



МОНГОЛ УЛСЫН ШИНЖЛЭХ УХААНЫ АНАДЕМИ
ГАЗАРЗҮЙ, ГЕОЭКОЛОГИЙН ХҮРЭЭЛЭН



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Institute of Geographic Science and
Natural Resources Research, CAS



ASIA-PACIFIC NETWORK FOR
GLOBAL CHANGE RESEARCH

"Strengthening Local Adaptation Plans Based on Social and Economic Vulnerability Assessment and Policy Analysis of Mongolia and China"

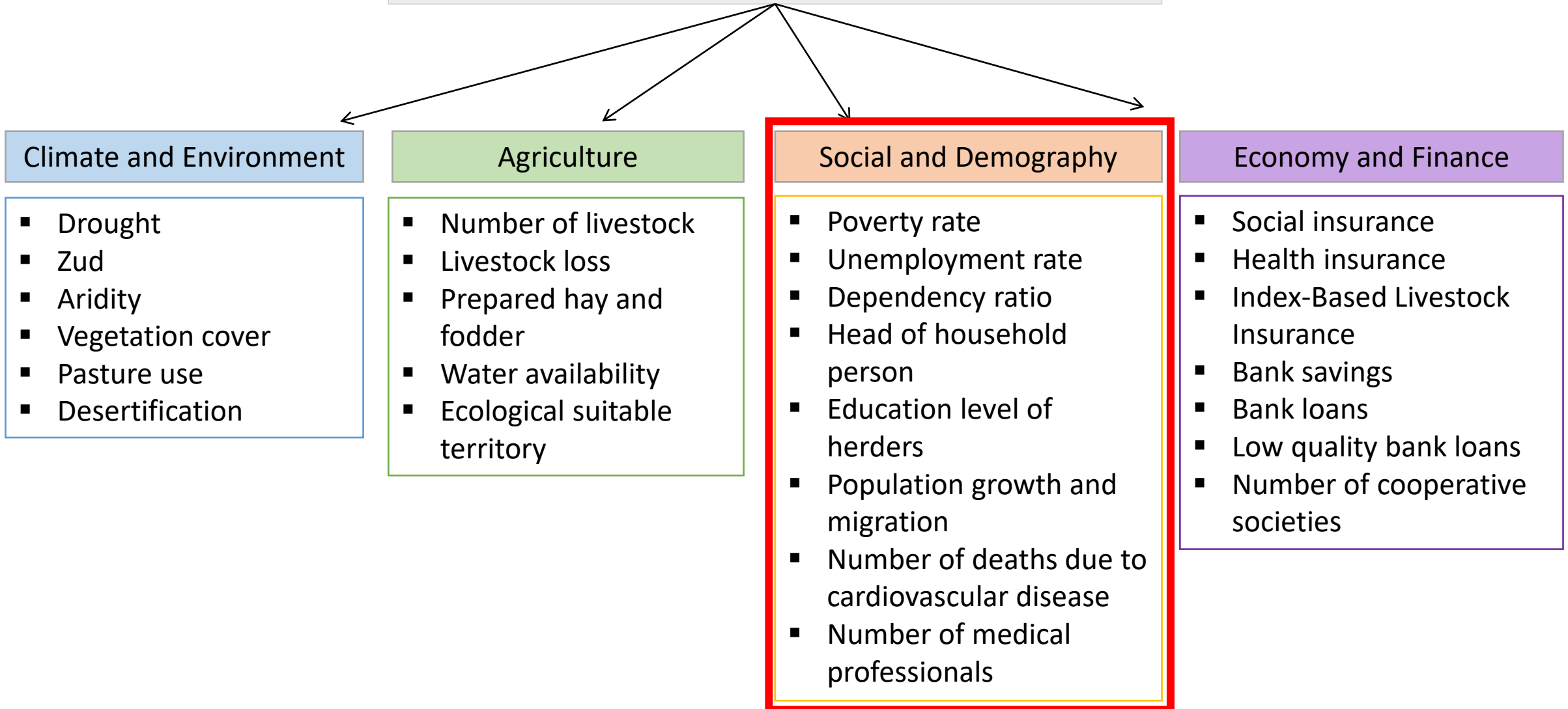
Preliminary Results of Social Variables Analysis of Rural Population's Vulnerability to Climate Change

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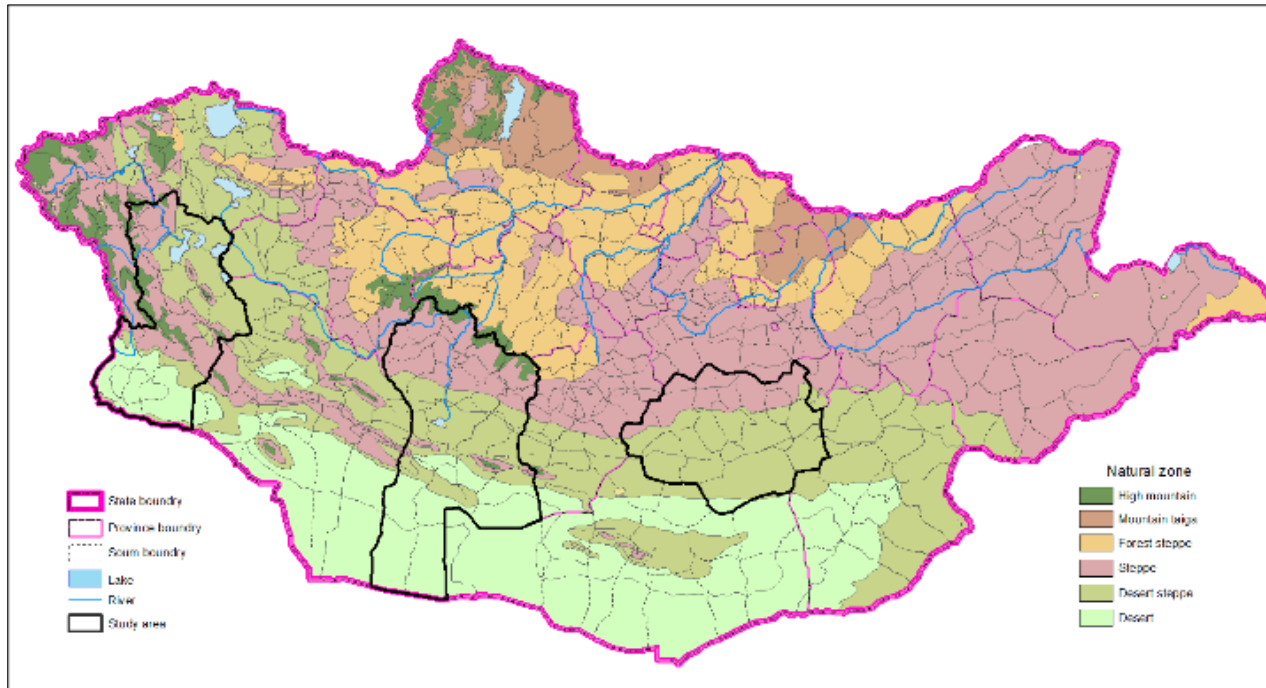
Khovd city, 2023.08

Methodology

Climate change vulnerability variables



Research area and data



Bayankhongor, Dundgovi and Khovd provinces were selected as the study area. Bayankhongor province covers 5 natural zones, and it is highly vulnerable to climate change. Dundgovi and Khovd provinces are experiencing intense desertification and land degradation due to climate change.

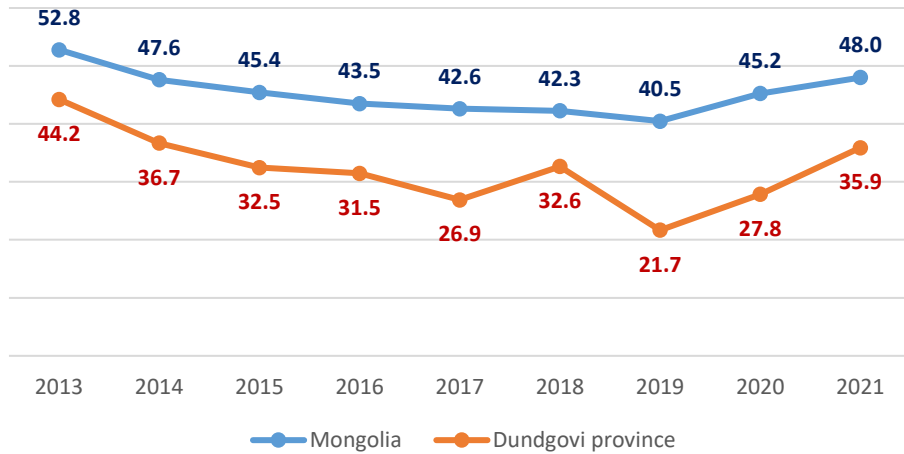
№	Хувьсагч	Тооцох аргачлал	Шалгуур үзүүлэлт	Хугацаа	Баянхонгор	Дундговь	Ховд
1	Ажилгүйдэл(ажилгүйдлийн түвшин)	АТ = Ажилгүйчүүд*100/ажиллах хүч	Ажиллагчид	2010-2021			
			Ажилгүйчүүд	2010-2021			
2	Зүрх судасны тогтолцооны өвчнөөр нас баралт(Зүрх судасны тогтолцооны өвчнөөр нас баралтын түвшин)	НБТ=Зүрх судасны тогтолцооны өвчнөөр нас барсан хүний тоо*100/Хүн амын жилийн дундаж тоо	Зүрх судасны тогтолцооны өвчнөөр нас барсан хүний тоо	2010-2021	+	+	+
			Хүн амын жилийн дундаж тоо	2010-2021	+	+	+
3	Малчдын боловсрол(Нийт малчдын тоонд боловсролгүй болон бага боловсролтой малчдын эзлэх хувь)	МБТ=Боловсролгүй болон бага боловсролтой малчдын тоо*100/нийт малчдын тоо	Малчдын тоо, боловсролын түвшингээр	2010-2021	2017-2020	2017-2020	2017-2020
4	Өрх толгойлсон ганц бие эцэг/эх(Нийт өрхөд өрх толгойлсон ганц бие эцэг/эхтэй өрхийн эзлэх хувь)	ӨТГБЭ/Э=Өрх толгойлсон ганц бие эцэг/эхтэй өрхийн тоо*100/нийт өрхийн тоо	Өрх толгойлсон ганц бие эцэг/эхтэй өрхийн тоо	2010-2021		+	
			нийт өрхийн тоо	2010-2021	+	+	+
5	Хүн амын насны бүтэц (Хүн ам зүйн ачаалал)	ХАЗА=ХА(0-14)+ХА(65-аас дээш)/ХА(15-64)*100	Хүн амын тоо, насны бүлгээр	2010-2021	+	+	+
6	Хүн амын өсөлт (Хөдөөгийн хүн амын жилийн дундаж өсөлтийн хувь) болон шилжих хөдөлгөөн (Цэвэр шилжилтийн коэффициент)	ХАЖДӨХ=(ХА(2021)-ХА(2010))/Х*ХА(2010)*100	Хүн амын тоо, 2010-2021	2010-2021	+	+	+
7	Эмч, мэргэжилтний хангамж (10 000 хүнд ногдох их, эмч сувиллагчийн тоо)	ИМХ=Их эмч, сувиллагчийн тоо*10 000/Жилийн дундаж хүн амын тоо	Их эмчийн тоо	2010-2021	+	+	+
			Сувиллагчийн тоо	2010-2021	+	+	+
8	Ядуурал (нийт малчин өрхөд 200 хүртэлх малтай өрхийн эзлэх хувь)	ЯТ=200 хүртэлх малтай малчин өрхийн тоо*100/Нийт малчин өрхийн тоо	Малчин өрхийн тоо, малын тооны бүлэглэлтээр	2010-2021		+	

1. Poverty

Variable	Poverty
Indicator	Rural poverty rate (percentage of households with up to 200 livestock in total herding households)
Unit	Percent, %
Definition and current situation of Variables, Impacts of climate change	It shows the percentage of the population with consumption below the poverty line in the total population. As of 2020, the poverty rate at the national level was 27.8, and considering the form of settlement, it was 25.4 percent in UB, 29.1 percent in the province center, and 30.5 percent in the soum center and rural areas. Recently, due to the impact of climate change, the frequency of natural disasters has increased, and the degradation of pastures has intensified, which has a negative impact on the sustainability of animal husbandry, improving their livelihoods, and decrease of poverty rate.
Rationale for conditionalizing variable vulnerability	The first results of global warming and its negative consequences are hitting the vulnerable and the poor harder. In particular, low-income, poor people and herders are more affected by climate change. For example: According to the study, it was found that poor households and households with small livestock (up to 200 livestock) are more affected by natural disasters and are more vulnerable to climate change. Because livestock farmers' livelihoods are deeply dependent on animal husbandry - 95 percent of livestock farmers' income is livestock income, which is extremely vulnerable to fluctuations in the prices of animals and animal products, natural and climatic conditions, and disasters. Areas with high levels of poverty rate have the lowest response and adaptation capacity to climate change, so it was chosen as one of the indicators of vulnerability to climate change.
Methodology	$RPR = \frac{\text{Number of households with up to 200 livestock}}{\text{Total herder households}} * 100$ <p>RPR- Rural poverty rate</p>

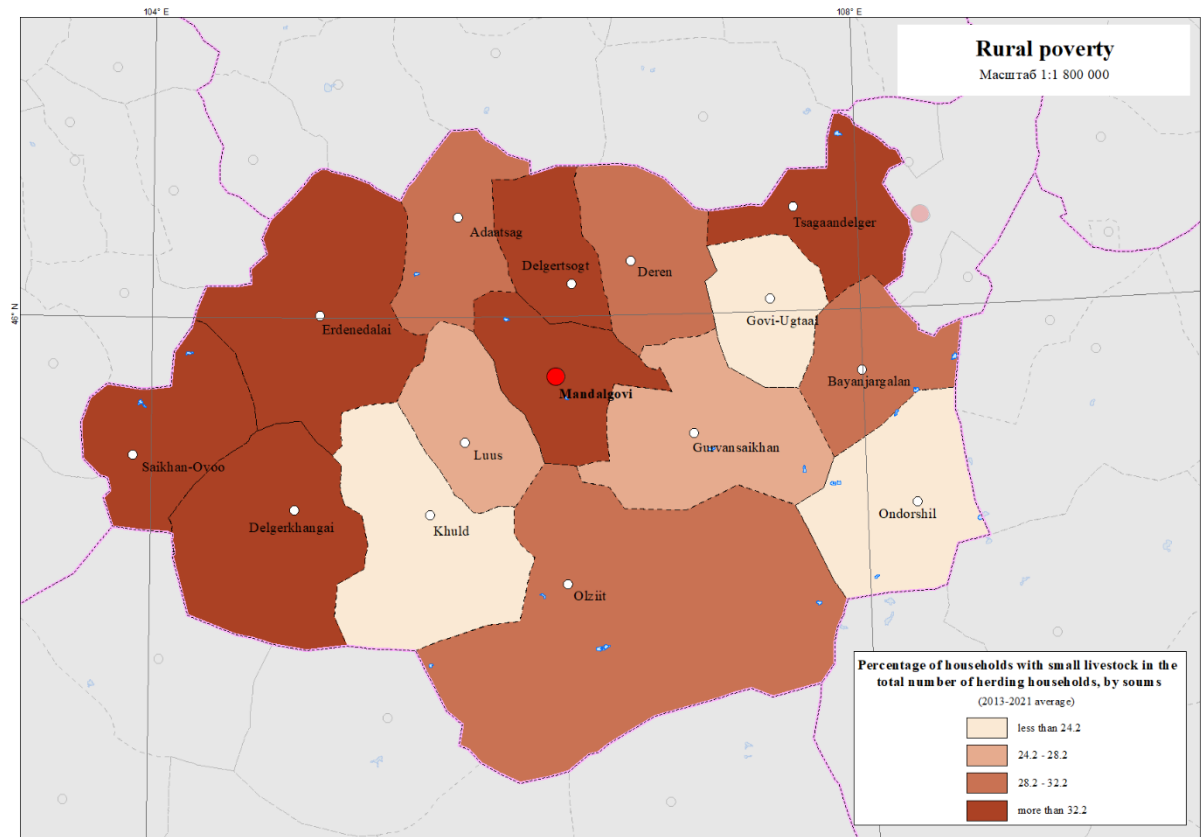
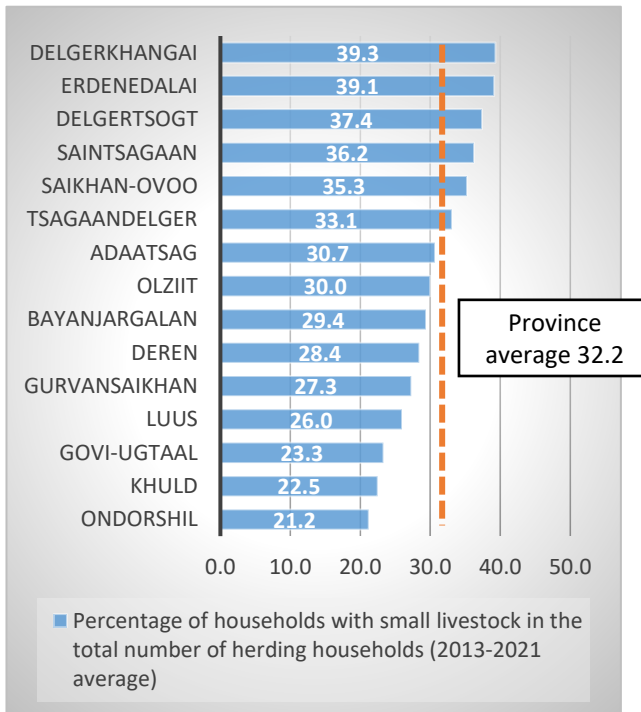
Rural poverty rate in Dundgovi province

Rural poverty rate in Dundgovi province, 2013-2021



Rural poverty rate in Dundgovi province is calculated as the average for 2013-2021, 6 soums such as **Delgerhangai (39.3)**, **Erdenedalai (39.1)**, and **Delgertsogt (37.4)** are higher than province average or more vulnerable to climate change.

Poverty rate in Dundgovi province, 2013-2021

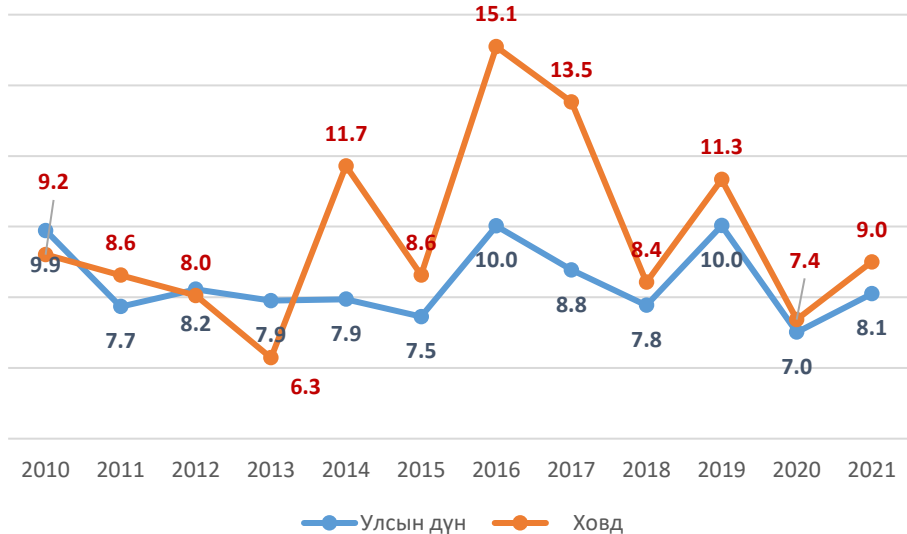


2. Unemployment

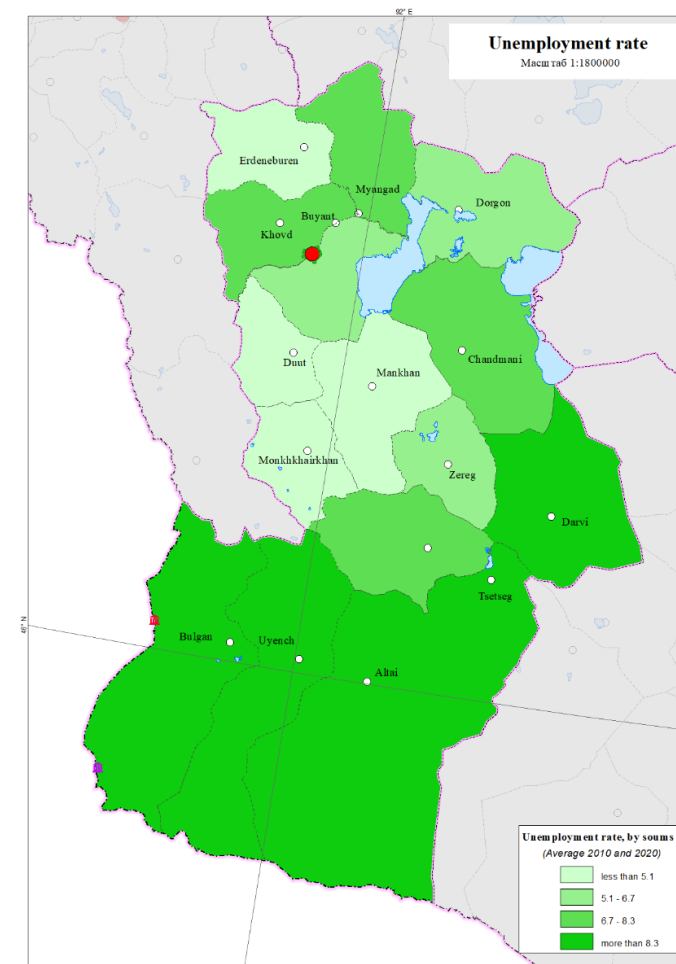
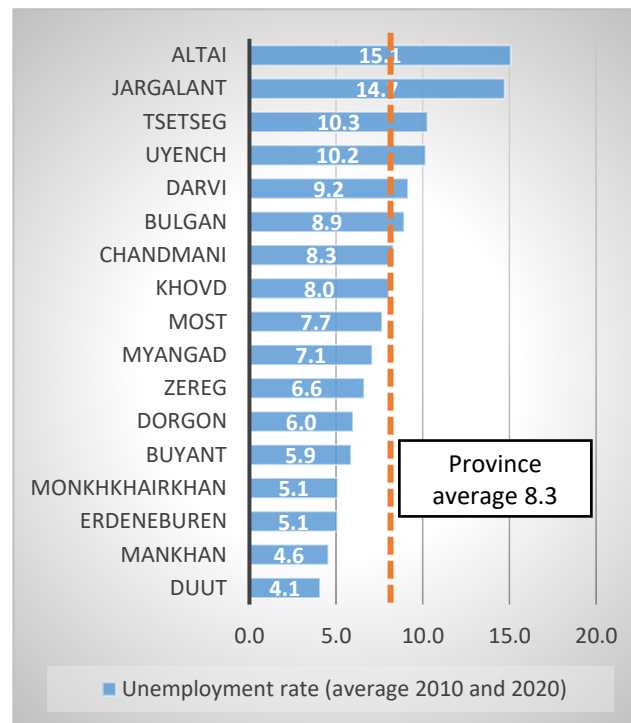
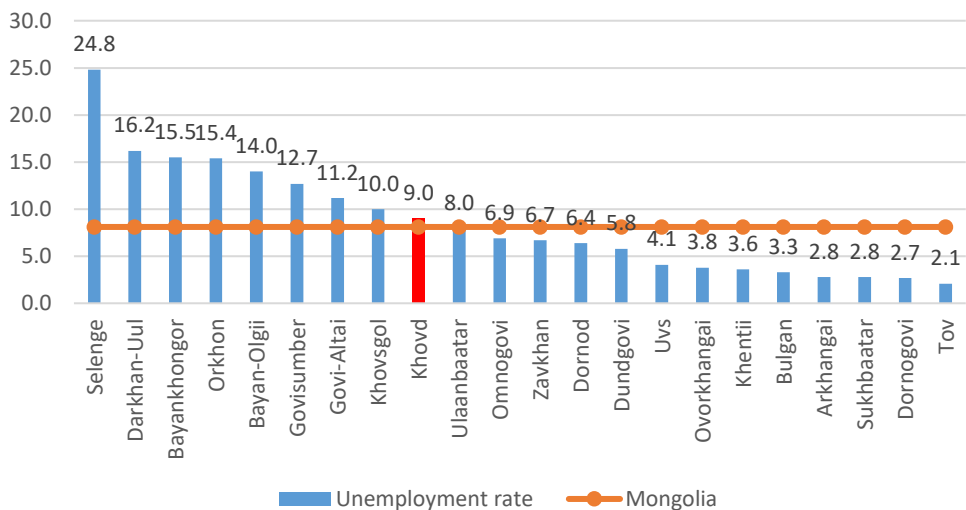
Variable	Unemployment
Indicator	Unemployment rate
Unit	Percent, %
Definition and current situation of Variables, Impacts of climate change	Simply, the inability of a person actively looking for a job to find a job is called unemployment, and it is divided into 4 categories: cyclical, structural, transitional and seasonal. The unemployment rate is the percentage of unemployed people in the total labor force. Considering the unemployment rate, as of 2020, it is 7 percent nationwide, 8 percent in urban, and 4.6 percent in rural areas. Due to the impact of climate change, population migration and settlement towards Ulaanbaatar city, province centers and soum center will increase, and on the other hand, unemployment may increase due to the lack of sufficient jobs in these settlement areas.
Rationale for conditionalizing variable vulnerability	The most important asset of people living in poverty is their own ability to work and work productively. Therefore, providing everyone with decent employment opportunities and social protection is the main way for individuals, communities, and countries to get out of poverty. However, due to the effects of climate change, natural disasters, droughts and floods, poverty has increased, and migration to cities and towns has intensified, increasing the unemployment rate. Unemployment is very sensitive to economic and social changes, and it was chosen as one of the vulnerability assessment variables because high unemployment rate increases vulnerability to climate change.
Methodology	$UR = \frac{\text{Total number of unemployed people} * 100}{\text{Labor force}}$ <p>UR- Unemployment rate</p>

Unemployment rate in Khovd province

Unemployment rate in Khovd province, 2010-2021



Unemployment rate in Mongolia, by provinces, 2021



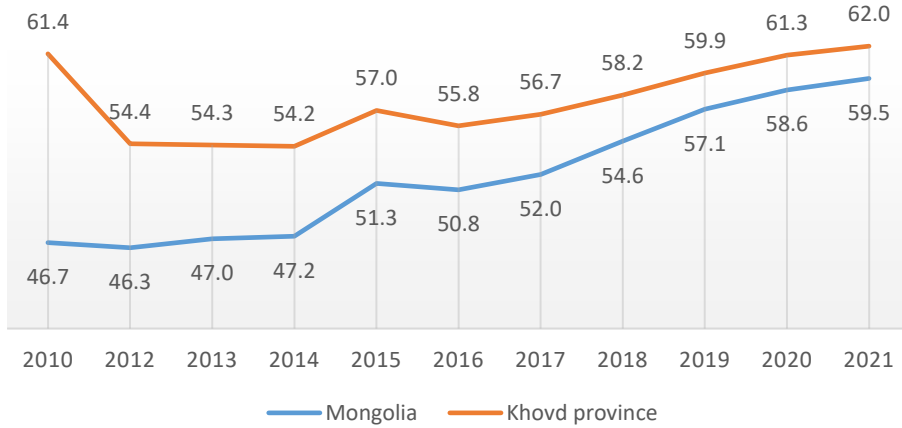
Unemployment rate of Khovd province is calculated by sum, as the average of 2010 and 2020, 6 soums such as **Altai (15.1)**, **Jargalant (14.7)**, and **Tsetseg (10.3)** are higher than province average or more vulnerable to climate change.

3. Age structure of the population

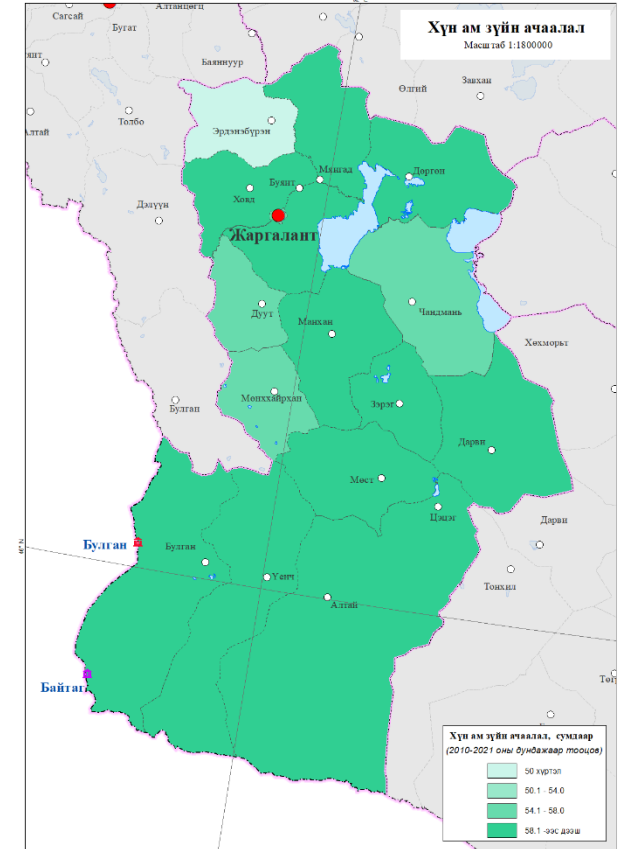
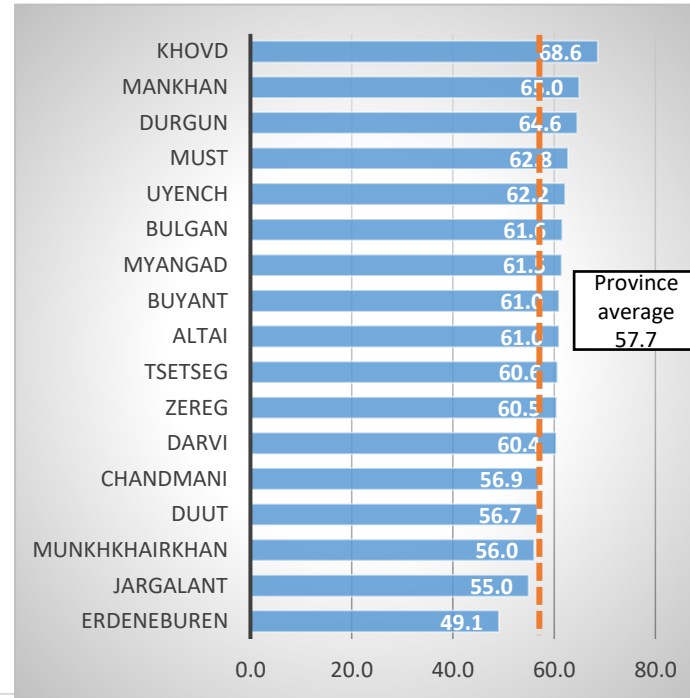
Variable	Age structure of the population
Indicator	Dependency ratio
Unit	Ratio
Definition and current situation of Variables, Impacts of climate change	<p>Dependency ratio refers to the number of dependents per 100 people of working age, or the burden placed on society by the non-working age population. According to the results of the 2020 population and housing census, 31.5 percent of Mongolia's population is under 14 years old, 64.5 percent is 15-65 years old, and 4.1 percent is over 65 years old, the dependency ratio is 57.1 percent. Due to the more active participation of the working-age population in the migration of population from rural to urban areas due to the effects of climate change, the dependency ratio in rural areas is likely to increase.</p>
Rationale for conditionalizing variable vulnerability	<p>The higher the dependency ratio, the fewer people in the active workforce, and the higher the proportion of children and elderly people who need care, the greater the likelihood of economic hardship, reduced productivity, and poverty. Therefore, it was considered that the higher the dependency ratio of the soum, the more vulnerable to climate change.</p>
Methodology	$DR = \frac{P1+P3}{P2} * 100$ <p>DR-Dependency ratio, P1(0-14 aged), P2(15-64 aged), P3(more than 65 aged)</p>

Dependency ratio in Khovd province

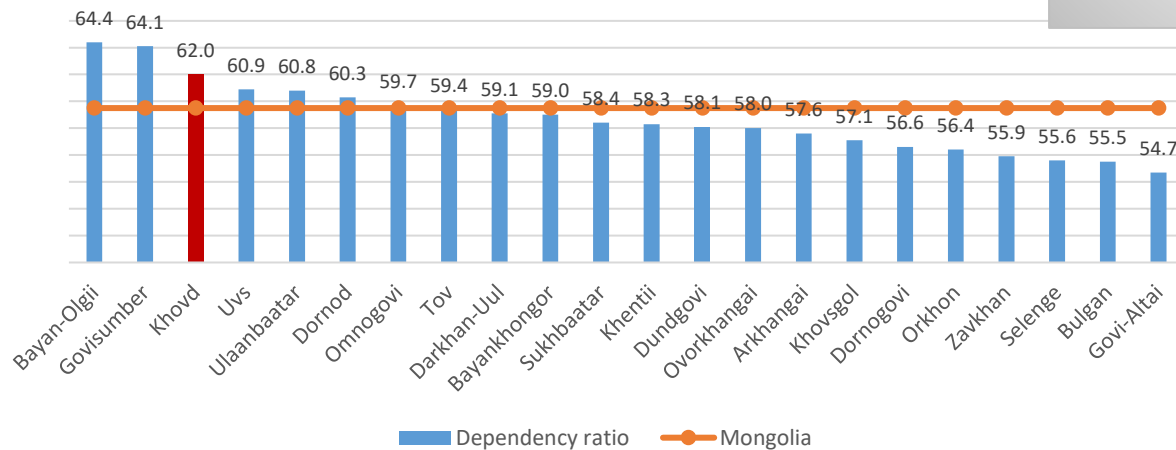
Dependency ratio in Khovd province, 2010-2021



Dependency ratio in Khovd province, by soums (on average over the last 10 years)



Dependency ratio in Mongolia, by province, 2021



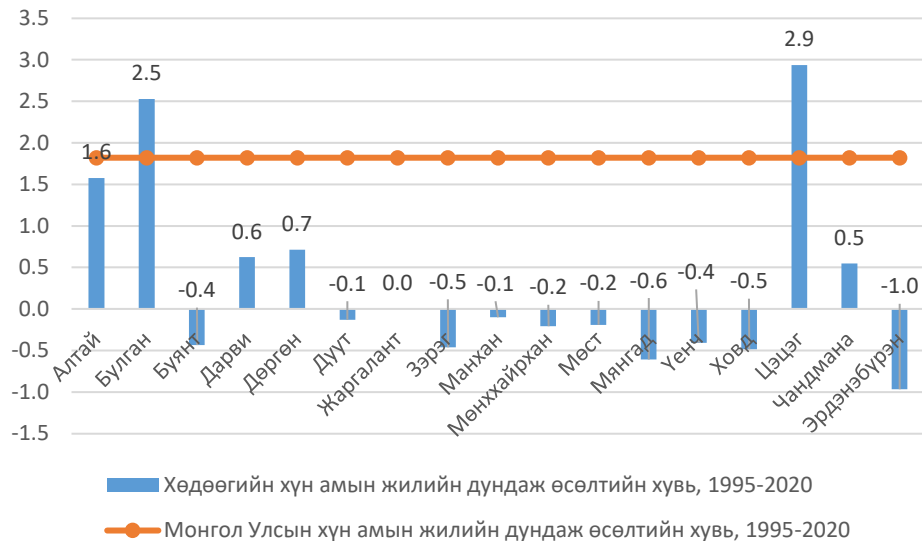
Dependency ratio in Khovd province, by soums, and the average for 2010-2021, 12 soums such as **Khovd (68.6)**, **Mankhan (65)**, and **Durgun (64.6)** are higher than the province average or more vulnerable to climate change.

4. Population growth and migration

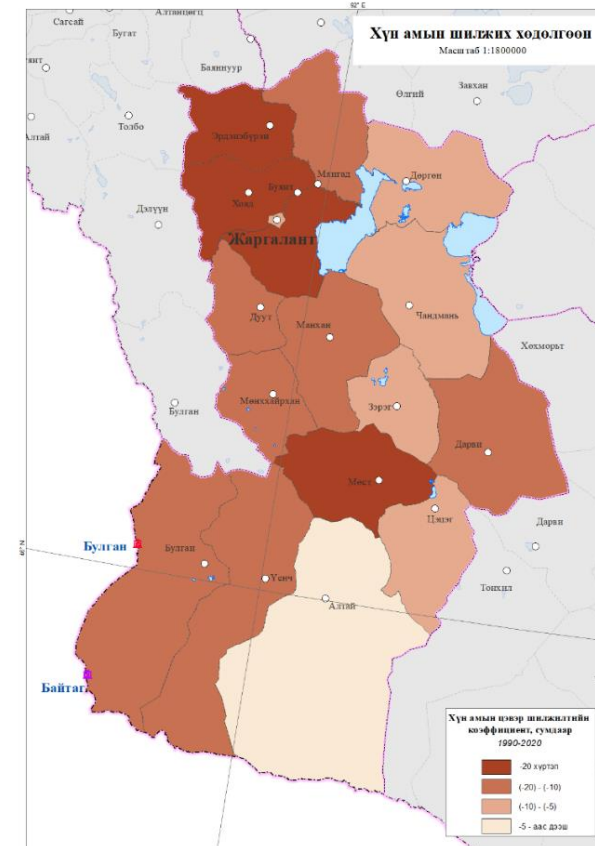
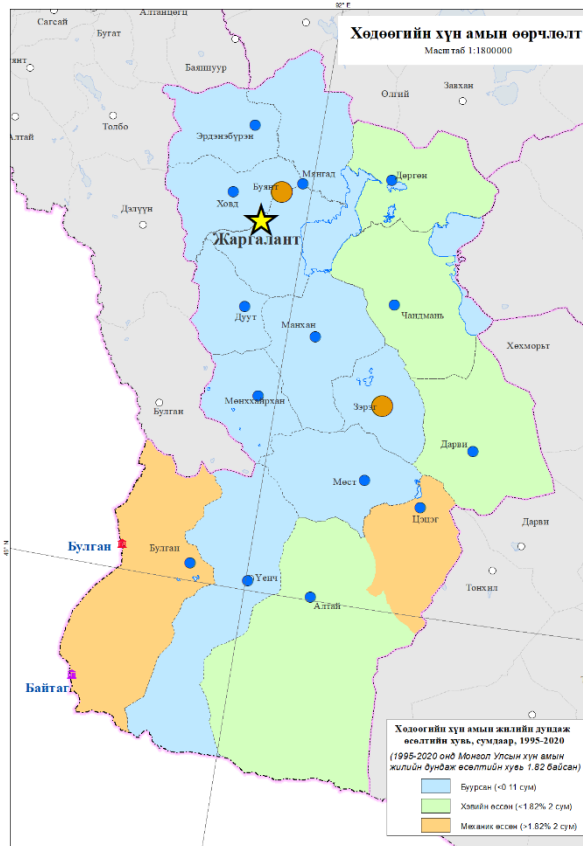
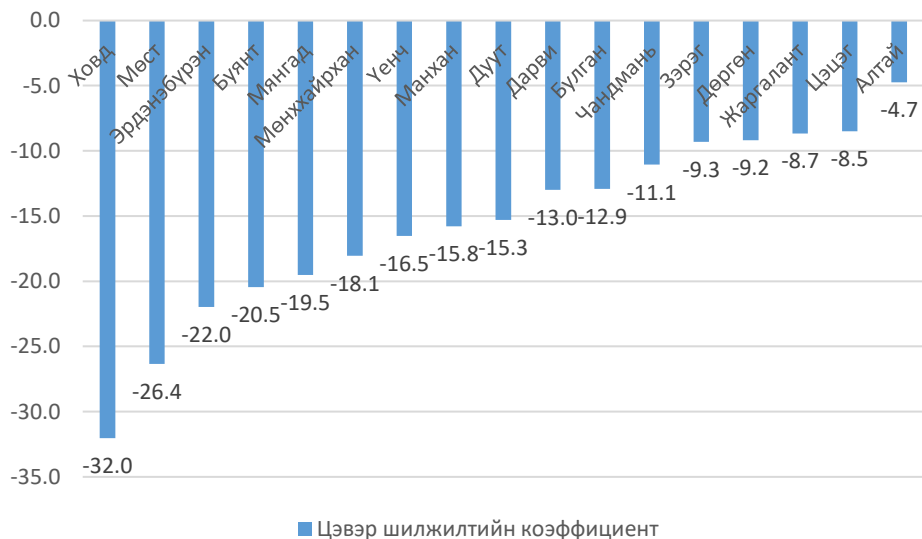
Variable	Population growth and migration
Indicator	Average annual population growth rate, net migration rate
Unit	Percent, %
Definition and current situation of Variables, Impacts of climate change	<p>Population migration is a change in population settlement that takes place between administrative (between provinces) and geographical location (between cities and rural areas) and is classified as external and internal. Migration within the country is called internal migration of the population and depends on the difference in social and economic development of the country. If we consider the internal migration of the population of Mongolia, the migration of the rural population (nomadic herders and farmers in rural settlements) to cities and urban-type settlements dominates. In the last 30 years, a total of 652.4 thousand people have migrated from provinces and rural areas to Ulaanbaatar. Number of people migrating to Ulaanbaatar, 40.8 and 67.4 thousand people migrated in 2003 and 2004 and 39.7 thousand people migrated in 2010 and 2010, respectively.</p>
Rationale for conditionalizing variable vulnerability	<p>Due to the characteristics of the population's lifestyle, location, settlement, economy, and ecosystem, there is a strong connection and interaction between climate change and population migration in Mongolia. For example: In the years of drought and drought, covering more than 80% of the total area, the number of herding families decreased, and the number of people migrating to Ulaanbaatar increased dramatically. Pastoral families who have lost their livestock, which was once a source of livelihood, create migration from rural to urban areas. In other words, the rural people of Mongolia are the most vulnerable and vulnerable to climate change, and one of the ways to adapt to it is to migrate or settle in Ulaanbaatar, the provincial capital, or soum. The change of herdsman's settlement, i.e., moving from the countryside to the center of soum or to the center of the province, is a transition between population locations and is not recorded in any statistics or civil records. For this reason, the net migration rate and the average annual population growth are indicators of vulnerability to climate change in a given region.</p>
Methodology	$Pc = \frac{Pt - Po}{X * Pt} * 100$ <p>Pc-Average annual population growth rate, Pt-Population t-year, Po-Population o-year, X-The period between the two years</p>

Population growth and migration in Khovd province

Average annual rural population growth rate, 1995-2020, by soums



Net migration rate, 1990-2020, by soums



The average annual growth percentage of the rural population of Khovd province by soums, from 1995 to 2020, has decreased by **11 soums**, and for the center of soum, it has decreased by **14 soums**, which is more vulnerable to climate change.

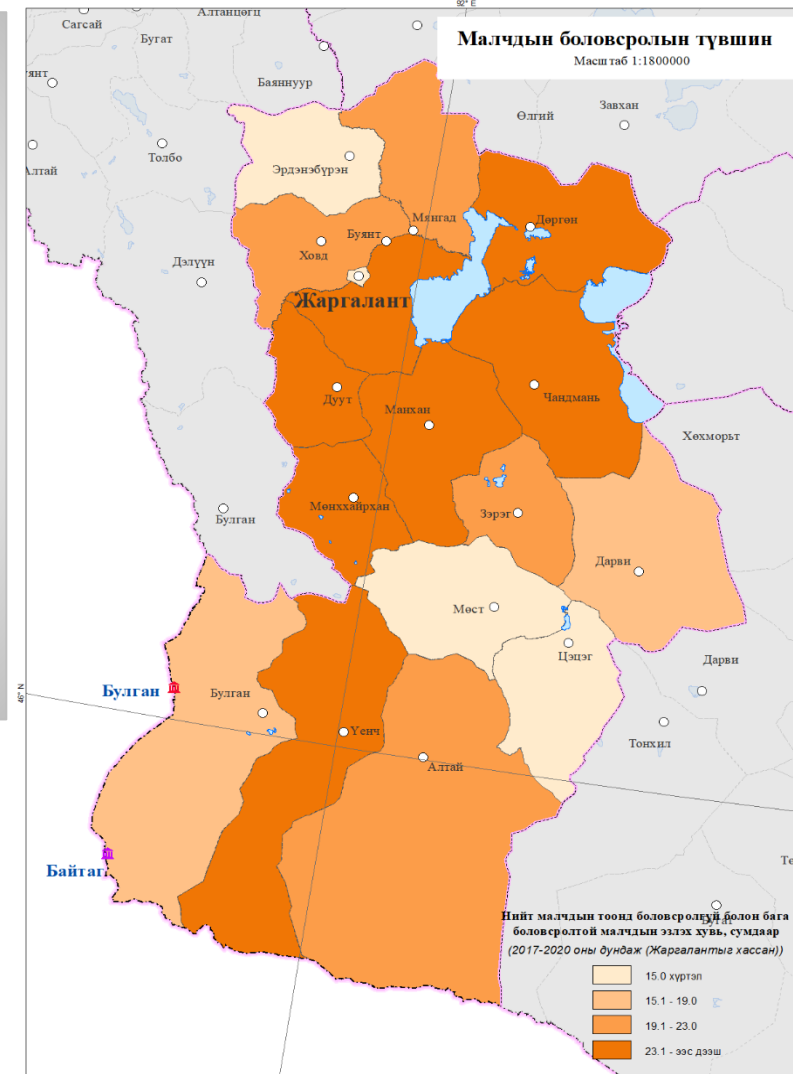
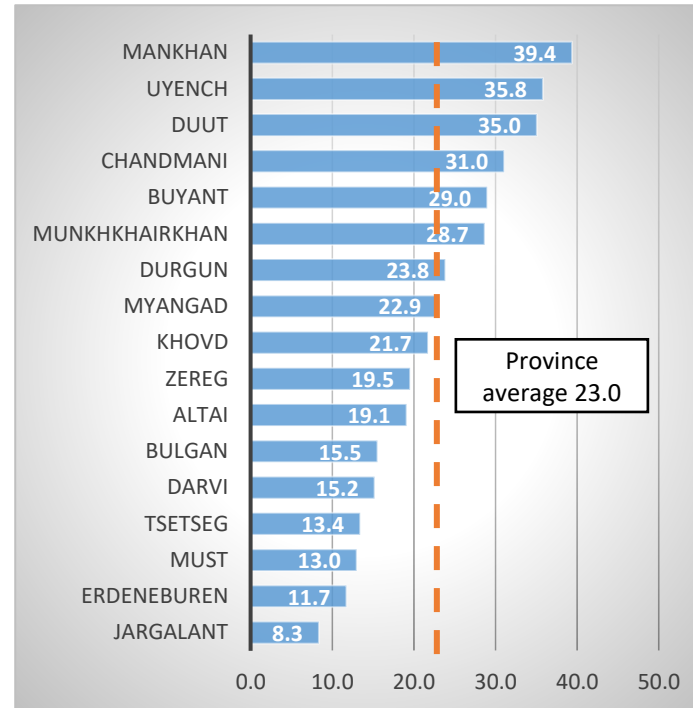
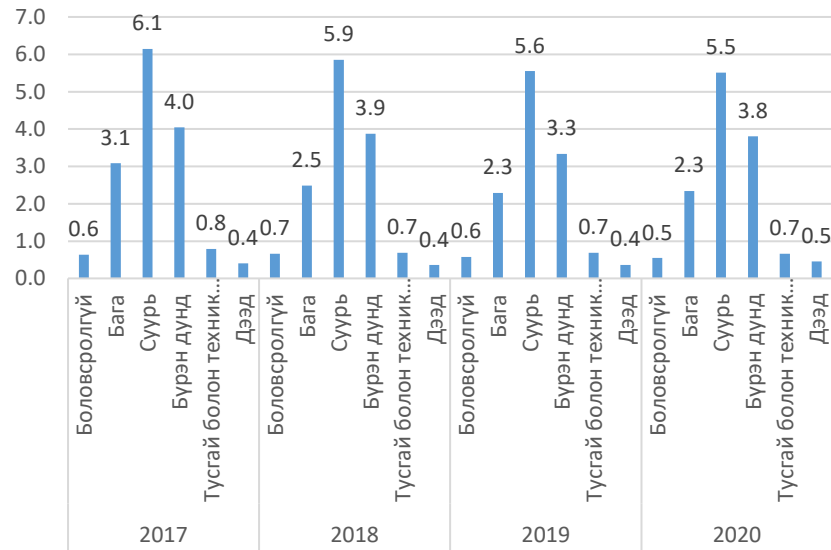
When calculating the net coefficient of population migration of Khovd province by soum, from 1990 to 2020, all soums such as Hovd (-32), Must (-26.4), and Erdeneburen (-22) are dominated by population out migration or are more vulnerable.

5. Education of herders

Variable	Education level of herders
Indicator	Percentage of uneducated and low-educated herders in the total herders
Unit	Percent, %
Definition and current situation of Variables, Impacts of climate change	<p>One of the main indicators of human resources is the level of education. As of 2020, there are a total of 298.7 thousand herders in Mongolia. Considering the education level of herders, 3.5% have no education, 22.2% have primary education, 39.4% have basic (incomplete secondary) education, 24.1% have complete secondary education, 6.3% have technical or special professional education, and 4.5% have higher education. For herders working in the livestock sector, education is important to avoid poverty, adapt to any risks caused by climate change, manage their household livelihoods, and implement knowledge and information-based management.</p>
Rationale for conditionalizing variable vulnerability	<p>Education level is one of the key components of vulnerability assessment. Therefore, the education level is considered to be an important factor in increasing the standard of living of the population. A higher education level increases employment opportunities, but also helps you understand other important aspects of life, such as the importance of good health and being more active in your community. In other words, the lower the education level, the more likely it is to be affected by poverty at the household level. Uneducated or low-educated people tend to work in jobs that do not require professional skills, or work with low productivity and low income, and are therefore more vulnerable to shocks, difficulties, and problems. In this context, the education level of herders was taken as one of the criteria for determining vulnerability.</p>
Methodology	$ELH = \frac{\text{No education} + \text{primary education}}{\text{Total herders}} * 100\%$

The education level of herders in Khovd province

The education level of herders in Khovd province, 2017-2020



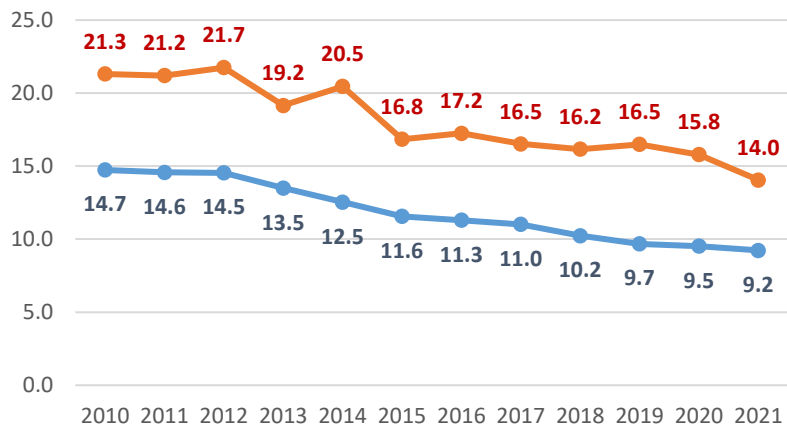
The education level of herders in Khovd province is calculated as the average for 2017-2020, 7 soums such as Mankhan (39.4), Uyench (35.8), and Duut (35) are higher than province average or more vulnerable to climate change.

6. Head of household person

	Head of household person
Indicator	Percentage of head of household person in total households
Unit	Percent, %
Definition and current situation of Variables, Impacts of climate change	<p>Head of household person is a single parent whose spouse has been found dead or missing by a court, whose marriage has been terminated, or whose paternity rights have been limited or revoked by a court decision, but who have not been married during the period in which the decision is in force, but who have children born or adopted. Head of household person is considered to be a citizen with special needs who lacks family care and support, has little chance to live independently or without the help of others, and is a family member in need of social welfare support and assistance. Therefore, Head of household person belong to the vulnerable group of society. As of 2020, there are 86.5 thousand head of household person in Mongolia, which is 9.5 percent of all households.</p>
Rationale for conditionalizing variable vulnerability	<p>Vulnerable social groups are more vulnerable, sensitive and vulnerable to climate change. In the event of a natural disaster caused by climate change, head of household person tend to be less financially, economically, and less able to meet their basic needs than other households. Therefore, it is believed that the high proportion of head of household person in soum will increase vulnerability and sensitivity to climate change.</p>
Methodology	$A = \frac{B * 100}{C}$ <p>A- Percentage of head of household person in total households B- Head of household person C-Total households</p>

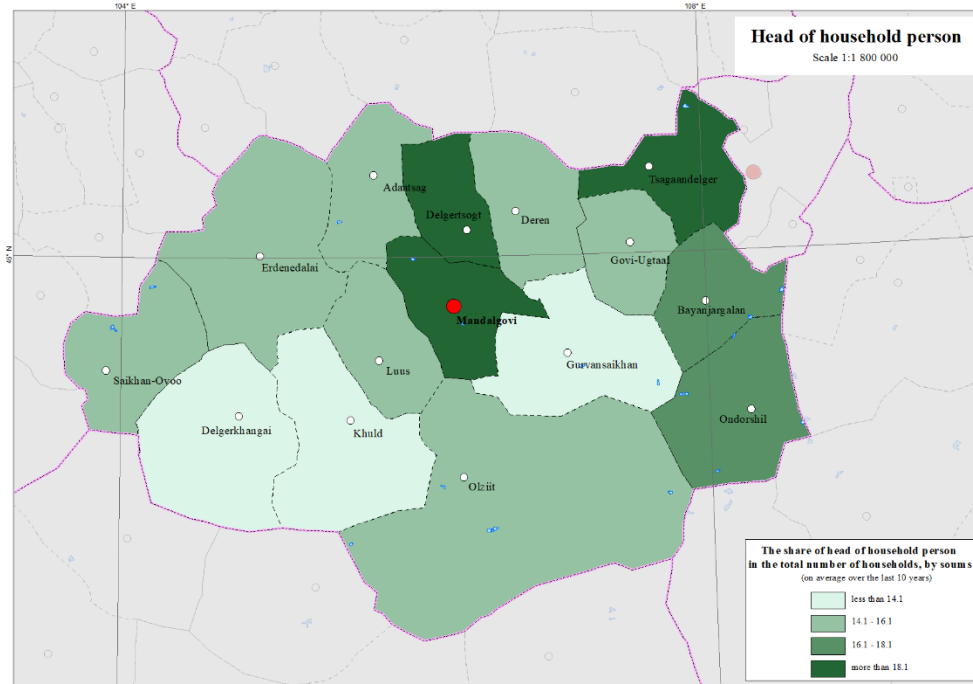
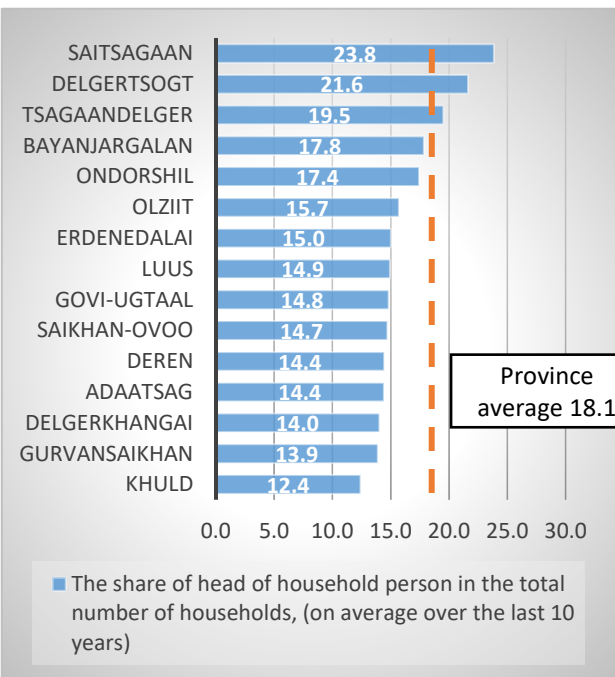
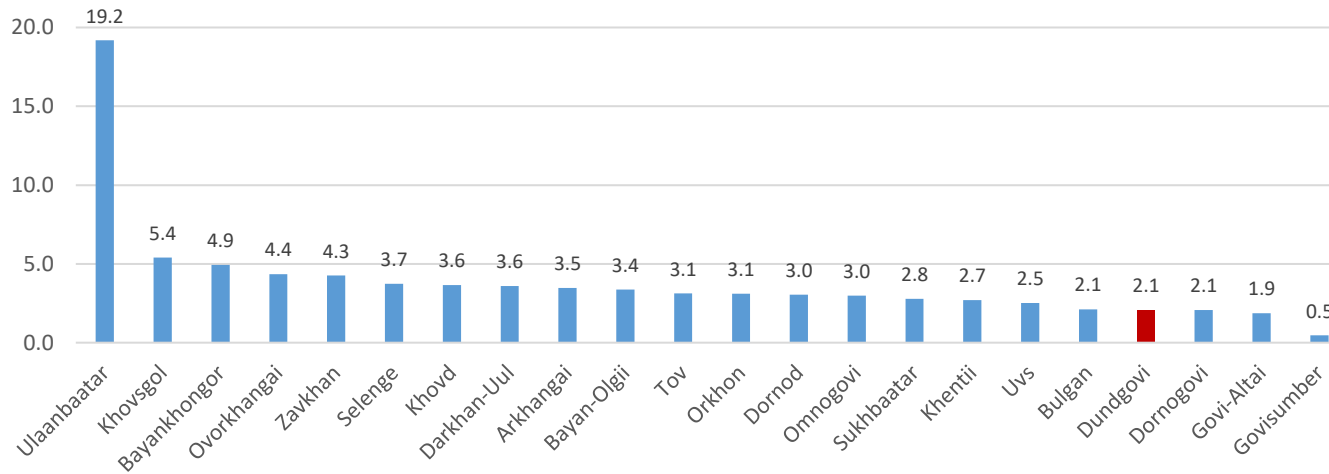
Head of household person in Dundgovi province

The share of head of household person in the total number of households, 2010-2021



—●— Mongolia —●— Dundgovi province

The number of head of household person, by province, 2021



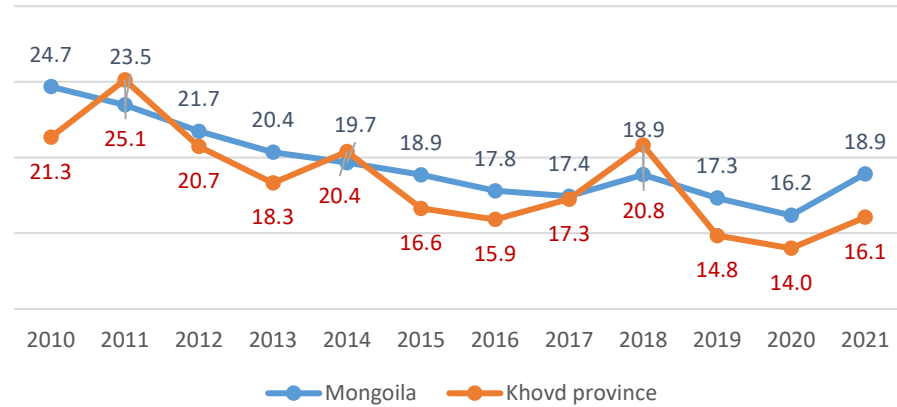
The share of head of household person in the total number of households in Dundgovi province, on average over the last 10 years, **Saintsagaan (23.8)**, **Delgertsogt (21.6)**, and **Tsagaandelger (19.5)** are higher than the province average or more vulnerable to climate change.

7. Death from diseases of the cardiovascular system

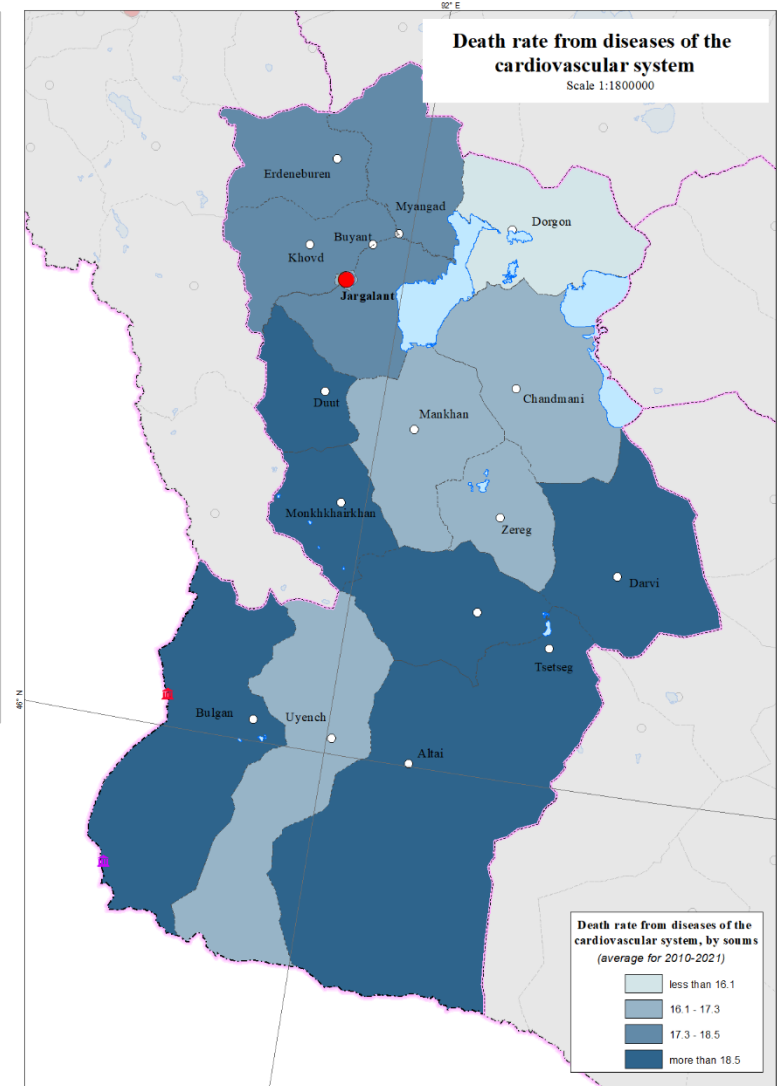
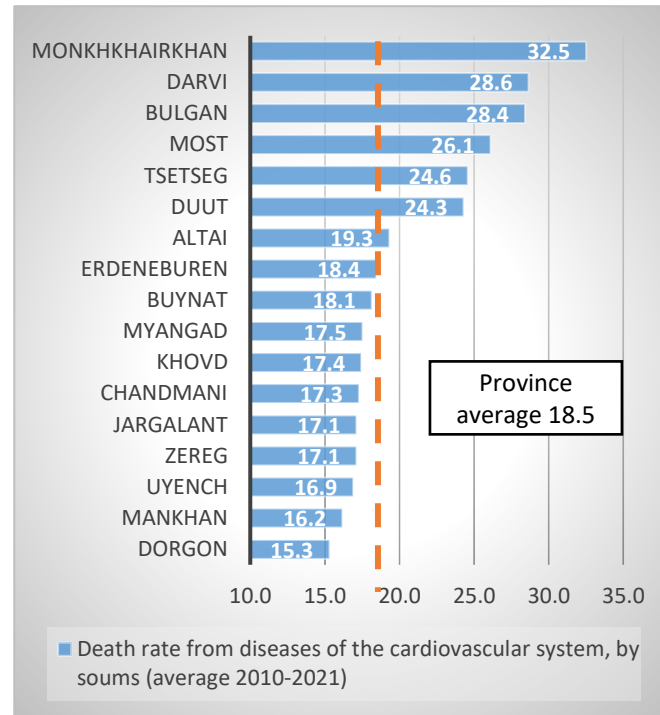
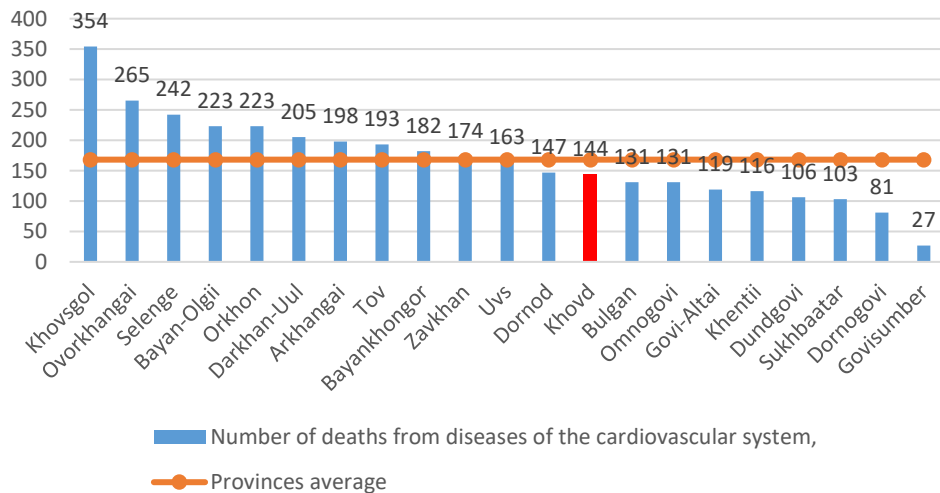
Variable	Death from diseases of the cardiovascular system
Indicator	Death rate from diseases of the cardiovascular system
Unit	Ratio
Definition and current situation of Variables, Impacts of climate change	The ratio of the number of deaths from cardiovascular diseases recorded in a given year to the annual average number of the population is called the death rate from cardiovascular diseases. Before 1990, diseases of the respiratory system were the leading cause of morbidity and mortality in the population of Mongolia, but since then, diseases caused by the heart and blood vessels have been consistently leading the way, with a tendency to increase. Death rate due to cardiovascular diseases was 7.1% in 1950, 23.4% in 1985, 30.8% in 1995, and 32.8% in 2020. An average of 16,500 deaths have been recorded in Mongolia in the last 10 years, and heart and vascular system diseases accounted for 34.2% of the causes and became the leading cause of death in the population.
Rationale for conditionalizing variable vulnerability	Climate change-related extreme heat, air pollution, floods, droughts, water shortages and pollution directly and indirectly affect the health of our country's population. Studies show an increase in cardiovascular and circulatory morbidity and mortality due to these effects of climate change. For example: In the last 34 years, due to the warming of the climate, respiratory diseases have decreased and cardiovascular diseases have increased. The correlation between the incidence of heart and vascular diseases in the population of Mongolia and the change in the average air temperature in the summer season has a value of R=0.62. In other words, the hotter the summer, the more cardiovascular disease and death among the population. Therefore, high death rates from cardiovascular disease are more vulnerable to climate change.
Methodology	$DR = \frac{D}{P} * 100$ <p>DR-Death rate from diseases of the cardiovascular system , P-annual average number of population</p>

Death from diseases of the cardiovascular system in Khovd province

Death rate from diseases of the cardiovascular system in Khovd province, 2010-2021



Number of deaths from diseases of the cardiovascular system, 2021



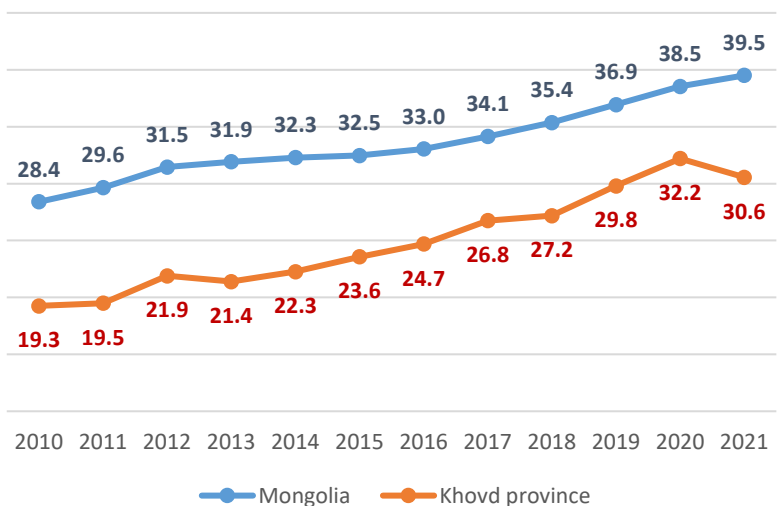
Death rate from cardiovascular system diseases in Khovd province is calculated by soums and the average for 2010-2021, 7 soums such as **Munkhkhairkhan (32.5)**, **Darvi (28.6)**, and **Bulgan (28.4)** are higher than province average or more vulnerable to climate change.

8. Physician and specialist supplies

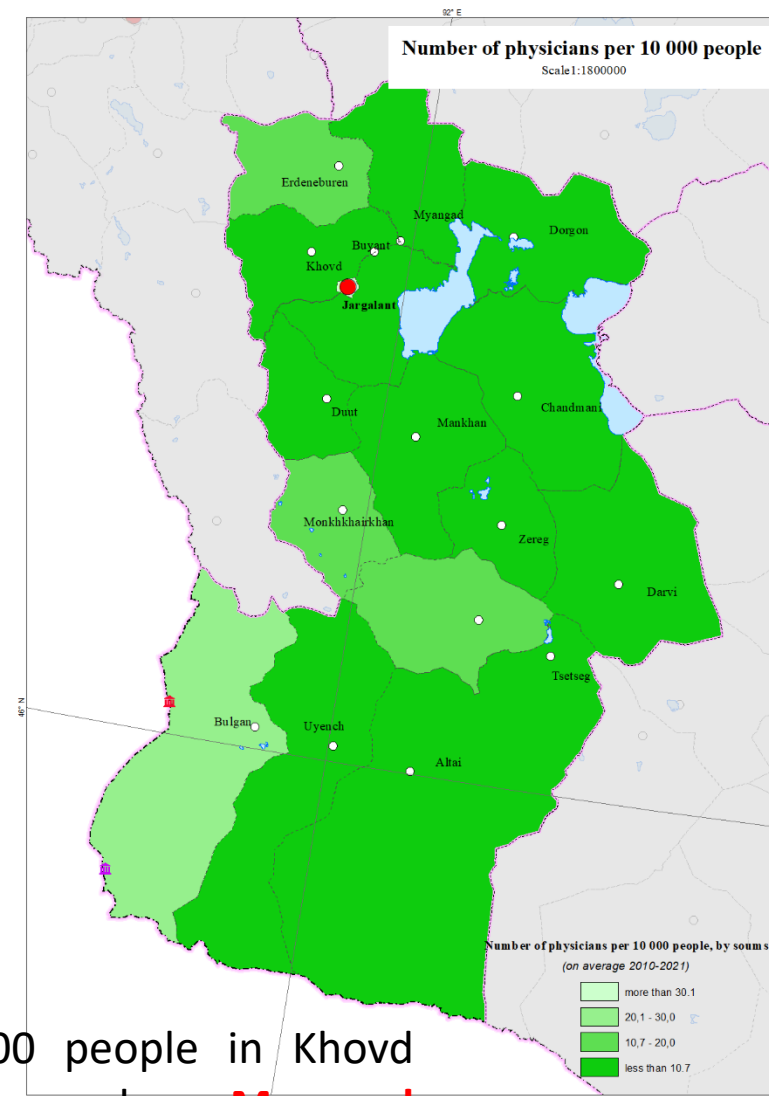
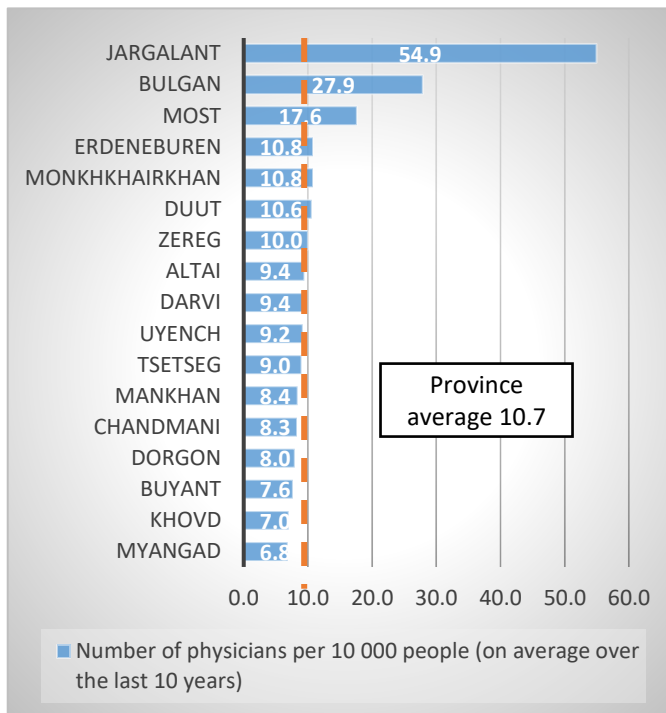
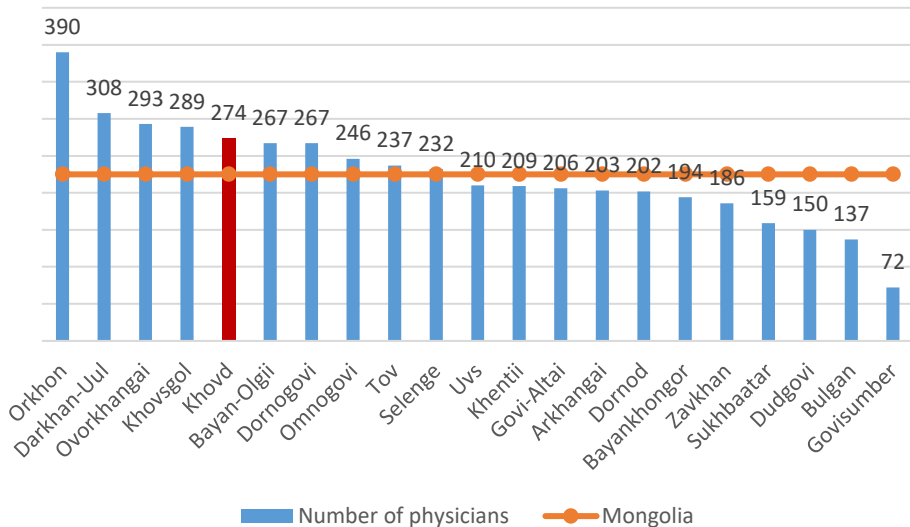
Variable	Physician and specialist supplies
Indicator	Number of physicians per 10 000 people
Unit	Ratio
Definition and current situation of Variables, Impacts of climate change	The number of physicians per 10,000 people is an indicator of the availability of care and services in the health sector of the soum, and it is calculated by comparing the average number of physicians and nurses to the number of physicians and nurses. As of 2020, there are 38.5 physicians and 40.7 nurses per 10,000 people in Mongolia, and by location, there are 52.4 physicians and 46.8 nurses in urban, and 24.7 doctors and 33.4 nurses in rural areas.
Rationale for conditionalizing variable vulnerability	It was considered that the number and availability of physicians and specialists to provide health care services has a positive effect on reducing the morbidity and mortality of the population caused by the local climate changes.
Methodology	$NP = \frac{\text{Number of physicians}}{P}$ <p>NP-Number of physicians per 10 000 people P-annual average number of population</p>

Physician and specialist supplies in Khovd province

Number of physicians per 10 000 people in Khovd province, 2010-2021



Number of physicians, by province, 2021



Number of physicians per 10,000 people in Khovd province for 2010-2021, 12 soums such as **Myangad (6.8)**, **Khovd (7)**, and **Buyant (7.6)** are less than province average or more vulnerable to climate change.

Thank you for
your attention.