recent years. Due to drought in 2015, roughly more than 340 thous.tonn of yield of crop is lost only.

Dzud: Dzud is a Mongolian specific harsh winter/spring weather/climate event which cause significant losses in the pasture livestock in the country. There is increasing tendency of frequency of dzud since 2000. Dzuds of winter 1999-2000, 2001-2002 and 2009-2010 caused massive damage in socio-economy of Mongolia. Total livestock number has been decreased by more than 20% by the dzud of 2009-2010.



A. Long term average drought index of Mongolia



B. Long term Dzud index of Mongolia

Future projection of climate change in Mongolia

Annual mean temperature increases:

- 2016-2035: 2.0 – 2.3⁰C,
- 2081-2100 : 2.5 – 6.7⁰C..

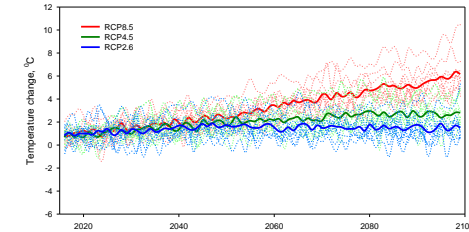
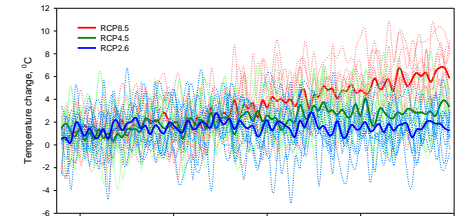
Precipitation amount change:

- Winter precipitation: 15.5- 50.5% increase by 2081-2100,
- Summer precipitation: No significant change.

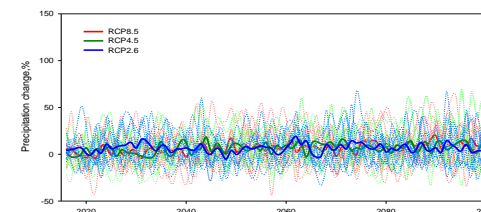
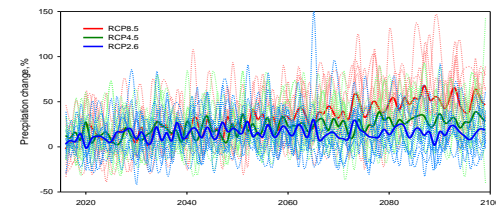
Mongolia's climate change projections in different GHG scenarios (average of 10 global climate models)

GHG emission scenarios	Season	Near future, 2016-2035		Long term, 2081-2100	
		Temperature, ⁰ C	Precipitation, %	Temperature, ⁰ C	Precipitation, %
RCP2.6	Winter	2.3	10.1	2.5	15.5
	Spring	2.3	9.2	2.4	11.7
	Summer	2.2	6.2	2.5	5.1
	Autumn	2.1	7.6	2.4	7.6
RCP4.5	Winter	2.1	12.3	3.7	28.7
	Spring	2.0	7.8	3.4	17.4
	Summer	2.1	1.1	3.5	7.8
	Autumn	2.0	8.1	3.4	11.7
RCP8.5	Winter	2.2	14.0	6.3	50.2
	Spring	2.2	9.8	5.6	28.6
	Summer	2.2	2.4	6.0	8.7
	Autumn	2.2	6.4	6.1	24.1

Temperature change (⁰C) of 2081-2100 a) winter and b) summer

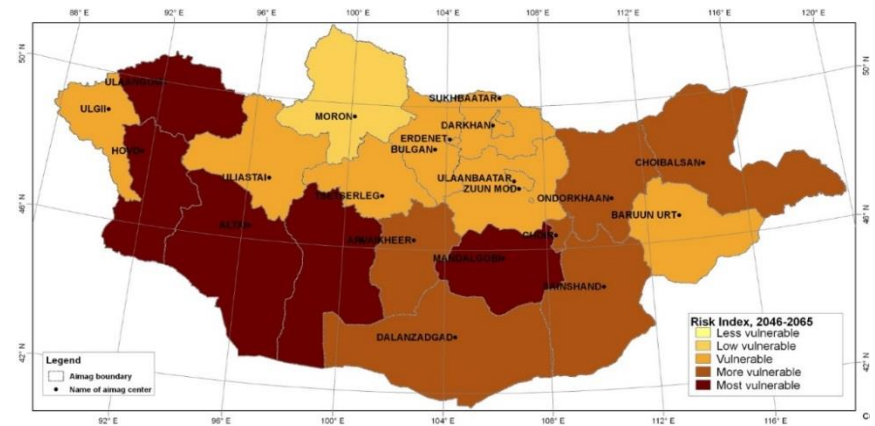
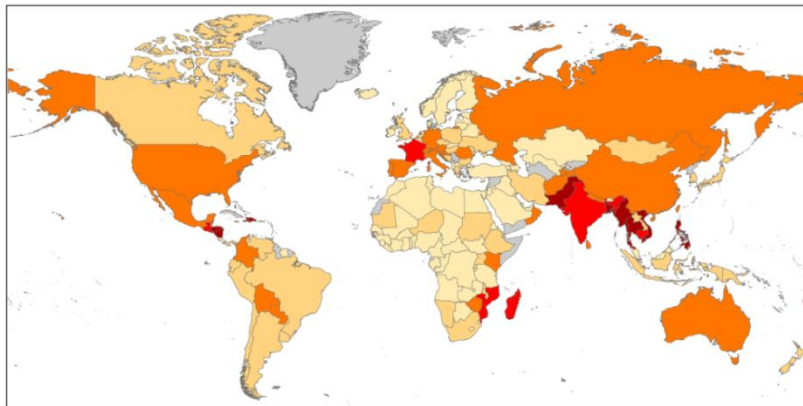


Precipitation change (%) of 2081-2100 a) winter and b) summer



Vulnerability of animal husbandry to climate change and risks associated

- Nomadic herding is most vulnerable sector for climate change in Mongolia. Climate change not only directly impacts on livestock, but it has negative indirect impacts through the soil, pastureland, water supply and disaster related events.
- Also it has direct impacts to the livelihood of herders and their lifestyle and incomes.
- By the annual assessments using climate change vulnerability index conducting by Germanwatch, Mongolia is classified as a high risk country.
- Spatial distribution of climate change vulnerability and risk index is not-equal over territory of Mongolia and most high risky regions are the Western and south-west *aimags and Dundgobi Aimag* of the country.



Climate change potential impacts and risks for animal husbandry (1)

Climate change has the following direct and indirect impacts and risks to livestock sector of Mongolia:

- Due to climate change, frequency of hot waves and number of dry and hot days are increasing which effect to condition of summer grazing of animals,
- Agrometeorological observations made in the different natural zones, animals' summer-autumn and winter-spring weight gain is reducing and livestock productivity is decreasing consequently,
- Due to warming of climate, period of sheep wool, and goat cashmere and cattle fiber is coming shorter.
- Changing vegetation phenological period and growth, decreasing species diversity and yield.

Climate change impact and risk for animal husbandry (2)

- Declining soil nutrition, degrading pasture by overgrazing and other factors and intensifying desertification.
- drying out of springs, rivers, lakes and ponds in steppe zones, changing groundwater regime and the water level are affecting negatively to livestock water supply.
- Increasing frequency and intensity of weather and climate induced disasters effect on livestock sector sustainability and productivity.
- Climate change and natural disasters such as droughts and dzuds effect on livelihood and income of the local communities,

Climate change impact and risk reduction adaptation measures

In order to establish climate resilient and climate smart society, the following important steps to be undertaken in the livestock sector:

- Conduct a comprehensive assessment of climate change impacts and vulnerabilities of livestock sector,
- Identify and prioritize the most suitable and urgent adaptation measures for the sector and for sub-regions,
- Planning and implementing process of adaptation measures should be integrated into the sectorial, *Aimag* and *Soum* levels development programmes and plans.



Key strategic priorities of adaptation measures in livestock sector (1)

By establishing sustainable livestock sector that is well adapted to climate change, country will ensure food security of the population, to supply light and food industry with raw materials constantly and to expand organic production.

Key strategic priorities of adaptation actions of livestock sector:

- Improve management and institutional arrangements of livestock sector in line with the changes in the environment and climate system,
- Manage livestock number consistent with carrying capacity and fodder stock, water availability and introduce a mechanism of incentives and compensation system,

Key strategic priorities of adaptation measures in livestock sector (2)

- Increase productivity, quality and value of pasture livestock, improve livestock breeding and health,
- Decrease vulnerability of pasture livestock, increase adaptive and establish resilience,
- Improve fodder supply of animals in winter and spring seasons by producing feeds suitable for pasture and farm livestock,
- Build capacity of livestock sector to prevent risks and overcome disasters ,

Key strategic priorities of adaptation measures in livestock sector (3)

- Strengthen livestock insurance mechanism of disaster risk
- Improve sustainability and competitiveness of livestock sector
- Improve weather and forecasts and climate predictions and provide herders and local communities with weather and disaster information in timely manner, establish an early warning systems.

Mongolia's policies and strategies related to climate change

- National action program on climate change, 2011, and Government Action Plan of the programme, 2011
- INDC/NDC of Mongolia to UNFCCC and Paris Agreement, 2015/(2019)
- National Security Concept of Mongolia, 2010
- Green Development Policy, 2014
- Sustainable development vision 2030, 2016
- Law on Air /revised/ (2010, 1995);
- Law on Environmental Protection (1995, 2007);
- Law on Disaster Prevention, etc.

National action program on climate change (NAPCC)

- NAPCC is approved by the Great Khural (Parliament) in 2011. NAPCC will be implemented in two phases until 2021.
- The objective of NAPCC is to ensure environmental sustainability, ensure socio-economic development adapted to climate change, reduce risk and vulnerability, mitigate GHG emission and as well as promoting economic effectiveness and efficiency and implementation of 'green growth' policies.
- By implementing NAPCC, Mongolia will create the capacity to adapt to climate change and establish a foundation for green economic growth and development.
- NAPCC includes strategy and measures reduce negative consequences of climate change, mitigate GHG emissions, establish climate resilient and low carbon economy.

INDC/NDC

- Mongolia developed and submitted its INDC to the UNFCCC Secretariat just before and Paris agreement in 2015.
- Mongolia obligated to reduce its greenhouse gas emissions by 14% by 2030, identified needs for adaptation measures and technical and financial support.
- Now, updating INDC and developing new NDC is underway. One of the strategic areas of the Mongolian NDC will be agriculture sector, in particular livestock sector.
- Mongolia is undertaking a number of measures to implement actions identified in its INDC. For instance, Mongolia has prepared funding jointly with UNDP and FAO a project proposal for “Improving Adaptive Capacity and Risk Management of Rural communities in Mongolia” for GCF. The proposal will be submitted to GCF for its consideration.

Concluding Remarks and recommendation (1)

- The fundament to ensure sustainability of pasture livestock sector of Mongolia and improve competitiveness is to develop and implement a Climate-smart development model of the sector that fully reflects the climate change consequences and challenges inclusively.
- Actions toward to adapt to climate change are based on advantages and good practices of nomadic herding, reduce adverse impacts of climate change and prevent potential risks associated with climate change.

Concluding Remarks and recommendation (2)

- Livestock sector's adaptation actions are ought to be implemented according to the national plans and policies that are mainstreamed into sectorial and local development policy planning documents. Active stakeholders engagement, including local authorities and herder communities plays an important role in implementation of adaptation measures.
- Technical, technological and financial supports of international organizations and partner countries are significant to implement adaptation actions successfully. In particular, it is necessary to actively engage with UNFCCC and Paris Agreement and its financial mechanisms such as Green Climate Fund.



Thank you for your attention!

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