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The Climate Challenge: Thinking Beyond Borders for Collective Action
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Local Solutions for Climate Resilience: Mongolia Case Study

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Climate change in Mongolia

- Mongolia is highly vulnerable to climate change due to its geographical location, sensitive ecosystems, and an economy heavily dependent on natural climate conditions.
- Extreme variations in air temperature and significant fluctuations in precipitation.
- Between 1940 and 2023, the annual average air temperature in Mongolia has increased by 2.52°C, while total precipitation has shown a slight upward trend of 3.4%. This warming effect varies across different regions.
- Warming in Mongolia is occurring at a faster rate compared to the global average, which has increased by 0.74°C since 1906.

Figure 1. Deviation from the long-term annual average air temperature and total precipitation anomalies

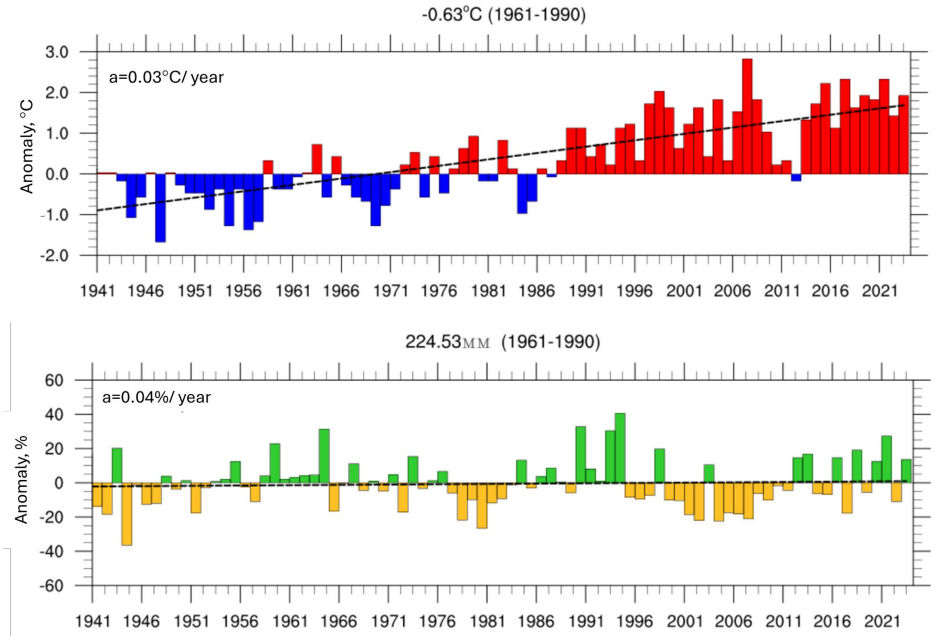
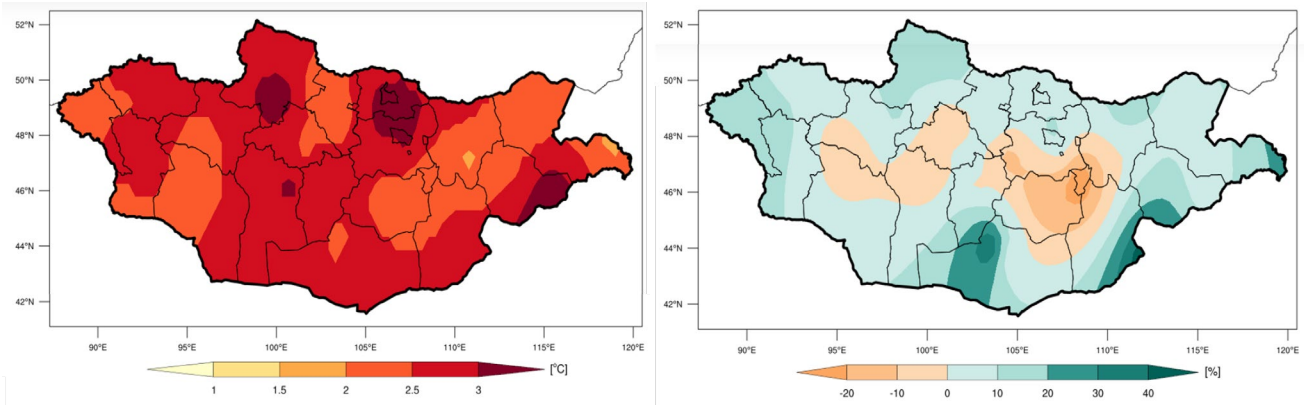


Figure 2. Spatial distribution of changes in annual average air temperature and total precipitation



Source: Information and Research Institute Of Meteorology, Hydrology and Environment

Impacts of Climate Change

Climate change and variability have become significantly apparent. Over the past 50 years, Mongolia has experienced:

- Intensification of pasture degradation and desertification;
- Decrease in plant species diversity;
- Contraction of wild animal habitats and a reduction in their populations;
- Scarcity of water resources in the steppe regions;
- Rise in the incidence of forest and grassland fires due to aridification;
- Increased frequency and intensity of droughts and harsh winters
- The frequency and intensity of disasters and hazardous events have increased.
  - The number of disasters and hazardous events, and accidents excluding object fires, has increased 3.3-fold over the past 20 years. Financial damage has increased 8.4-fold, reaching 320 billion MNT in 2023.

Figure 3. Number of disasters, hazardous events, and accidents, 2000-2023

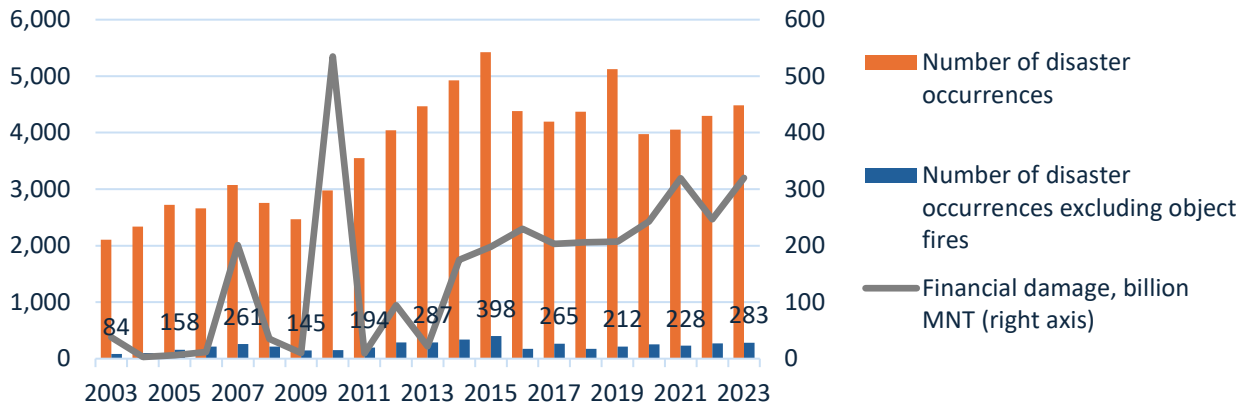
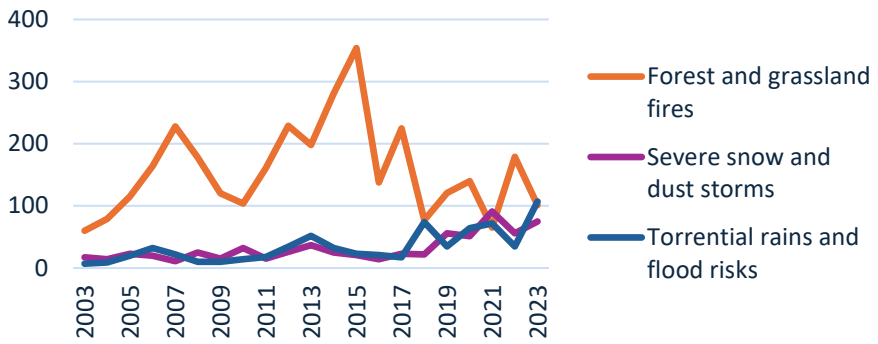


Figure 4. Number of disasters, hazardous events, by type



Source: National Statistics Office

Public Participation

The Third Sustainable Livelihood" (SLP-3) project /2015-2023/ – Local Development Fund

- The project was implemented by the Ministry of Finance between 2015 and 2023 with funding from international development organizations. The project aims to plan and execute priority investments, enhance governance and citizen and public participation in local communities, and support the implementation of the Budget Law, which is central to the government's decentralization policy.
- The project's target group is employees of government and administrative organizations and citizens of all 330 soums. Beneficiaries of the project will be the entire local population, who will benefit from improved, transparent and effective management of public finances of the local government and the Local Development Fund (LDF).
- A total of 2,054 initiatives related to climate change have been proposed under the LDF, with an implementation rate of 91%. These initiatives have been allocated a budget of 131 billion MNT.

Table 1. Number of LDF projects proposed by local communities, 2015-2023

Project investments type	Number of projects	Approved budget /billion MNT/
Environmental protection and restoration	1,097	97
Planting trees	251	12
Water management and spring source restoration	394	13
Flood protection	312	10
Total	**2,054**	**131**

Source: Economic Research Institute, (2023a)

Dzud – extreme weather event

- Dzud events are characterized by "... deterioration of the weather conditions in winter and spring leading to shortage of pasture and water for livestock suffering massive die-off" (UN Mongolia 2016)
  - deep snow, covering animals and food sources
  - no snow but harsh cold, can freeze from exposure
  - waterlogging and inaccessible food due to impenetrable ice caused by fluctuating temperatures

- Due to the impacts of climate change, aridification is intensifying, leading to reduced forage yields, decreased species diversity, and pasture degradation. Consequently, livestock are unable to fully regain their strength during the summer and autumn, which adversely affects their ability to endure harsh winters and other disasters.

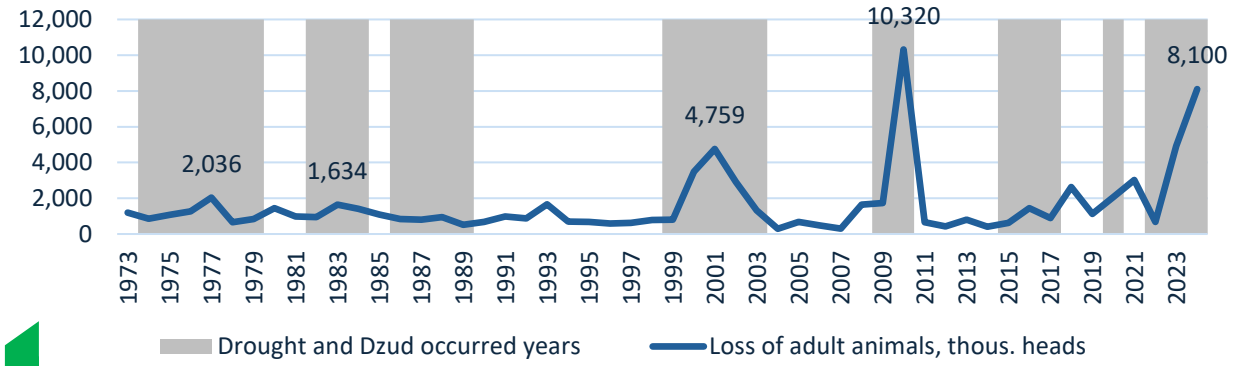
- Rangeland Degradation: Herd size VS. Climate change?

  Livestock herds and climate both have had statistically significant, negative impacts on rangeland biological productivity. Climate and weather's impacts are an order of magnitude larger than those of herd size, however, albeit less so in cooler, higher-elevation areas than in warmer, drier desert and semi-desert zones (Avralt-Od et al., 2023).

Dzud – extreme weather event

- Dzud has a severely adverse impact on national social and economic welfare. The massive loss of livestock means the collapse of the primary, if not the sole, source of income and livelihoods for a large portion of the population.
- In the past 50 years, drought and dzud have occurred for 27 years.
- The risk assessment for disasters, encompassing both dzud and consecutive drought-dzud events, indicates that the area with high dzud risk is projected to increase by 14.4% compared to the 2020-2022 average, while areas with extreme risk are anticipated to rise by 3.4% by 2030.

Figure 5. Drought and Dzud occurred years and loss of adult animals, thous. heads, 1973-2023



Source: National Statistics Office, and Ministry of Food and Agriculture

- **2023/2024 Dzud**
  - November 2023 and May 2024, Mongolia experienced the harshest dzud in the last 50 years.
  - As of the end of February, 185,937 herder households, constituting 75 per cent of all herder households, have been directly or indirectly affected by the Dzud's impacts. About 100,000 herder families are considered the most vulnerable households. As of 7 March 2024, 1,344 herders have lost their entire livestock, and 18,859 herder families are currently on the Otor movement.
  - Affected over 188,300 people, including 80,215 children
  - 20 people, including 2 children, lost their lives due to severe blizzard
  - State Emergency Commission estimated the total livestock loss could reach 15 million by April 2024, based on the severity of the weather conditions and previous historical dzud data.
  - Jan-May 2024, the number of livestock loss reached 7.2 million, amounting to 11.6% of the total.

Dzud - Local solutions

Prevention and warnings dissemination

- National Emergency Management Agency (NEMA), the legally designated authority for early warning dissemination in Mongolia, disseminates prevention and warnings for each of the 24 disaster types including Dzud.

W

Medium- to Long-Term Forecast Information

- IRIMHE publishes medium- and long-term forecasts of Dzud risk information every October as Dzud Risk Map.
  Distributed via: the IRIMHE website , Facebook, SMS, TV and radio

Short-Term Forecast Information

- IRIMHE's Dzud risk map is updated according to winter conditions.
  Distributed via: provincial meteorological office's Facebook page and official website.

Emergency Forecast Information

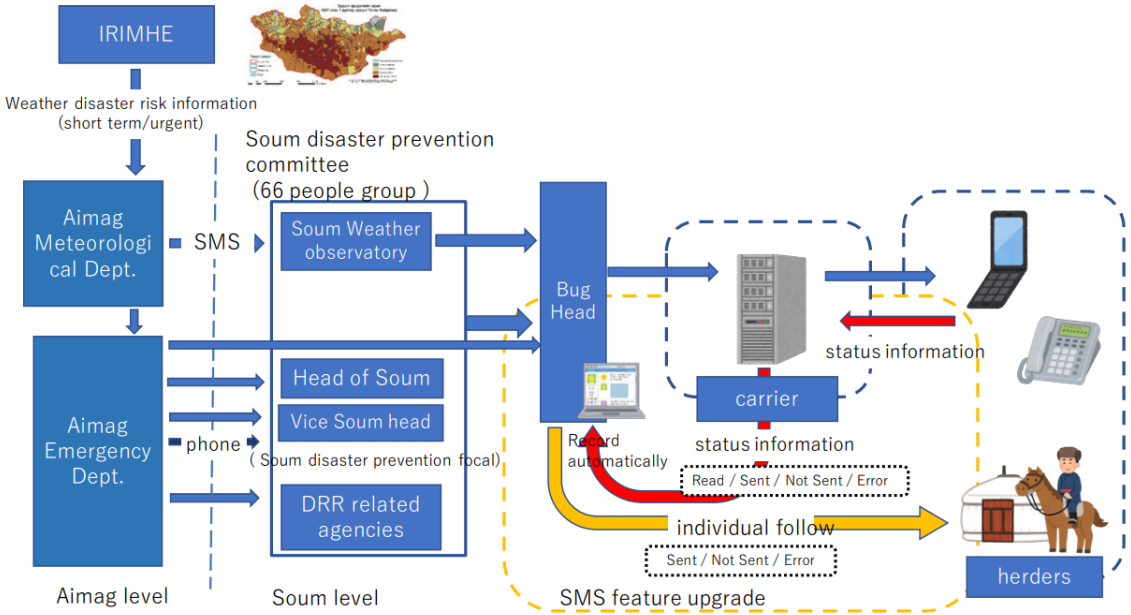
- Sudden weather changes are communicated as emergency information. Emergency information is often communicated by phone or SMS, and through Facebook groups. The information is transmitted such as provincial meteorological office→Head of Soum→Head of Bug→Headers.

- Currently, information on weather-related disaster risks is sent to herders via SMS messages from administrative agencies. Given the high percentage of herders who have mobile phones, using SMS is more effective for information dissemination than applications like Facebook.

Solutions

- Improve communication between administration and herders by upgrading SMS functionality that allows both sender and receiver to confirm information transmission.
- Improvement of efficiency of information transmission through the development of a herders' database. In addition to the information submitted to the NSO every year, basic information on herders will be linked to the SMS read confirmation system to link with Dzud countermeasures. In addition, to organize information on the status of livestock breeding and sales, and link this information to the Veterinary Agency's MAHIS system.

Figure 6. Overview of SMS function Upgrade



Source: JICA, (2023), The Data Collection and Confirmation Survey for Dzud Countermeasures (Climate Change Adaptation Measures) and Resilience Building in Mongolia: Completion Report

Dzud - Local solutions

Solar power system for meat freezing and preservation (PV system)

Problem

- The income of herders depends on livestock and livestock products, and their productivity is not stable due to the sudden decline in production and increase in expenditure due to the risk of natural disasters.
- Under normal circumstances, herders slaughter about 20-25% of their livestock. However, in anticipation of dzud, this proportion increases to 30-35%. Most of the livestock slaughtered in anticipation of dzud are those in poor condition, deemed unlikely to survive the winter. The price of meat from thin livestock tends to be lower. Herders face several challenges regarding livestock sales, including:
    1) Fluctuating and low prices,
    2) Difficulty in finding direct buyers,
    3) Challenges in storage,
    4) Remoteness from markets and transportation difficulties,
    5) Insufficient knowledge and information.
- It was found that there was a high need for the installation of freezer storage at the soum level because “difficulty in storage” was cited as an issue of livestock sales for effective use of the results of Dzud predictions (ERI, 2022).

Solutions

- Currently, a meat refrigeration and storage system utilizing solar energy (PV system) is being tested. Based on dzud forecasts, herders slaughtering their livestock and storing it in refrigerated units at the district level is expected to improve the distribution of livestock products in Mongolia and strengthen the value-added chain.
- However, implementing sophisticated equipment, such as PV systems, at the soum level can be challenging due to the maintenance and management costs.

Figure 7. Demonstrating PV system in Mongolia

Source: ERI (2022),

Dzud - Local solutions

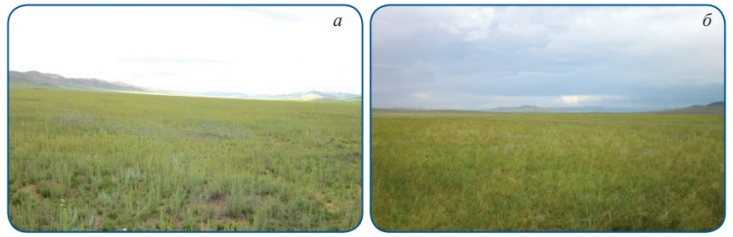
Green Gold Project

- 70% of the Mongolia is covered in grassland - known as the green gold. Swiss Agency for Development and Cooperation (SDC)'s Green Gold project, which aims to protect these pastures, has been implemented together with herders, Mongolian authorities, and other stakeholders since 2004.
- Herders enter into grazing agreements, agreeing to manage their livestock numbers and load according to the pasture's carrying capacity.
- At the national level, the Ministry of Food, Agriculture, and Light Industry (MOFALI), the General Authority for Land Administration, Geodesy, and Cartography (GALAGC), and National Agency for Meteorology and Environmental Monitoring (NAMEM), along with local-level Pasture-User Groups (PUGs) and soum administrations, implement six critical steps of recovery-capacity-based pasture management based on collaborative efforts.
    - Organization of grazing user groups
    - Mapping of pasture conditions and recovery capacity
    - Pasture management plan
    - Implementation of the pasture management plan
    - Monitoring the effectiveness of pasture use and long-term monitoring
    - Disseminating trends in pasture conditions to the public
- These efforts have resulted in the restoration of over 20 million hectares of fallow grazing land within 15 years.
- More than 92,000 herder families (~30% of all herders) have made a contractual commitment to sustainable rangeland management.

New Cooperative – Wealthy Herder Program

- To prevent potential disasters in the livestock sector due to climate change and to support the sustainable development of livestock production and herders' cooperatives, the 'New Cooperative' movement has been initiated by the Government. As part of this movement, the "New Cooperative – Wealthy Herder" initiative will be carried out.
- The aim of the movement is To support the affected herders of 2023-2024 dzud and to mitigate the negative impacts of climate change on traditional livestock farming.
- The "New Cooperative" movement represents a comprehensive reform initiative extending beyond agriculture alone. As part of this program, herders will have access to subsidized investment loans. This financial support aims to facilitate the establishment of cooperatives and lay the groundwork for herders to become agricultural producers. Investments can be made in various areas including livestock feeding, by-product processing, veterinary services, development of water points, wool and hide preparation, primary processing, establishment and operation of warehouses and storage facilities for livestock products, and meat and dairy production.

Figure 7. a. Severely degraded condition dominated by unpalatable plant species b. Improved condition after sustainable pasture management



Source: NFPUGH, (2015), National Report on the Condition of Pastures in Mongolia II

Flood - Local solutions

Within the framework of the capital's **Engineering Preparation Master Plan 2040**, it is planned to complete and beautify the protective dam on the northern bank of the Tuul River in the densely populated areas of six central districts.

For flood control dams:

- 13 km in five locations along the Tuul River
- 10 km along the Selbe River
- A new 9 km dam is planned along the Uliastai River.

To prevent the risk of possible flooding, the following measures are being taken in the vicinity of the Selbe River.

- Enforcement of the flood protection zone regime,
- Evacuation of households from risk areas
- Clearance of land
- Creation of living conditions in the migration zone and organization of necessary measures

They are also organizing the removal and cleaning of silt, dirt, trees, and bushes along the Selbe River channel, and working to address the associated costs.

Flood - Local solutions

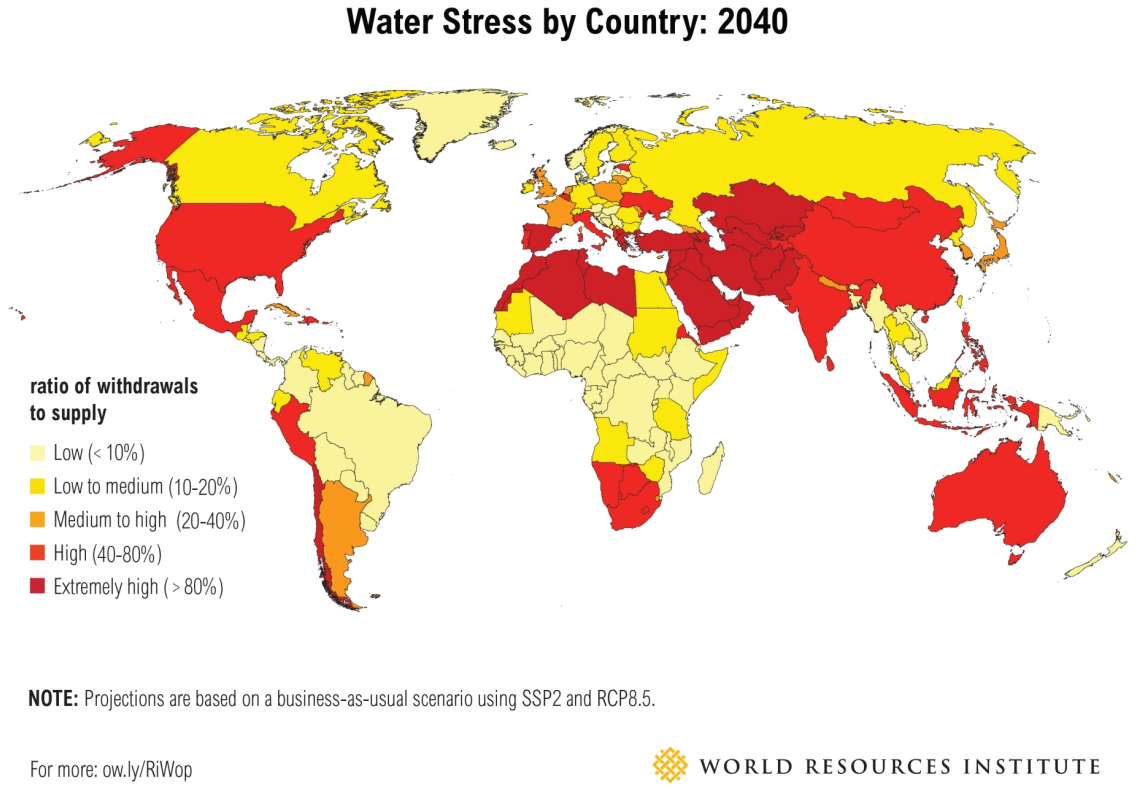
At the July 2023 meeting of the Metropolitan Governor's Council, a proposal was made to build an artificial lake and pond for storing flood water. Starting in August 2023, nationwide construction of floating ponds commenced. As a result, floating ponds have been established in Uvurkhangai, Gobi-Altai, and Zavkhan provinces.

It includes:

- A floating pond with a capacity of 11,745.6 cubic meters was established at 'Ikh Bulangyn Am' in Narynteel Sum, Ovorkhangai Province.
- In Zavkhan Province, a 120-meter long and 50-meter wide floating pond with an earth dam was established in the steppe area, located 90 km from Uliastai Sum and 10 km from Tsagaanchuluut Sum.
- With the support of the World Conservation Fund, a floating pond was built in Darvi Sum. This embankment measures 36 meters long, 2.5 meters high, and 3.5 meters wide.

Water Stress – Local Solutions

- 69.8% of Mongolia's total water usage was allocated to electricity, gas, and heat production, 14.1% to agriculture, 3.7% to mining, 8.8% to other industrial production, and 3.5% to household use (NSO, 2022).
- Mongolia livestock and mining sectors depend on water. In the long run, water scarcity could become a major limiting factor for the economic growth.
- In the Gobi region, there is a huge demand to find water solutions. Government and water stakeholders should look for alternative water supply options that are sustainable and efficient.



Water Transmission Line Projects

- The Kherlen-Toono and Orkhon-Ongi water transmission line project is included in the 2024-2028 government action program. This project aims to fully meet the water needs of the population, livestock, industry, and mining sectors in Khentii, Govisumber, Dornogovi, Dundgovi, and Umnogovi provinces by utilizing 5-9% of the annual average flow of the Kherlen River and Orkhon River through a closed pipeline.

Billion Trees Movement

- By 2030, the movement will increase forest stock to 9.0% by planting, maintaining, and growing billions of trees.

Water Stress – Local Solutions

Developing Greenhouse Farming

- Government has been implementing “Food Supply and Security” program since 2022.
- The program aims to increase greenhouse production to 270 hectares by 2026.
  - The area of summer greenhouses will expand from 88 hectares to 188 hectares
  - The area of winter greenhouses will grow from 32 hectares to 82 hectares.
- Subsidized loans were provided to farmers to increase greenhouse production.
- 39 billion MNT will be allocated to subsidize these loan interest rates (ERI, 2024a).
- A green loan of MNT 12 billion was granted for a five-year period and favorable terms for the Dutch-style fully automated, four-season greenhouse project of “Tugs Urgats” LLC.

Water Stress – Local Solutions

Intensive Animal Farming

- Due to climate change, livestock productivity in Mongolia has been decreasing as a result of drought and arid conditions.
- The government has been implementing “The Intensive Animal Farming” project since 2017

- Nuudelchin Agro Farm LLC, in partnership with KHAN Bank and APU Dairy LLC, a leading national producer of milk products, is jointly implementing a model farm project that meets international standards for liquid milk production and farming. This project has established Mongolia's first cluster farm, comprising 10 farms with a total of 400 cows. As a result, the milk produced on these farms is purchased and processed year-round at stable prices and delivered to consumers.

Table 2. Number of livestock in animal farming

	Dairy cow farming	Beef cattle farming	Meat and wool sheep farming	Poultry farming	Beekeeping
2016	60998	17698	91404	880114	9276
2021	98025	34963	34523	1028977	13708

Source: Ministry of Food, Agriculture and Light Industry

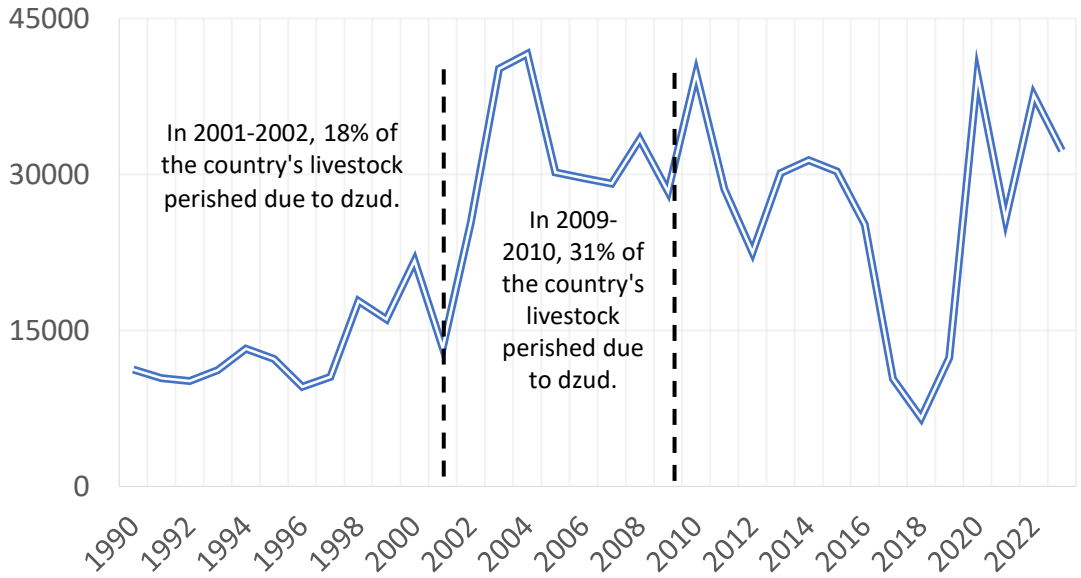
Water Stress – Local Solutions

Grey Water Use

- Large beverage producing enterprises, including MCS, APU, and BiTse Trade LLC, are successfully treating and reusing grey water to irrigate capital's green facilities.
- Mining companies also re-purify and reuse the water they consume. For example, Oyu Tolgoi LLC extracts water from a depth of 150-400 meters, and 87% of this groundwater is reused. Additionally, through a wastewater reclamation system, 100% of the water used for car washing, domestic sanitation, and cooling is recycled.
- In 2019, a government decree on the use of grey water was issued. This order mainly targeted car washes but has not been fully implemented. As of May 2023, grey water reuse equipment has been installed in 34 car washes across the capital, though it is not yet fully utilized.
- Car washes continue to use clean water because the technological solution for grey water is not clear.

Natural disasters, migration and air pollution

Figure 8. The trends of migration towards Ulaanbaatar



Source: National Statistics office (www.1212.mn)

Challenges and difficulties arising from migration

- Following the dzud, a natural disaster, migration towards Ulaanbaatar has sharply increased.
- Migration to Ulaanbaatar strains social services, worsens air pollution, leads to unsustainable land use, and exacerbates poverty and unemployment (IOM 2018).

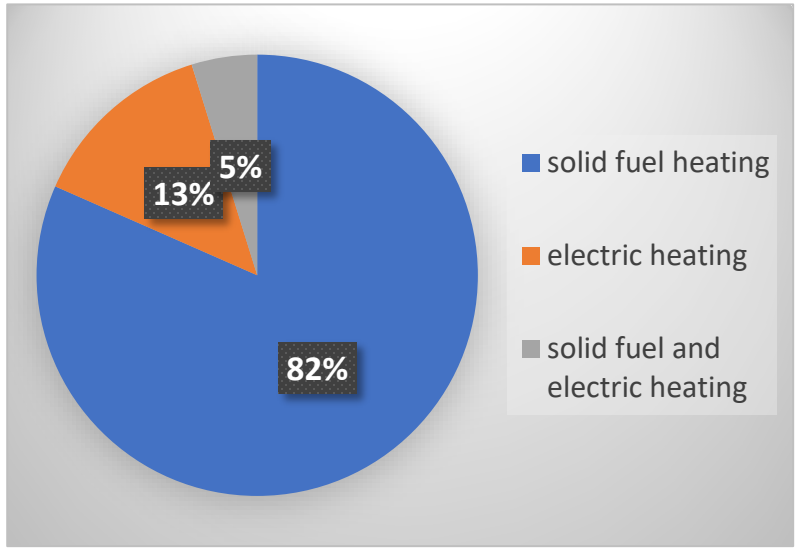
Air Pollution – Local Solutions

- As of 2024, approximately 160,000 households live in Ulaanbaatar's ger districts, which make up about 48% of the capital's households. These districts contribute around 31% of the city's air pollutants.
- 93% of ger district homes need insulation, making it essential to develop heat loss reduction solutions and financial products (ERI 2023b).

Green loan for home insulation

- One of the solutions to reduce air pollution is to improve insulation in ger district residences.
- According to the study, 52.6% of households plan to insulate their homes, with 22% of these households interested in using loans for the insulation.
- Government subsidies for improved fuels and reduced night-time electricity tariffs are contributing to the low interest in home insulation and the lack of knowledge about green loans among most residents (ERI, 2023b).

Figure 9. Heating Sources for Ger District Residences



Source: ERI, 2023b

Air Pollution – Local Solutions

The Passive House Program

- The Passive House Program is an energy-efficient building standard that emphasizes high insulation, airtightness, and advanced ventilation systems. It aims to minimize energy use for heating and cooling, achieving up to 90% energy savings compared to traditional buildings. This concept is particularly relevant in cold climates like Mongolia, where it supports efforts to improve residential energy efficiency, reduce emissions, and promote sustainable construction practices.

- Though the program has high upfront costs, it significantly reduces energy consumption, greenhouse gas emissions, and air pollution, making it beneficial in the long term. However, many people lack the financial capacity to participate in this program. (Mongolian Passive House Institute NGO)

GIZ's Energy-Efficient Building Refurbishment Project in Mongolia

- GIZ's energy-efficient building refurbishment project in Mongolia has been implemented since 2013. The goal of the project is to support measures related to improving the quality of building insulation, reducing energy consumption, and protecting the environment.

Air Pollution – Local Solutions

Green and Environmentally Friendly Building Materials

- Green Building minimizes environmental harm, optimizes energy use, and ensures comfort, with benefits like reduced health impacts, lower energy use, and sustainable materials
- Green Buildings cut energy use by 25% and water use by 11%, combat carbon emissions and global warming, and are increasingly in demand worldwide, including in Mongolia where sustainable construction is crucial.
- In Mongolia, the use of green materials is rising, supported by the Green Development Policy and favorable loans, with green building loans reaching MNT 8.9 billion in 2023, though they remain a small portion of total construction loans.

Energy Transition

New Recovery Policy (2022-)

Connecting to the North East Asian Integrated Energy Grid

Achieving 30% Renewable Energy Consumption by 2030

Reducing greenhouse gas emissions by 7.3 million tons of CO2

Source: New Recovery Policy Accelerator center

Mongolian Government's 2024-2028 Action Program

- Wind power projects up to 300 MW and solar power projects up to 200 MW will be implemented in phases with private investment (current capacity of wind power 155MW, 2024)
- In related to new solar and wind power projects, over 200 MW of adjustable-mode battery storage systems will be built
- Support will be provided for projects to build hydroelectric power plants in reservoirs and domestic rivers, which will be implemented with private sector investment
- Develop renewable energy production and reduce production costs.

Energy Transition – Local solutions

Figure 10. Energy production share

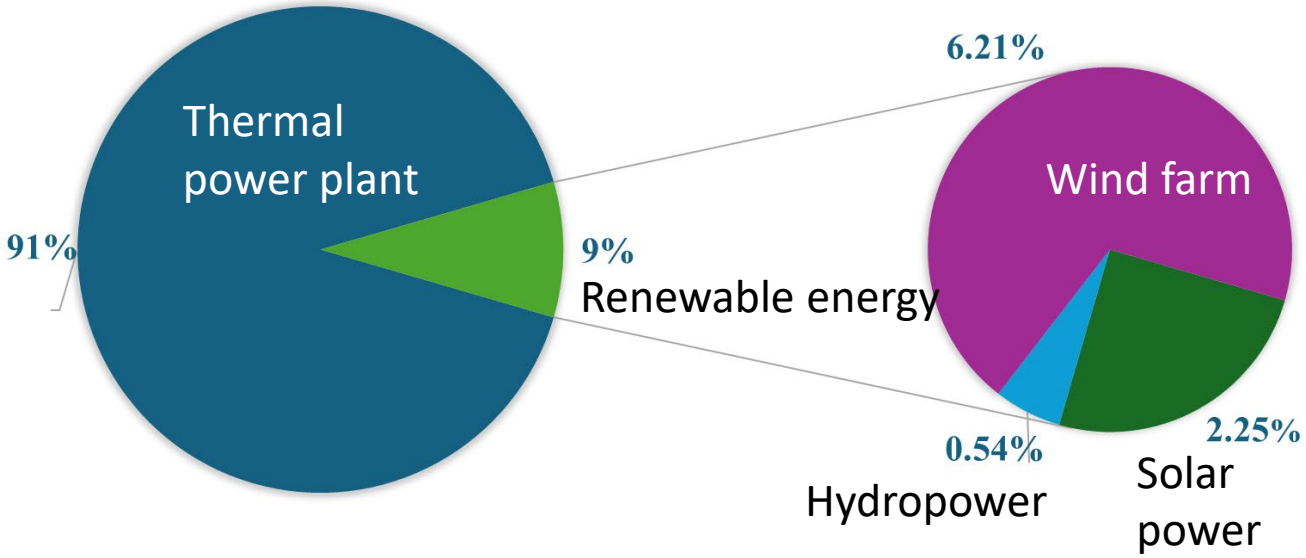
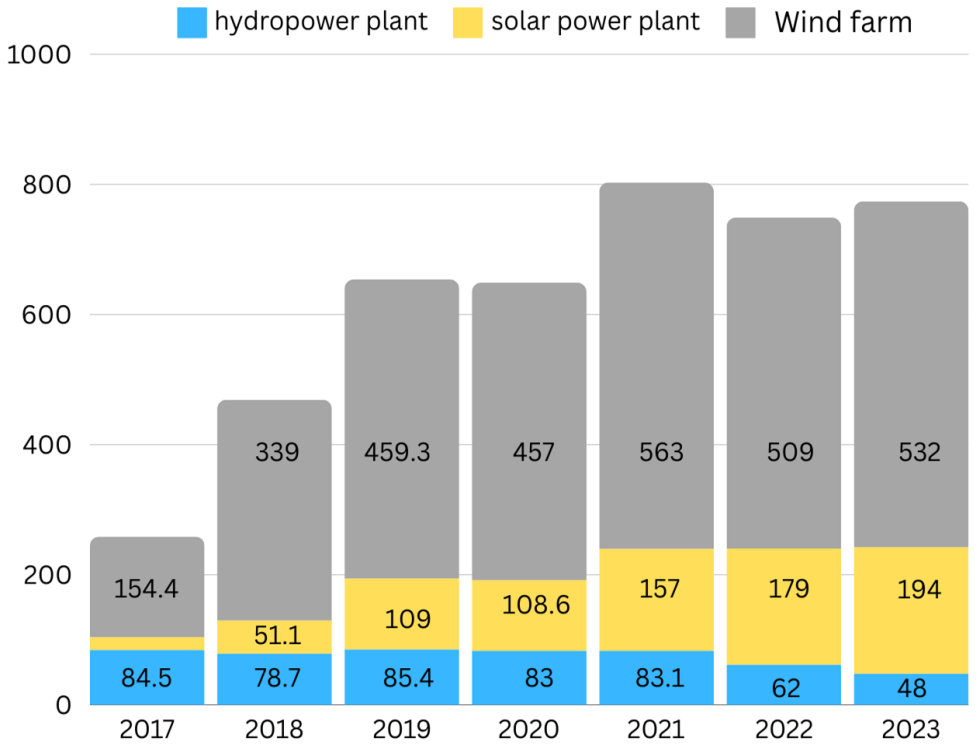


Figure 11. Renewable energy production, million KWh



- Renewable energy 773.8 million kWh
- Thermal power plant (7755.1 million kWh)

Source: Energy Regulatory Commission

Energy Transition – Local solutions

Table 3. Renewable Energy Projects and Programs

Projects	Implementing organization	Period	Funding organization	Funding amount
Erdeneburen Hydropower Plant Project Capacity of 90 MW	Ministry of Energy	61 months	Discounted loan from the Export-Import Bank of China /EXIM/	266 million USD
Renewable energy enhancement	Ministry of Energy	2019-2027	Asian Development Bank	66 million USD

Sub-projects of “Renewable energy enhancement”

- 2023, a 10 MW solar power plant in Yesonbulag Sum, Gobi-Altai Province
- 2022, a 5MW solar power plant and a 3.6MWh battery storage plant in Uliastai Sum, Zavkhan Province

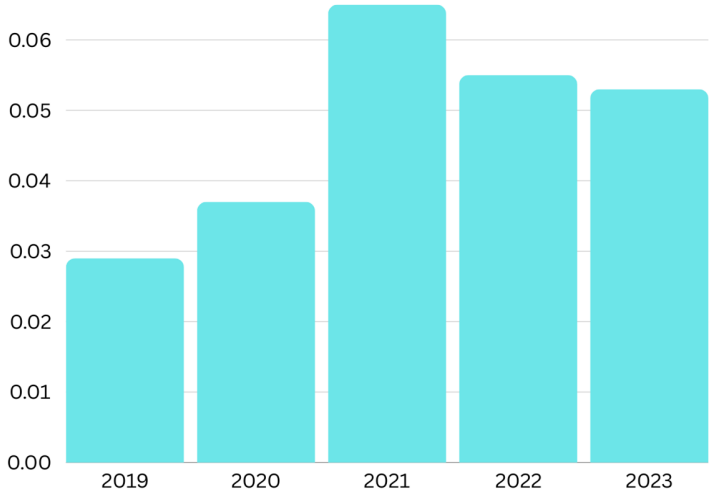
Source: Mongolian Renewables industries Association

Energy Transition – Local solutions

- The shift to coal briquettes in Ulaanbaatar was implemented to improve air quality by reducing harmful emissions from raw coal
- “Tavantolgoi Tulsh” state owned company was established 2018 to produce coal briquettes.
- Investment costs in 2018-2020: MNT 269 billion (~USD 100 million)
- Improved briquettes are sold at discounted prices / 25kg = 3750 MNT ~1.10USD/
- Total output: 1.5 million tons (2019-2023)
- Consumption of briquettes in Ulaanbaatar 3100 tons/day

- However, the introduction of coal briquettes has resulted in higher sulfur dioxide (SO_2) emissions compared to raw coal.
- The content of sulfur dioxide (SO_2) gas has increased by 1.8 times during the winter months.

Figure 9. Sulfur dioxide (SO_2) emissions in Ulaanbaatar, mg/m3



Source: National Statistics Office of Mongolia

Thank you for your attention !

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