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MINISTRY OF ENVIRONMENT AND TOURISM

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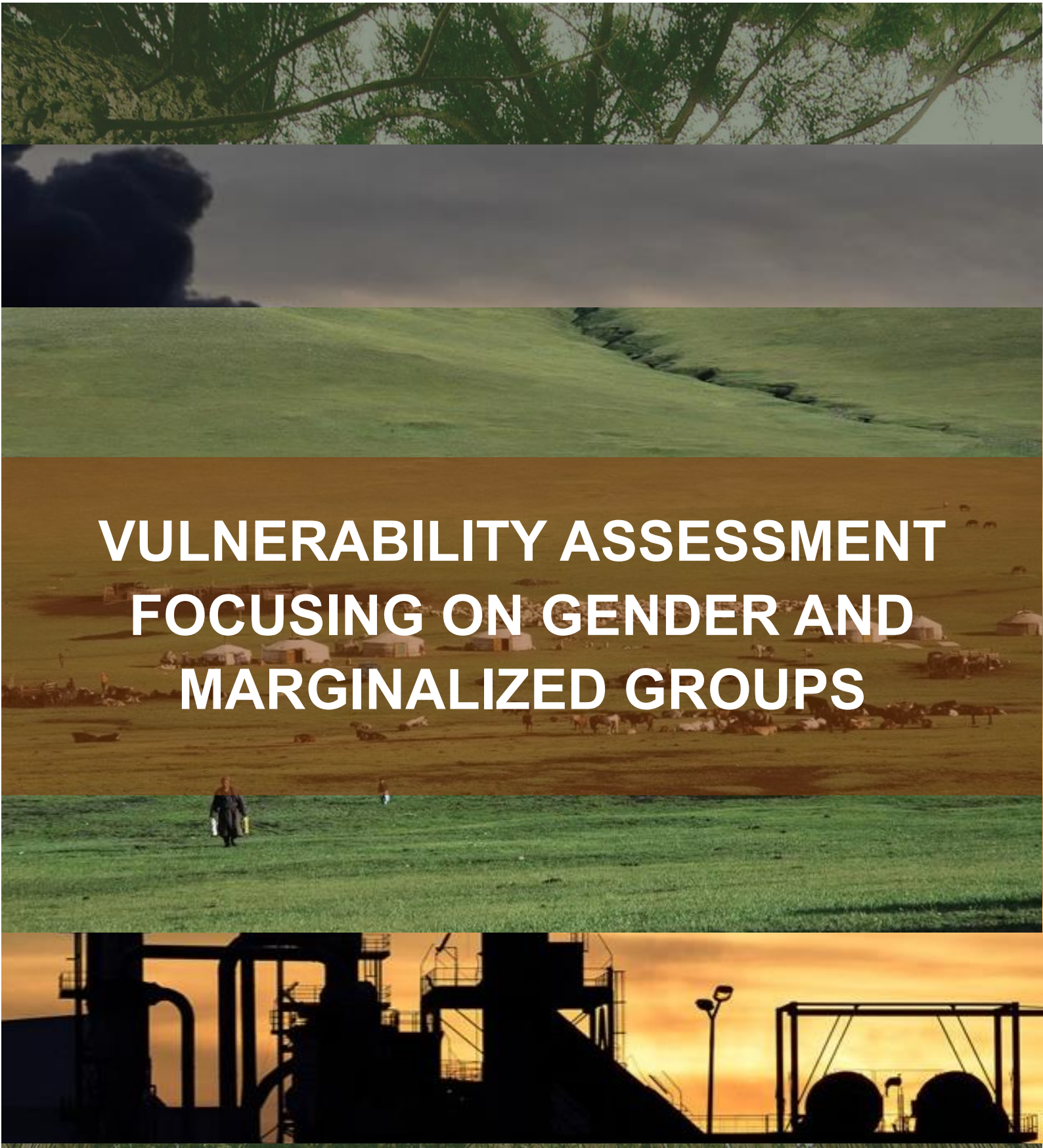

# VULNERABILITY ASSESSMENT FOCUSING ON GENDER AND MARGINALIZED GROUPS

2021

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## ABBREVATION

| | |
|---|---|
| MET | Ministry of Environment and Tourism |
| MES | Ministry of Education and Science |
| WHO | World Health Organization |
| GSE | General secondary education |
| NCGE | National Committee on Gender Equality |
| NPGE | National Program on Gender Equality |
| NCPH | National Center for Public Health |
| UNFPA | United Nations Population Fund |
| CGF | Green Climate Fund |
| IPCC | Intergovernmental Panel on Climate Change |
| NAP | National Adaptation Plan |
| NSO | National Statistical Office |
| MLSP | Ministry of Labor and Social Protection |
| NHRC | National Human Rights Commission |
| HDI | Human development Index |
| SDG | Sustainable Development Goals |
| NPA | National Police Agency |
| MoH | Ministry of Health |

# CONSULTANT TEAM

This consulting service concerning national vulnerability assessment for gender and marginalized groups was completed within the framework of the project "*Building capacity to advance the National Adaptation Plan Process in Mongolia*", implemented by the Ministry of Environment and Tourism (MET) and United Nations Environment Program (UNEP) through the funding from the Green Climate Fund (GCF). Results, conclusions, recommendations, and content of this assessment are solely the opinion of the consultants.

Consultant team members:

| | |
|---|---|
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# ACKNOWLEDGEMENT

Within the framework of the project "*Building Capacity to Advance the National Adaptation Plan Process in Mongolia*", the research aimed at identifying climate change vulnerability within gender and marginalized groups and has raised significant challenges to the consultant team. Due to the current situation under global pandemic, team members faced extreme limitations in regards to data collection. Therefore, it was exceedingly difficult to explain whether the numerical data collected under the records (open statistics data) were a result of the current social, economic and political situation or climate change.

Authors wish to thank M.Altanbagana, Head of Social, Economic Geography Division, Institute of Geography-Geoecology, Mongolian Academy of Sciences, D.Dagvadorj, Director of the Institute for Climate Change Research, Doctor of Geographical Sciences and Z.Batjargal, Special Envoy for Climate Change in Mongolia in overcoming this obstacle, provided methodological advice for our work, participated and shared their valuable opinion in meetings organized under the project.

# CHAPTER 1. INTRODUCTION AND METHODOLOGY

## 1.1. BACKGROUND

With the financing of the Green Climate Fund (GCF), Ministry of Environment and Tourism (MET) and the United National Environment Program (UNEP) are implementing the "*Building the capacity to advance National Adaptation Plan Process in Mongolia*" project. This project aims at strengthening institutional and technical capacity of stakeholders that take part in advancing the climate change adaptation planning process at both national and local levels and is being carried out under four components: enhancing the institutional and technical capacity of key actors to advance the National Adaptation Plan (NAP) process; establishing a climate information system; developing a financial strategy for sustainable implementation of the NAP process and designing a monitoring and evaluation framework for the NAP process.

Under a sub-action of the first component of the project for identifying and developing the climate change adaptation planning process, a vulnerability assessment of gender and marginal groups was undertaken at the national level.

This work aims to contribute to policies related to climate change adaptation for gender and marginalised groups and for the project activities which will take gender inequality issues into consideration. It will also help improve capacity building by creating an equal participation platform for women, children, herders, farmers and marginalised groups.

## 1.1. ASSESSMENT METHODOLOGY

Climate change vulnerability assessment focusing on gender and marginalized groups applied an International Panel on Climate Change (IPCC) framework (IPCC, 2001) to assess exposure, sensitivity and adaptive capacity as a general methodology and quantitative indicators under each component were selected based on stakeholder consultation with national consultants. During the stakeholder consultation, the term vulnerability and its definition by other researchers was discussed to prevent inconsistencies in the understanding of vulnerability assessment. As such, the concept vulnerability is considered as follows.

> IPCC (2001): 'The degree, to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climatevariability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change andvariation to which a system is exposed, its sensitivity, and its adaptive capacity'.

Adger, W.N (2006): The state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt.

Chuluun.T, Altanbagana.M (2012): The degree of damage to a system as a result of any impacts caused by climate change. Exposure of the system to social and ecological systems due to climate change is understood as vulnerability.

Vulnerability is considered in terms of various sectors such as environmental, social and agricultural, and is assessed at different levels from national level to regional, local level or sectoral level depending on the purpose of the vulnerability assessment. It also measures vulnerability through a variety of indices and indicators, such as environmental vulnerability, social vulnerability, and economic vulnerability, depending on the scope and purpose.

**The key scope for this vulnerability assessment task is to identify which social groups are most vulnerable to climate change, as it is a nationally targeted vulnerability assessment for gender and marginalized groups as per the terms of reference.** The IPCC methodology considers vulnerability in the context of three main components, and the design that summarizes this methodology is shown in the following figure.

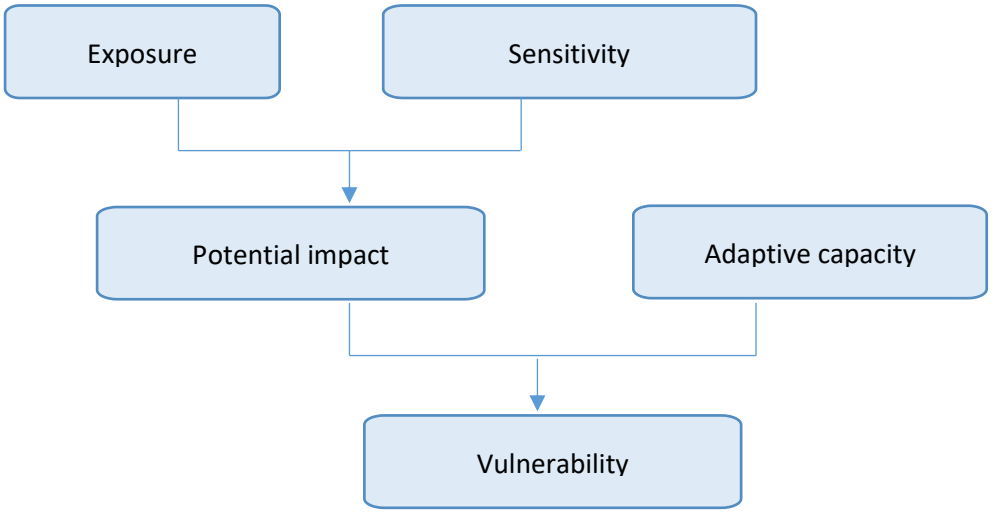



*Figure 1. Design of the assessment methodology*

The definition for each component is as follows.

i. **Exposure:** the nature and degree to which a system is exposed to significant climatic variations.
ii. **Sensitivity:** the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. The effect may be direct or indirect.

iii. **Adaptive capacity:** the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

For the assessment calculation, these three components are calculated using the following formula.

Vulnerability= (Exposure + Sensitivity) - Adaptive capacity

While exposure and sensitivity increase the vulnerability, adaptive capacity reduces vulnerability and cope with climate change.

As each indicator is measured with different scales, the selected criteria for each of these three components were normalized and indexed using a value ranging from 0 to 1. A value of 1 indicates the most vulnerability. The more it moves towards 0, the lower the vulnerability. Depending on the indicator, the indexing was calculated based on two groups as follows.

**Positive indicators:** These are indicators that should be increased to improve the situation and reduce the vulnerability. Indexes of positive indicators were calculated as follows:

$$Index = 1 - \frac{Actual\ value - Minimum\ value}{Maximum\ value - Minimum\ value}$$

**Negative indicator:** These are indicators that should be decreased to reduce the vulnerability and calculated as follows.

$$Index = \frac{Actual\ value - Minimum\ value}{Maximum\ value - Minimum\ value}$$

After calculating the index for each of the selected indicators, the geometric mean of the indices was calculated and the index for each component (i.e. exposure, sensitivity, and adaptive capacity) was calculated.

## 1.2. ASSESSMENT INDICATORS

Based on the literature review, study of previous assessments, consultation with stakeholders and in-depth interview with experts, as well as data availability, the following indicators were selected as criteria for each of these three components.

*Table 1. Assessment indicators*

| Component | Indicators |
|---|---|
| **Exposure** | Drought |
| | Zud |
| | Land degradation |
| **Sensitivity** | Poverty rate |
| | Unemployment rate |
| | Life expectancy |
| | Percentage of people affected by the disaster |
| | Enrollment in education |
| | Percentage of people with disabilities |

| Component | Indicators |
|---|---|
| | Percentage of female-headed households with children under the age of 18 |
| | Percentage of single elder household |
| | Percentage of herder household |
| | Percentage of people working in the informal sector including agriculture |
| | Migration |
| **Adaptive capacity** | People who pay social insurance |
| | Internet use |
| | Mobile phone use |
| | Citizens' understanding, knowledge and attitudes towards climate change |
| | Implementation of projects and programs in the field of disaster and climate change |
| | Existence of a disaster management program, plan |
| | Number of health facilities |

## 1.3. DATA COLLECTION METHOD

Data to measure the components of the vulnerability assessment are based on primary and secondary sources. Primary data was collected through face-to-face meetings with experts, telephone interviews and online surveys among specialists in 21 aimags and Ulaanbaatar. Secondary data was collected from open data source of the National Statistical Office (NSO) and some data related to weather, disaster and emergency was obtained from relevant government organizations and agencies.

## 1.4. LIMITATIONS

While carrying out this consulting service, the following factors caused challenges and limited the scope of work:

1. Due to the terms of reference being imprecise, understanding of the stakeholders and expectations from the assessment varied such that stakeholders raised questions and comments on household vulnerability, vulnerability of men and women, and provincial (*aimag*) or local level vulnerability assessments and demanded results beyond the TOR. Therefore, after the stakeholder consultation, face-to-face interviews and meetings with other consultants working on the project were conducted in order to clarify any overlaps or gaps and the scope of work was redefined in detail.
2. Due to the COVID-19 pandemic lockdown, there were limitations concerning data collection resulting in delays for secondary data collection. Agencies and bodies in Ulaanbaatar City were under lockdown; despite any attempts to directly collect data

from aimags, the data was not compiled at the aimag level. For lockdown reasons, some aimags has to await for data to be sent from agencies operating in Ulaanbaatar.

3. Requests were made for retrieving more detailed data that exist on open databases or for non-existent data. However, the data availability was poor and the possibility to retrieve data disaggregated by gender and age groups was limited. In addition, the chronology of some statistics varied and the lack of data dynamic over multiple years limited making an in-depth analysis of climate change exposure. Due to these circumstances, the criteria were adjusted to the availability and accessibility of the data.

# CHAPTER 2. VULNERABLITY ASSESSMENT RESULTS AND DISCUSSION

## 1.2. OVERVIEW OF GENDER AND MARGINALIZED GROUPS

The law on promotion of gender equality, passed in 2011, has adopted a second national program on gender equality, and has been implementing an action plan since 2017. According to the Law on Social Welfare, citizens with special needs who are in a poor state of health, lacking family care and incapable of conducting normal life independently or without other's help and to individual member of household requiring social welfare assistance or care are provided pension, allowances, and special care by government to meet his/her minimum needs. An individual member of households selected from households which have a living standard lower than the current poverty line and which is entered in the household information database in accordance with methodology approved jointly by the National statistical committee and the state central administrative organization in charge of social welfare matters are considered to be in need of social welfare and support. These include groups such as children at risk, the elderly, people with disabilities, people in need of permanent care, single parents, and families below the poverty line.

A common perception is that households and groups below the poverty line on social welfare services are considered vulnerable, almost by definition. The term marginalized groups stated in the TOR of vulnerability assessment was assessed in terms of identifying groups at risk of being left behind in development processes due to climate change, reflecting the problems faced by those groups, and incorporating them into climate change adaptation policies, programs, and interventions.

The National Program on Gender Equality aims to ensure gender-sensitive policies and planning in the implementation of sustainable development goals, the implementation of the law through measures aimed at changing stereotypes about gender equality, and gender equality in political, economic, social, cultural and family relations. Within the framework of this program, there are 6 objectives to create equal access to development benefits for women and men, implement gender-sensitive policy, planning and budgeting, conduct advocacy to change gender stereotype, strengthen national capacity to ensure gender equality, combat violence and discrimination, and increase women participation in political decision-making. The program has been implemented from 2017 and will finish in 2021.

Gender policies and strategies have been developed and approved for 12 sectors other than health, including gender strategies in the environmental sector, and gender policies in the

food, agriculture, and light industry sectors. It appears that regulations on gender equality are in place in areas with high impact of climate change .

For example, it is stated to increase engagement of men and women, and social groups through tailoring information and guidelines on climate change, desertification and disaster prevention for community groups and men and women to the specific needs of women and men and disseminating it with the participation of local communities in the gender strategy in the environmental. However, there is no information about its implementation, progress and monitoring. Because the monitoring and evaluation of these sectoral strategy and policy of gender have not been made yet.

The sex ratio of the population is 49% and 51% for men and women, respectively. The Human Development Indicators and gender indicators continue to improve. For instance, the gender gap index has dropped from 0.719 to 0.706 over the last 10 years, ranking 79th out of 153 countries in 2020. (World Economic Forum, 2020). The gender development index has risen from 1,021 to 1,023 over the past 10 years, while the gender inequality index has fallen from 0.409 to 0.322 (UNDP, Human Development Report, 2020). Although the overall gender equality index is improving, the gap remains wide for some areas. The gender gap in life expectancy was 9.6 years in 2019 meaning that men are living 10 years less than women. This gender gap in Mongolia is more than twice the world average and ranked second among the East Asia and the Pacific countries. (NSO, 2020).

In terms of gross national income per capita, men are 1.5 times more than women. The gross national income per capita is US$10,839 at national level, US$12,981 for men and US$8,756 for women. (HDR, 2020). In terms of living conditions, 28.4% or 904.9 thousand Mongolia's 3.2 million people are poor according to the latest poverty survey. The results of this survey show that although the poverty rate has decreased from the previous survey conducted in 2016, the percentage of the population at risk of living below the poverty line is 15% (475 thousand people). Poverty reduction has been uneven between urban and rural areas, and rural poverty has decreased by 4 points from the previous survey, while urban poverty has remained unchanged.

## 1.3. EXPOSURE COMPONENT

The climate change exposure assessment was carried out on the basis of official records of the Information and Research Institute for Meteorology, Hydrology and Environment (IRIMHE) and of Integrated Land Database as well as climate change and environmental baseline research reports. Within the framework of this research, indicators for climate change exposure criteria were selected on the basis of the frequency of droughts and *dzud* as well as the extent of land damage.

### 1.3.1. Climate change and frequency of drought and dzud

According to reports, “Mongolia's average annual air temperature has warmed by 2.4°C between 1940 and 2020, and total precipitation shows a trend where it has declined slightly by 6%. The multi-year chart reports that 2020 was the sixth warmest year and the 12th highest recorded year in terms of precipitation ”(IRIMHE, 2021).

*Table 2. Data on drought and summer, 2015-2019 (IRIMHE)*

| Year | Land portion /%/ | | | Soums /corresponding to Government Resolution No.286/ | |
|---|---|---|---|---|---|
| | Good | Medium | Poor | Drought equivalent | Drought |
| **2015** | 30 | 60 | 10 | | Bayannuur of Bayan-Ulgii; Sagil, Turgen, Davst, Tsagaankhairkhan of Uvs; Khatgal, Tarialan of Khuvsgul; Bayanlig of Bayankhongor; Khurmen Dalanzadgad of South Gobi; Undurshireet of Tuv; |
| **2016** | 60 | 30 | 10 | | Sagsai, Tolbo, Ulaankhus of Bayan-Ulgii; Khovd, Zuunkhangai of Uvs; Erdeneburen of Khovd; Biger, Guulin of Gobi-Altai; Tsakhir of Arkhangai; Bat-Ulzii, Kharkhorin, Zuil, Zuunbayan-Ulaan of Uvurkhangai; Batsumber of Tuv |
| **2017** | 40 | 50 | 10 | Most areas of Uvs, Khovd, Zavkhan, Gobi-Altai, Khuvsgul, Arkhangai, Uvurkhangai, Bulgan, Orkhon and Umnugobi; Bayan-Ulgii, some soums of Bayankhongor, Selenge, Tuv, Khentii, Dornod Dundgovi and Dornogovi or territory of 120 soums in total | Most territory of Khovd, Bayankhongor; some areas of Uvs, Zavkhan, Gobi-Altai and Umnugobi; one or few areas of Bayan-Ulgii, Khuvsgul, Arkhangai, Bulgan, Tuv and Selenge or 40 soums in total |
| **2018** | 90 | 10 | - | - | - |
| **2019** | 70 | 30 | | | Bogd of Bayankhongor, Ulziit of Dundgovi, Khuld, Saikhandulaan and Ulaanbadrakh of Dornogobi |

Table 2 shows that the summers between 2015 and 2019 were better than the average. Details concerning summer season are provided in Appendix 3. In terms of average summer air temperature, in 2020 some areas of Uvurkhangai, Dundgovi, Umnugovi and Tuv aimags reported 1.0 to 1.9°C warmer than the long-term average, while Chandmani soum of Khovd aimag, Malchin, Undurkhaan of Uvs aimag and Bayannuur soum of Bayan-Ulgii reported -1 to -1.5°C colder and other regions reported an average of multiple years.

*Table 3. Data on dzud, 2015-2016 /as of third ten days of January/*

| Year | Size of snow covered area, /%/ | Name of the soums /by 286th Government act/ | |
|---|---|---|---|
| | | Dzud equivalent | Dzud |
| **2015** | About 60 | - | - |
| **2016** | About 80 | Khangai, Tuvshruulekh, Erdenemandal, Chuluut of **Arkhangai;** Jinst, Zag, Shargaljuut, Bayanbulag, Gurvanbulag of **Bayankhongor;** Bayannuur of **Bayan-Ulgii;** Selenge, Dashinchilen, Teshig of **Bulgan**; Taishir, Delger, Guulin, Altai, Tsogt, Tugrug, Khukhmorit, Khaliun of **Gobi-Altai**; Altanshiree, Ikkhet, Airag of **Dornogobi**; Matad, Tsagaan-Ovoo, Bulgan, Sergelen, Choibalsan, Chuluunkhoroot, Bayantumen of **Dornod**; Deren, Saikhan-Ovoo, Delgerkhangai of **Dundgobi**; Uliastai, Zavkhanmandal, Yaruu, Tsagaanchuluut, Santmargats, Erdenekhairkhan, Urgamal, Durvuljin of **Zavkhan**; Altanbulag, Tseel, Jargalant, Ugtaaltsaidam, Argalant, Bayan-Unjuul, Zaamar of **Tuv**; Khyargas, Herder, Umnugovi, Khovd, Zavkhan, Ulgii of **Uvs**; Bulgan, Mankhan, Darvi of **Khovd**, Erdenebulgan, Tsagaan-Uul, Tosontsengel, Khatgal, Bayanzurkh, Renchinlkhumbe of **Khuvsgul**, Tsenkhermandal, Umnudelger, Delgerkhaan, Undurkhaan, Gurvanbayan, Bayanmunkh soums of **Khentii** experienced a situation **equivalent to dzud** due to compacted, thick snow. | Sagsai of **Bayan-Ulgii**; Uench, Altai, Chandmani of **Khovd;** Naranbulag**,** Turgen, Sagil, Ulaangom, Zuungobi, Baruunturuun, Tes, Davst, Undurkhangai of **Uvs**; Otgon, Bayankhairkhan, Bayantes, Tosontsengel, Ikh-Uul, Tsagaankhairkhei, Ider, Ted Tes, Aldarkhaan, Telmen, Tsetsen-Uul, Shiluustei, Nömrög, Songino of **Zavkhan;** Erdene, Tseel, Sharga, Tonkhil, Bayankhongor Buutsagaan, Jargalant, Galuut of **Gobi-Altai**; Jargalant, Galt, Tsagaan-Uur, Shine-Ider, Arbulag, Tsetserleg, Ulaan-Uul of **Khuvsgul**; Tsetserleg, Tsakhir, Khairkhan, Tariat, Undur-Ulaan of **Arkhangai**; Burd, Bat-Ulzii, Bulgan Bayannuur, Rashaant of **Uvurkhangai**; Yeruu of **Selenge**; Lun, Bayan and Bayanjargalan of **Tuv**; Jargaltkhaan, Galshar, Darkhan-Orgil of **Khentii**; Khalkhgol of **Dornod**, Khalzan, Uulbayan, Tumentsogt, Erdenetsagaan, Dariganga, Ongon, Asgat, Bargat -Urt, Sukhbaatar, Bayandelger, Munkhkhaan, Tuvshinshiree, Naran of **Sukhbaatar**; Delgerekh of **Dornogovi**; Tsagaandelger Undurshil, Adaatsag, Khuld, Luus, Bayanjargalan, Erdenedalai, Mandalgovi, Gurvansaikhan, Ulziit of **Dundgovi** and Baganuur of Ulaanbaatar experienced **dzud** due to compacted and thick snow. |
| **2017** | About 70 | Bulgan of **Bayan-Ulgii**; Ider, Tsetsen-Uul, Nomrog, Otgon, Tsagaankhairkhan of **Zavkhan**; Khatgal, Shine-Ider, Murun, Erdenebulgan, Ikh-Uul, Chandmani-Undur, Tsagaan-Uur, Burentogtokh, Tunel of **Khuvsgul**;, Gurvanbulag, Bulgan, Bugat of **Bulgan**; Tsakhir, Undur-Ulaan, Tsetserleg, Battsengel, Khashaat, Tariat, Bulgan, Khairkhan, Tuvshruulekh of **Arkhangai**; Nariinteel, Burd, Kharkhorin of **Uvurkhangai;** Jargalant of **Orkhon;** Baruunburen, Bayangol, Orkhontuul, Sukhbaatar, Mandal of **Selenge**, Khongor of **Darkhan-Uul;** Bayanjargalan, Bayanchandmani, Jargalant, Tseel, Bayan-Unjuul, Bornuur, Argalant of **Tuv**; Terelj, Baganuur of **Ulaanbaatar**; Batnorov, Norovlin, Binder, Undurkhaan, Kherlenbayan-Ulaan, Jargaltkhaan, Tsenkhermandal, Delgerkhaan, | Dayan /Sagsai/ **of Bayan-Ulgii;** Uench Altai, Bulgan of **Khovd;** Naranbulag, Turgen, Sagil, Khyargas, Herder, Zuungobi, Baruunturuun, Undurkhangai, Tes, Davst, Ulaangom of **Uvs;** Tudevtei, Aldarkhaan, Bayankhairkhan, Bayantes, Tosontsengel, Ikh-Uul, Tes, Telmen, Songino of **Zavkhan;** Tsagaan-Uul, Jargalant, Arbulag, Tosontsengel, Galt, Tsetserleg, Tsagaannuur, Renchinlkhumbe, Bayanzurkh, Tarialan, Ulaan-Uul of **Khuvsgul;** Khotont, Jargalant, Tsetserleg, Khangai, Ulziit, Erdenemandal, Ogiinuur of **Arkhangai;** Bayangol and Esenzuil of **Uvurkhangai;** Bayannuur, Dashinchilen, Khangal, Teshig, Rashaant, Selenge, Bayan-Agt of **Bulgan;** Khuder, Yeruu, Bugant, Tsagaannuur, Zuunburen, Khushaat, Tushig of **Selenge;** Orkhon of **Darkhan-Uul;** Bayan, Zuunmod, Altanbulag, Erdenesant, Erdene, Lun, Ugtaaltsaidam, |

| | | | |
|---|---|---|---|
| | | Batshireet, Bayan-Adraga of **Khentii**, Bayandun of **Dornod**; Tuvshinshiree, Munkhkhaan of **Sukhbaatar** and Deren of **Dundgovi** experienced a situation **equivalent to dzud** due to compacted, thick snow /62 soums of 13 aimags/. | Batsumber of **Tuv;** Dadal, Umnudelger, Ulziit, Bayan-Ovoo, Gurvanbayan of **Khentii;** Tsagaan-Ovoo, Dashbalbar, Sergelen, Bulgan, Bayantumen, Khulunbuir, Bayan-Uul, Khalkhgol, Gurvanzagal, Choibalsan of **Dornod;** Erdenetsagaan, Sukhbaatar, Uulbayan and Tumentsogt of Sukhbaatar experienced dzud due to thick snow /85 soums of 14 aimags/. |
| **2018** | About 70 | Dund-Us**,** Munkhkhairkhan, Myangad, Tsetseg of **Khovd;** Turgen of **Uvs,** Bayankhairkhan, Erdenekhairkhan, Tsagaankhairkhan of **Zavkhan;** Taishir, Khukhmorit, Sharga of **Gobi-Altai;** Jargalant of, Gurvanbulag, Zag, Bogd of **Bayankhongor**; Tariat, Erdenebulgan, Battsengel, Bulgan, Ulziit of **Arkhangai**; Bayan-Undur of **Uvurkhangai**; Selenge of **Bulgan**; Jargalant of **Orkhon**; Jargalant, Bornuur, Tseel of **Tuv**; Baganuur, Terelj of **Capital city**; Tuvshinshiree, Tumentsogt, Erdenetsagaan, Sukhbaatar, Dariganga, Naran, Ongon of **Sukhbaatar** experienced a situation **equivalent to dzud** due to compacted, thick snow /37 soumds of 13 aimags/. | Sagsai / Dayan / of **Bayan-Ulgii**; Ulaangom, Davst, Undurkhangai, Naranbulag, Khyargas, Baruunturuun, Tes, Zuungobi, Zuunkhangai, Herder, Tsagaankhairkhan of **Uvs**; Darwin, Manhan, Chandmani of **Khovd**; Zavkhanmandal, Yaruu, Tudevtei, Songino, Tsetsen-Uul, Bayantes, Tes, Tosontsengel, Tsagaanchuluut, Telmen, Aldarkhaan, Ider, Ikh-Uul, Nömrög, Durvuljin, Urgamal of **Zavkhan**; Jargalant, Khaliun, Bayan-Uul, Altai, Darvi, Guulin of **Gobi-Altai**; Shinejinst, Bayangobi, Galuut of **Bayankhongor**; Tsetserleg, Tsagaannuur, Galt of **Khuvsgul;** Tsakhir, Tuvshruulekh, Khairkhan, Khangai, Khotont, Jargalant, Erdenemandal, Khashaat, Ogiinuur, Tsetserleg, Chuluut, Undur-Ulaan, /Ikh Tamir, Tsenkher/ of **Arkhangai**; Khangal, Gurvanbulag, Dashinchilen, Orkhon, Buregkhangai, Bugat, Khishig-Undur, Bayannuur, Rashaant, Mogod of **Bulgan**; Kharkhorin, Zuil, Burd, Bat-Ulzii, Uyanga, Khujirt, Zuunbayan-Ulaan, Ulziit of **Uvurkhangai**; Bayan-Undur of **Orkhon**; Orkhontuul, Baruunburen, Yeruu /Bugant/ of **Selenge**; Bayanjargalan, Ugtaal, Zaamar, Batsumber, Zuunmod, Altanbulag, Bayanchandmani, Lun, Buren, Bayan-Unjuul, Bayan, Argalant, Delgerkhaan, Undurshireet, Erdenesant, Erdene of **Tuv**; Khalkhgol of **Dornod**; Asgat, Munkhkhaan, Uulbayan, Khalzan of **Sukhbaatar**; Mandalgobi, Adaatsag, Luus, Saikhan-Ovoo, Tsagaandelger, Erdenedalai of Dundgobi experienced **white dzud** due to compacted, thick snow /106 soums of 16 aimags/ |
| **2019** | Over 40 | - | - |

As of 31st of December 2020, over 70% of the total land was covered in snow, of which Altai, Khangai, Khentii and Khuvsgul high altitudes and Kharkhiraa Turgen mountains, Khan Khukhii mountain ranges had 20 cm deep snow; Davst of Uvs, Tsagaa-Uur of Khuvsgul, Galuut of Bayankhongor, Tuvshruulekh of Arkhangai, Gurvanbulag of Bulgan, Yeruu of Selenge, Asgat, Sukhbaatar and Erdenetsagaan of Sukhbaatar had 10.1-20 cm deep snow. Whereas most areas of the central region and some areas of Bayankhongor, Gobisumber, Dornogobi and Sukhbaatar had 5.1-10 cm deep snow and the snow depth was 15-30 cm in ravines and snow-

drift areas and 1-5 cm in other territories. Detailed information on *dzud* is provided in Appendix 3. Based on the fore-mentioned information, the average temperature in Mongolia has increased while the amount of precipitation has decreased.

### 1.3.2. Land damage

Between 2013-2019, with the participation of Agency for Land Administration and Management of the capital city and districts and Department of Land Relations, Construction and Urban Planning of 21 aimags and soum land officers, a nationwide photo monitoring of land changes was carried out at 4,781 monitoring points representing 109.2 million hectares in 6 districts of the capital city and 314 soums of 21 aimags (i.e. all soums and aimags nationwide). As a result, a consolidated report on Integrated Land Database was produced. Upon comparing the results of the report of 2018 and 2019, the percentage of land that has lost its natural unspoiled characteristics has decreased and the percentage of degraded land has increased. Damage to the census sites varied from year to year, and there was no information on whether it had been rehabilitated.

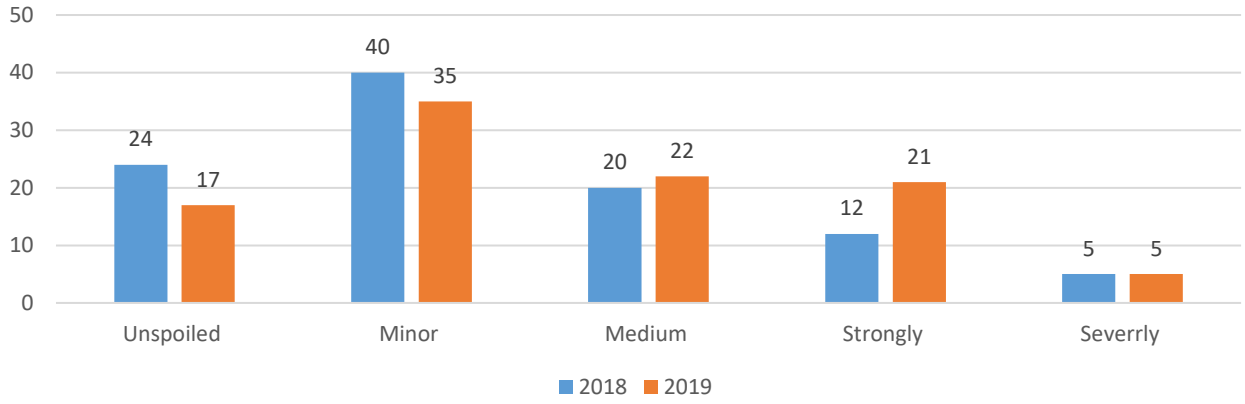



*Figure 2. Amount of degraded land by 2018 and 2019 (percentage)*

According to the consolidated annual reports, land is classified in terms of its type of use as arable land, pasture land, urban and rural settlements, forest fund, water reservoir and excavated or damaged land. Land damage is classified as unspoiled, minor, medium, strongly, or severely degraded. As of 2019, nationwide a total of 7,815,714.1 ha of land has suffered from some type of damage. By classification, 139,196.9 ha of arable land, 7.0 million ha of pasture and other herbaceous land, 49,882.8 ha land of urban and rural settlements, 570,824.2 ha of forest fund and 1,802.2 ha of water reservoir were damaged, and 23,852.6 ha of land was excavated. (Agency of Land Administration and Management, 2013, 2014, 2015, 2016, 2017, 2018, 2019).

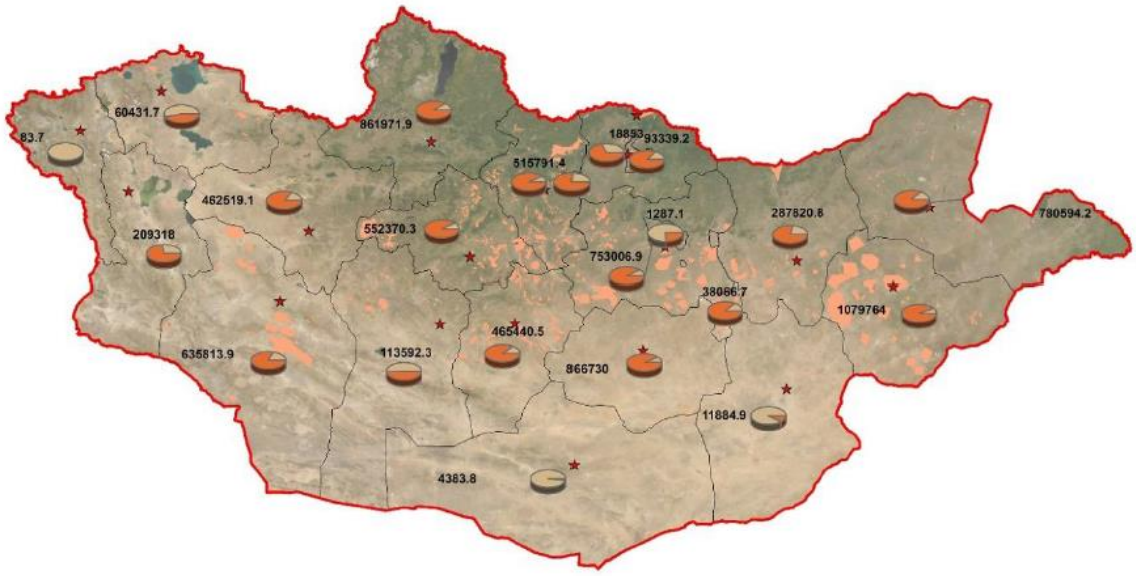



*Figure 3. Amount of damage caused to the land, by aimags (Integrated Land Database Report 2019.pdf)*

Factors that caused the most damage to crops and pastures were rodents and pests; to urban and rural settlements were human-induced damages; to forest funds were forest-steppe fires; to water reservoir with land damages were surface and groundwater contamination and to excavated areas were damages related to mining. Types of damages caused by each land category are shown in Appendix 3.

### 1.3.3. Climate change in local areas

In order to inquire signs of climate changes that are occurring in the area, vulnerable groups to the climate change and policies, programs and plans undertaken by the local government and as part of the climate change vulnerability assessment, an online survey was conducted among 47 environmental and tourism specialists as well as relevant officers of aimag and soum governor's offices of 21 aimags.

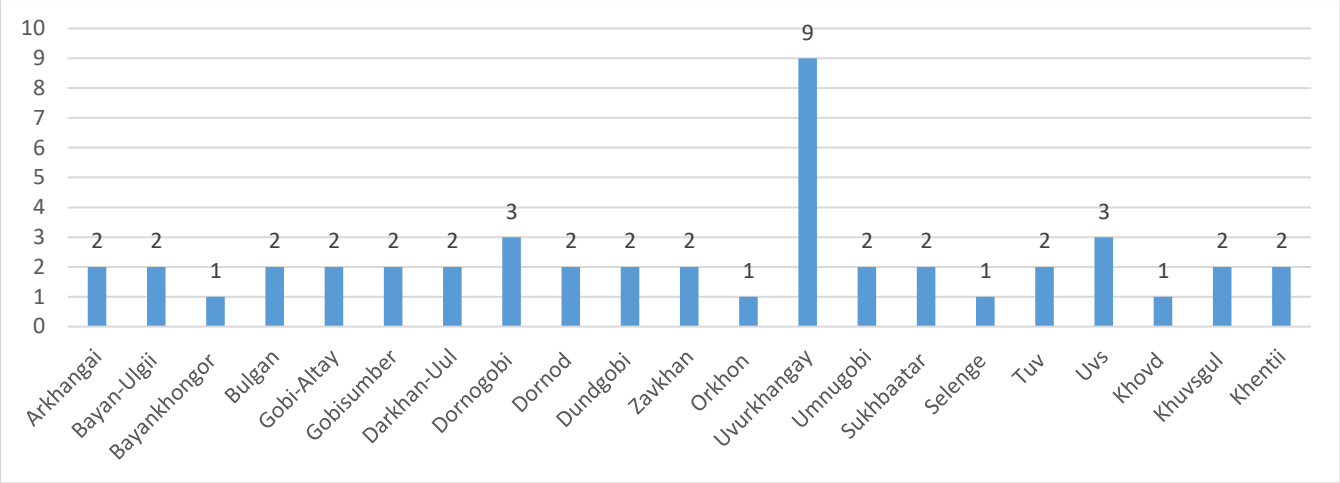



*Figure 4. Number of participants of the local vulnerability survey (n=47)*

Respondents mentioned the following as the most common reasons, namely:

- changes in precipitation – 14 mentions,
- drought and *dzud* - 9
- changes in plant yields - 6,
- increased wind storms - 6,
- flood – 5,
- desertification, sand movement – 3,
- changes in temperature - 2.

These climate changes have caused pasture and cropland degradation and erosion, with a direct impact on herders' and farmers' livelihoods. All 21 aimags responded to have observed climate change: not only direct forms of climate change were mentioned, but also indirect effects.

Changes in precipitation and in soil structure and soil erosion varied slightly from aimag to aimag. Increased stormy days and changes in crop yields were more common for Gobi aimags, while there is a tendency for an increased frequency of drought, dzud and flood in Khangai and mountainous regions. Climate change for each aimag and its results are shown in Appendix 3.

*Example 1. Bulgan aimag*

*... Our aimag is located in a unique region and it is an area that has khangai in the north and Gobi steppe region in the south. In recent years it has become common that herders of western aimags such as Uvs, Zavkhan and Khovd settling in southern soum areas and 8 soum of the region is suffering from overgrazing and increased infertile and eroded soil.*

*This is beginning to have a significant impact on crop yields as well as on climate instability and human and animal life. Especially, the nomadic herders have no place to graze their livestock, a lack of land for winter and spring camps and there are constant disputes. Due to this situation, in recent years, there has been a drought in the soums of the southern region and a dzud in winter.*

*Example 2. Gobi-Altai aimag*

*... To a greater or lesser extent, desertification is occurring in 79.5 percent of the country. Soil salinity keeps increasing. The source of the spring is drying up. The number of stormy days continue to increase, pasture plant yields drop following a lack of precipitation and the chance for dzud in winter has been increasing sharply. Extreme weather events such as hurricane and hailstorms have increased. As a result of an unforeseen cold weather, wild animals such as gazelle and saiga antelopes are in danger of freezing to death. There have been cases where a large number of waterfowls died due to a biological contamination.*

*Example 3. Sukhbaatar aimag*

*... In the last 15 years, there has been a lot of drought and increased sand movement in the south. An area which previously had 50 species of plants has now only 5 species of plants. The spring is without winter and the autumn is without autumn. The precipitation in summer is extremely strong and fails to be absorbed by the soil. It falls strongly in a short time and destroys the land surface. In winter there is less snow and gives less moisture. Excessive drought in spring and autumn can lead to an increased fire and destroy the pasture. As a result, loose dirt has increased and dust is formed on the surface. As a consequence of a lack of grass and soil moisture, overheating takes place and this leads to a destruction of the roots of these plants under the soil. There have been a lot of rats lately. There is a sudden overheating and extreme cold. In spring and autumn, the winds move very strongly and frequently and the sky darkens with soil. People even started to call it Baruun Urtiin bosoo ulaan.*

In 2020, nationwide, there were 90 weather related dangerous events and 11 catastrophic events, of which 19 hurricanes, 13 leeward side winds, 4 heavy and wet snowfalls, 7 extreme and sudden cold events, 11 heavy rains, 10 hailstorms, and 15 lightning strikes were observed. As a result, 15 people were killed and 14 injured, 11,955 livestock were lost, 7 roads and bridges were damaged, 976 gers and pen collapsed, 17 building roofs collapsed, 7 power

poles fell and 11,339 hectares of farmland were affected. 7 billion 625 million 187 thousand 426 MNT of direct damage was caused to the country (IRIMHE, 2021).

In summary, the frequency of drought and dzud and the extent of land damage can potentially serve as indicators for measuring the exposure to climate change. Climate change is common in each aimag and additionally, different effects were identified in regards to geographical zoning and location.

## 1.4. SENSITIVITY COMPONENT

### 1.4.1. Sensitivity index

Sensitivity indicators were identified for the capital city and 21 aimags level, and age and sex disaggregated analysis were made when data were available.

Sensitivity was assessed with a total of 11 indicators, and these indicators were selected based on the feedback from stakeholder consultations, face-to-face interviews, and international vulnerability assessment methodologies and experiences. Social, educational, health and livelihood measurement indicators were selected to reflect the sensitivity of social groups to climate change, and an index was calculated based on secondary data. Component sensitivity is highly dependent on groups living in areas that are vulnerable to climate change, such as agriculture and natural resources. If a particular social group or household's main source of livelihood is directly dependent on resources that are vulnerable to climate change, or depends on the agricultural sector, then that social group is considered as highly sensitive to climate change. In our country, livestock products are the largest source of income for rural households, making herder households one of the most vulnerable group to climate change. Understanding sensitivity to climate change requires us to think not only about the geography of a place but also to consider its socio-economic context – the level of poverty, the unemployment, or the access to basic services. Such non-climate related factors can influence vulnerability. (UNDP, Manual for Gender-Responsive Climate Change Vulnerability Assessment, 2015). The quality of life and socio-economic indicators of social groups are relevant to vulnerability because it reflects how they can cope with any disaster or risk, or how to prevent or recover, and how to respond effectively. As identifying which social groups are more sensitive to climate change and which regions are more sensitive cannot be adequately expressed in secondary data alone and it needs to consider the deeper qualitative information collected through surveys with open-ended questions from 21 aimags representatives and from other surveys conducted by different projects, programs and organizations. Secondary data criteria differ according to the source. Data processing used the data available in all time series were used, and the average of the numerical values were calculated. The result indicate

that the national sensitivity index is 0.054. Zavkhan aimag had the highest sensitivity index of 0.066, while the lowest score was 0.01 in Ulaanbaatar.

*Table 4. Sensitivity index by aimag*

| | School enrollment | Life expectancy | Percentage of herder families | Percentage of people with disability | Percentage of female-headed households with children under | Percentage of single elder household | Migration | Poverty | Unemployment | Percentage of people working in the informal sector including agriculture | Percentage of people affected by the disaster | General index |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Zavkhan** | 0.035 | 0.320 | 0.408 | 0.049 | 0.053 | 0.074 | 0.034 | 0.366 | 0.067 | 0.848 | 0.0001 | 0.063 |
| **Bulgan** | 0.075 | 0.282 | 0.436 | 0.039 | 0.049 | 0.051 | 0.025 | 0.341 | 0.078 | 0.867 | 0.0001 | 0.063 |
| **Bayankhongor** | 0.039 | 0.266 | 0.443 | 0.040 | 0.090 | 0.061 | 0.021 | 0.342 | 0.062 | 0.772 | 0.0001 | 0.058 |
| **Govi-altai** | 0.045 | 0.228 | 0.427 | 0.032 | 0.062 | 0.064 | 0.028 | 0.442 | 0.074 | 0.860 | 0.0001 | 0.058 |
| **Khuvsgul** | 0.034 | 0.239 | 0.410 | 0.041 | 0.086 | 0.064 | 0.017 | 0.272 | 0.072 | 0.808 | 0.0001 | 0.057 |
| **Arkhangai** | 0.044 | 0.214 | 0.532 | 0.039 | 0.046 | 0.057 | 0.024 | 0.379 | 0.048 | 0.829 | 0.0001 | 0.056 |
| **Dundgovi** | 0.027 | 0.258 | 0.461 | 0.043 | 0.076 | 0.060 | 0.030 | 0.223 | 0.051 | 0.945 | 0.0001 | 0.055 |
| **Tuv** | 0.049 | 0.228 | 0.380 | 0.033 | 0.052 | 0.057 | 0.039 | 0.189 | 0.038 | 0.799 | 0.0001 | 0.054 |
| **Govisumber** | 0.027 | 0.247 | 0.131 | 0.035 | 0.089 | 0.040 | 0.040 | 0.522 | 0.080 | 0.811 | 0.0001 | 0.053 |
| **Uvurkhangai** | 0.038 | 0.281 | 0.451 | 0.035 | 0.057 | 0.051 | 0.019 | 0.376 | 0.053 | 0.802 | 0.0001 | 0.052 |
| **Khovd** | 0.028 | 0.228 | 0.342 | 0.032 | 0.049 | 0.056 | 0.021 | 0.389 | 0.068 | 0.633 | 0.0001 | 0.052 |
| **Khentii** | 0.010 | 0.238 | 0.304 | 0.041 | 0.078 | 0.055 | 0.026 | 0.409 | 0.079 | 0.801 | 0.0001 | 0.052 |
| **Selenge** | 0.050 | 0.234 | 0.149 | 0.037 | 0.068 | 0.030 | 0.027 | 0.352 | 0.051 | 0.690 | 0.0001 | 0.051 |
| **Dornogovi** | 0.035 | 0.218 | 0.201 | 0.031 | 0.079 | 0.038 | 0.024 | 0.233 | 0.060 | 0.586 | 0.0001 | 0.046 |
| **Umnugovi** | 0.035 | 0.253 | 0.276 | 0.022 | 0.085 | 0.044 | 0.020 | 0.136 | 0.067 | 0.761 | 0.0001 | 0.046 |
| **Bayan-ulgii** | 0.064 | 0.273 | 0.384 | 0.043 | 0.049 | 0.011 | 0.014 | 0.294 | 0.107 | 0.085 | 0.0001 | 0.041 |
| **Uvs** | 0.043 | 0.220 | 0.399 | 0.002 | 0.036 | 0.074 | 0.006 | 0.269 | 0.072 | 0.896 | 0.0001 | 0.036 |
| **Dornod** | 0.000 | 0.242 | 0.190 | 0.049 | 0.081 | 0.037 | 0.025 | 0.420 | 0.108 | 0.645 | 0.0001 | 0.022 |
| **Sukhbaatar** | 0.000 | 0.206 | 0.413 | 0.040 | 0.049 | 0.046 | 0.019 | 0.386 | 0.070 | 0.842 | 0.0000 | 0.020 |
| **Darkhan-uul** | 0.000 | 0.272 | 0.040 | 0.030 | 0.063 | 0.035 | 0.030 | 0.331 | 0.087 | 0.313 | 0.0001 | 0.016 |
| **Orkhon** | 0.000 | 0.212 | 0.031 | 0.031 | 0.069 | 0.023 | 0.028 | 0.243 | 0.106 | 0.183 | 0.0000 | 0.012 |
| **Ulaanbaatar** | 0.000 | 0.293 | 0.005 | 0.332 | 0.056 | 0.014 | 0.034 | 0.254 | 0.050 | 0.010 | 0.0000 | 0.010 |
| **National** | 0.054 | 0.269 | 0.186 | 0.030 | 0.060 | 0.034 | 0.018 | 0.290 | 0.064 | 0.590 | 0.0004 | 0.054 |

Education is one of the key criteria to be considered, as it is one of the indicators to show capacity to respond to any positive or negative effects of climate change. Mongolia has a relatively high level of education and enrollment. When we include education level in the key criteria of sensitivity, we found school drop-out rate was a key indicator. However, there are not any official statistics on out of school children. A report on education sector released by the Ministry of Education and Science and the NSO included information about school dropout, however, it did not cover the total number of dropouts in the country, and it was not possible

to provide data by aimag and gender. Thus, we selected school enrollment as an indicator. According to the recent census data, the level of education of the population has improved and the proportion of women with higher education is increasing compared to men.

*Table 5. Education level of population by sex, census report*

| Д/д | Education level | 2000 | | | 2010 | | | 2020 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| 1 | Higher | 7.6 | 7.7 | 7.6 | 15.4 | 21.2 | 18.3 | 31.1 | 21.7 | 13 |
| 2 | College | 5.7 | 9.4 | 7.6 | 4.6 | 6.9 | 5.7 | 4.1 | 5.3 | 3.1 |
| 3 | Vocational and technical | 3.9 | 3.4 | 3.6 | 3.1 | 2.6 | 2.8 | 4.3 | 3.4 | 4.5 |
| 4 | Secondary | 19.1 | 22.8 | 21 | 32.2 | 31.9 | 32.0 | 30.7 | 27.7 | 22.9 |
| 5 | Lower-secondary | 28.3 | 22.1 | 25.1 | 20.3 | 15.6 | 17.9 | 19.2 | 15.1 | 29.0 |
| 6 | Primary | 23.8 | 23.1 | 23.4 | 16.6 | 15 | 15.8 | 14.6 | 12.8 | 21.2 |
| 7 | Uneducated | 11.7 | 11.5 | 11.6 | 8 | 6.9 | 7.5 | 5.3 | 4.6 | 6.2 |

*Source:NSO*

For the gross weight of basic education enrollment by sex, enrollment in primary education is the same for both sexes. However, the enrollment of boys in secondary education is lower than that of girls. Comparing this to the years with drought and *dzud*, there is a tendency for boys' education to decline further during or after the years marked by drought and *dzud*. As the gross enrollment data is available only since 2005, it was not possible to compare the previous years. In addition, the gross enrollment rate is a percentage of the total number of children of the appropriate age for the school year, it does not accurately measure the number of dropouts. However, drought and *dzud* are likely to affect children's education, especially boys' education.

*Table 6. School enrollment, gross weight, by sex*

| **Age\Education level, sex** | **Primary education /Grade 1-5/** | | **Lower secondary education /Grade 6-9/** | |
|---|---|---|---|---|
| | **Male** | **female** | **male** | **female** |
| 2005 | 90.5 | 94.1 | 92 | 94.1 |
| 2006 | 100.5 | 104 | 95 | 94.5 |
| 2007 | 90.6 | 91 | 88.2 | 91.9 |
| 2008 | 90.7 | 94.8 | 88.3 | 88.3 |
| 2009 | 90.4 | 94.6 | 83 | 87.8 |
| 2010 | 96.5 | 98.9 | 103.1 | 109.2 |
| 2011 | 86.1 | 90 | 86.9 | 89.1 |
| 2012 | 84.8 | 85 | 92.1 | 100.1 |
| 2013 | 98.3 | 104.8 | 89.8 | 104.2 |
| 2014 | 103.5 | 102 | 89.8 | 89.2 |
| 2015 | 98.3 | 98.6 | 84.5 | 84.9 |
| 2016 | 98.2 | 98 | 96 | 98.9 |
| 2017 | 97.9 | 97.3 | 99.3 | 101.3 |
| 2018 | 96.7 | 96.5 | 96.7 | 99.3 |
| 2019 | 97 | 96.7 | 96.7 | 98.3 |

**Years with drought and dzud are highlighted.* *Source: NSO*

Although there is no complete data on dropout rates, the annual education profile provides some figures for out-of-school children, indicating that the number of out-of-school boys is higher than that of middle-class girls.

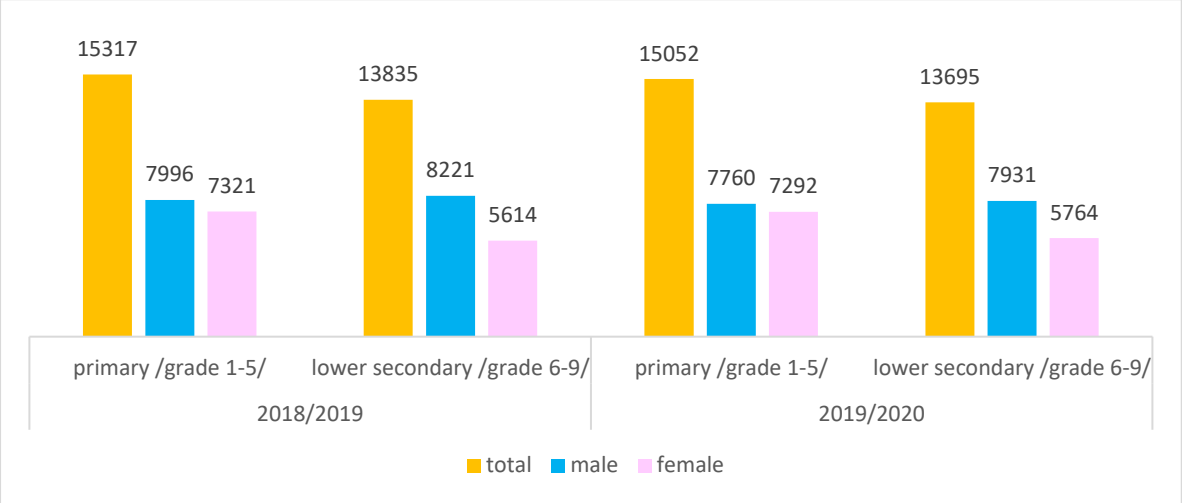



*Figure 5. Number of children out of school*

Life expectancy was selected as it is an indicator calculated by the aging of a population based on any disease, death from injury, number of people, and mortality rate. In terms of gender, there is a gender gap in life expectancy, and it varies by location. Orkhon, Sukhbaatar, Selenge, Dornogovi and Darkhan-Uul aimags have greater gaps than the national average. The gender gap of life expectancy in Orkhon aimag is 11.9 years and men living in Orkhon aimag live about 12 years less than women. It can be seen that men are more vulnerable in terms of aging and this impacts heavily the lives of elderly widows.

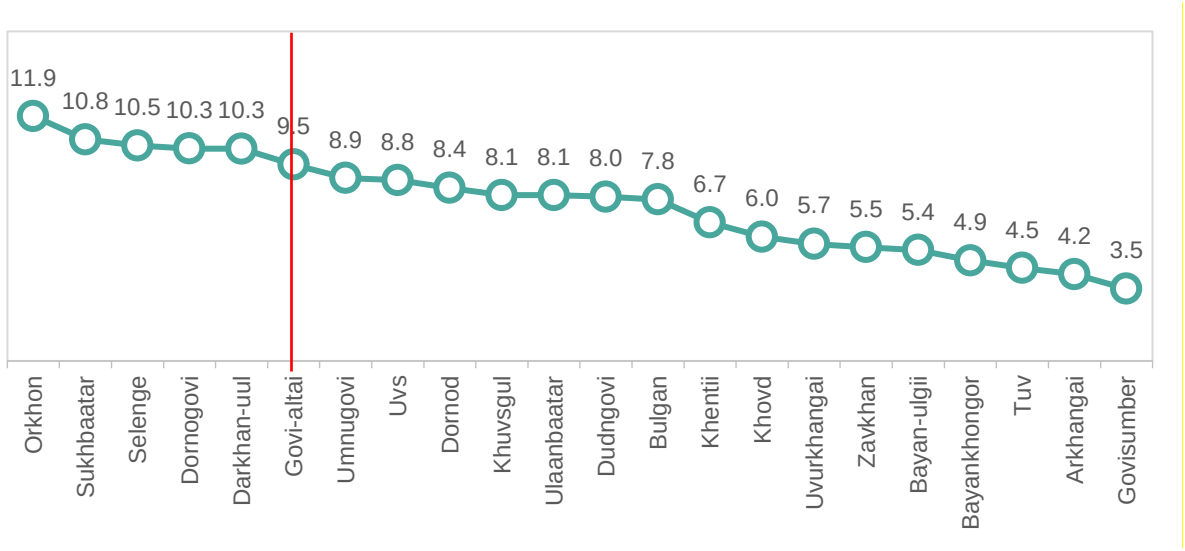



*Figure 6. Gender gap of life expectancy by aimags*

The percentage of herder households in the total number of households was considered as the next sensitivity indicator. Herder households are one of the most vulnerable groups to climate change. Losing their main source of livelihood to natural disasters, droughts and dzuds, directly affects their main sources of income. This index is 0.186 at national level, which is less sensitive, but varies from aimag to aimag. For example, Arkhangai aimag has the highest index of 0.532, followed by Dundgovi aimag with an index of 0.46. Due to its location with the least livestock, the capital city is 0.005 or insensitive, while Orkhon and Darkhan-Uul have the lowest indices. The number of herder households in Mongolia is about 19 percent of the total. According to a herder survey conducted by the Labor and Social Welfare Research Institute, natural and climatic difficulties are the biggest obstacles to herding. For example, 95.8 percent of the respondents mention drought, 90.3 percent mentioned *dzud*, 90.4 percent mentioned shortage of pastures, and 80.9 percent mentioned shortage of water in the springs. (RILSP, 2018).

In terms of gender, 56 percent of all herders were male and 44 percent were female, and the proportion of young herders is the highest at 67 percent in terms of age group in 2017. In addition to having a single source of income and sensitive to nature and climate, herders are vulnerable for access to social and health services. Participants of the same survey mentioned above by Research Institute for Labour and Social Protection said that they needed to travel an average of 25.0 kilometers to the nearest hospital at first level and an average of 98.4 kilometers from the nearest aimag or district hospital. In terms of location, herders living in rural areas have relatively greater difficulty accessing health care compared to the capital city, aimag centers, and soum centers.

*Example 4*

*... There is a lack of access to information and public services, and when you have to go and get public services in person, you do not have much time due to animal husbandry. Herders are discriminated against, especially in accessing public services such as education, health and welfare. Also, as children of herders, children are more discriminated against and oppressed. In general, we herders need to pay attention to the fact that we are an abandoned group...*

Furthermore, herder women are more sensitive by being more economically disadvantaged, more dependent on family income, and less socially involved than other groups. For example, 50 percent of total of 634 herder women participated in the study on Sexual and Reproductive Health and Rights of Mongolian Herder Women by the National Human rights Commission said that they decide their family finances with their husbands and spouses, 41 percent said they decide their family finances but can't manage spending for themselves, and 9 percent said their husbands manage their family budgets. Herder women are more vulnerable in terms of economic capacity due to the fact that herders do not have fixed working hours, and in addition to herding-related employment, women are more involved than men in raising children and household chores.

On the other hand, men are more vulnerable than women to harsh weather conditions. For example, herder women's study reported that in difficult weather conditions, men usually manage their livestock and women stay at home to look after children, and if women needed to go in difficult weather condition, they always go with someone else. (NHRC, 2019). For herders, men are increasingly directly vulnerable in terms of physical activity to livestock related work, especially in severe weather conditions, but women are becoming increasingly vulnerable to the effects of climate change, in addition to current issues such as lack of economic capacity and gender-based violence.

In terms of livelihood and poverty indicators, according to a study by the World bank and NSO, poverty in rural areas tends to decrease, but poverty coverage is higher in rural areas. Rapid growth in agricultural income and the expansion of social protection programs for the poor have had a significant impact on reducing poverty in rural areas. There was no change in poverty coverage in urban area due to the lack of changes in the wages, and the high prices of livestock products, especially cashmere, which is the most profitable, contributed to the increase in herders' income. However, it is important to understand that herders are dependent on livestock and vulnerable to natural disasters and hazards. 2016-2018 were good years for almost all rural herders as a result of higher livestock product prices, but this reflects the reality that they are highly vulnerable to livestock price shocks and especially to harsh winters or any other natural disasters which could destroy their livestock

herds and capital base. Once such a shock hits herder households, without adequate safety nets, their well-being can be significantly deteriorated in all aspects including employment, income and consumption. Moreover, the rapid advance of pastural degradation on the back of increasing demand in livestock products could threaten the sustainability of herders' livestock activities (World bank, 2020).

Informal employment including the agricultural sector were also included in the sensitivity index. There is no detailed information on informal employment of people engaged in artisanal and small-scale mining and subsistence farming, such as collecting pine nuts, and the NSO's data on informal employment has started including the agricultural sector from 2019 and we considered it as one of the indicators. Dundgovi and Uvs aimags had the highest indices by informal employment. For example, NSO's report in 2016 on artisanal miners stated that a total of 11,962 people were involved in artisanal mining. These are an example of people dependent on natural resource and sensitive to climate change related.

Other social groups who are considered as necessary to be covered by social welfare or benefits such as single women with children, single elder households, people with disability are included in the indicators of sensitivity. Moreover, number of deaths by disaster also considered. The index included people who died as a result of the total disaster, based on the availability of data, couldn't include the number of people affected. Also, it was impossible to disaggregate the numbers by type of disaster, focusing on natural disaster only, age, sex and aimag. The total number of deaths affected by disaster since 2014 is 3911, of which 351 or 9 percent were caused by climate related disasters. For these people affected by climate related disaster, 57 percent were male, and 43 percent were female. In terms of disaster type, the highest number of deaths were due to strong winds and floods, and in terms of gender, the percentage of men who died due to strong winds and lightning was higher, and the percentage of women who died due to floods was higher.

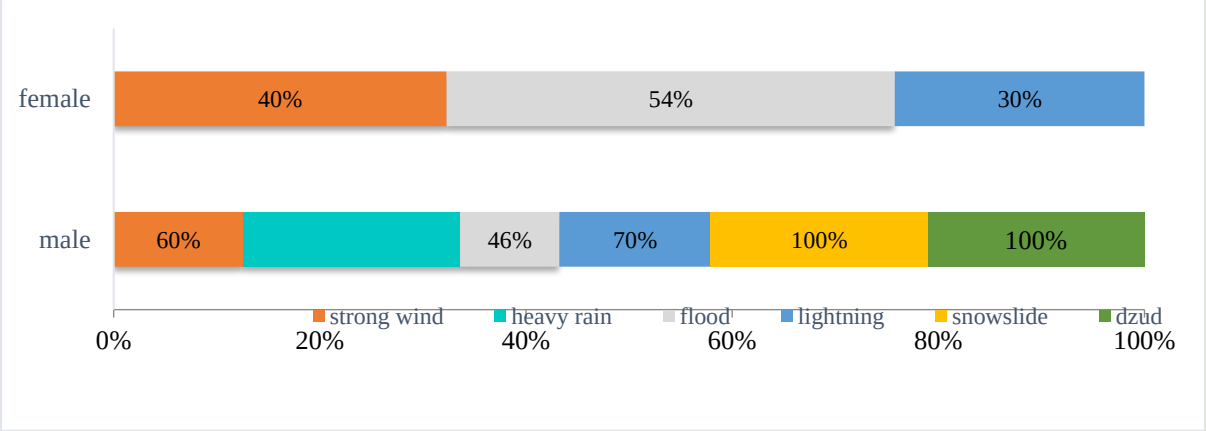



*Figure 7. Ratio of deaths due to climate disaster*

### 2.3.1. Self-assessment of local government representatives

According to local specialists and representatives of government and NGOs, climate change has a negative impact, especially on herders and farmers. Droughts, *dzuds*, floods, precipitation, and climate change are contributing to desertification and river drying. It was repeatedly mentioned that climate change has a direct impact on herders' livelihood including high livestock mortality due to harsh weather, rise of meat prices, loss of homes and shelters due to strong storms and floods, the collapse of fences, and households who lost the loss livestock and home directly fall into poverty.

However, a few positive impacts were mentioned too. These includes herders' desire to have additional income source, increase of households having home-business in addition to the livestock, reducing the number of livestock and herding a small number of quality livestock. Regarding which groups of local community are more vulnerable, all participants believe that herders and farmers with the lowest living standards are the most vulnerable. Other than that, people with disabilities are particularly affected by the lack of employment, the vulnerability of single mothers with many children, vulnerable groups living in ger areas, children and the elderly were also mentioned. In terms of gender, they answered that both men and women are affected, not only women are vulnerable, but men are also affected by severe winter conditions. They also explained that men are more burdened when their families are separated for many months when they are on *otor, a* traditional mobility strategy developed by Mongolian herders to cope with their highly variable and uncertain environment. During this temporary migration herder wives and children live in the soum center during school session.

Survey responses of local specialists and representatives about the effects of climate change included:

- *The most vulnerable groups to climate change are middle-income and lower-income households. For example, some people who produce and sell crops, vegetables, hay and fodder, as well as families who make a living from it, are more affected and have a negative impact on their livelihoods. Our aimag is mainly an agricultural region in the north area and livestock production in the south area. In other words, climate change is having a greater impact on herder households in the eight southern soums.*
- *Herders are the most vulnerable to climate change, especially men. With the start of school, family members and the elderly are staying in the soum to send their children to school and kindergarten, leaving men to fend for themselves and their siblings. Uvurkhangai province*
- *Young herders in rural areas are losing their gender balance due to the fact that young herders are becoming scarce, and parents pay more attention to girls' education and want them to move to urban areas.*
- *Extreme levels of flood danger were occured in many parts of the country. Some bridges have not yet been rebuilt. Residents were locked on the side due to the flood for many days, had their cars run in the flood and struggled financially. In addition, fields which is some households' main source of livelihood and crops were lost.*
- *During the winter, strong winds caused power poles to fall and apartment heating to fail. In addition, four years ago, the basements of many apartments and parking lots were flooded causing significant property damage.*
- *There are more negative effects than positive ones. Drought and dzud have led to the loss of livestock, wildlife and animal diseases, decrease of milk and dairy product, reduce of livestock profits, increase of meat prices, and affected raw materials to become cheaper. People who have lost their livestock moved to the aimag center, but there is a tendency to increase the number of poor people due to lack of jobs. As commodity prices rise, purchases deteriorate and migration to the center increases. Also there are many results such as reduction of crops yields.*

## 1.5. ADAPTIVE CAPACITY

Climate change adaptive capacity is indexed from the open data and the assessment was made on the basis of self-assessment of representation of local government bodies.

### 1.5.1. Adaptive capacity index

The index is based on 6 indicators, of which 5 are positive and 1 is negative (number of people per doctor).

*Table 7. Indicators*

| | Criteria | Unit | Positive / negative | Maximum | Minimum |
|---|---|---|---|---|---|
| **1** | Number of health facilities | number | + | 0 | 1 |
| **2** | Number of people per doctor | number | - | 0 | 1 |
| **3** | Number people covered by social insurance | number | + | 0 | 1 |
| **4** | Number of households connected to electricity | number | + | 0 | 1 |
| **5** | Number of mobile phone users | number | + | 0 | 1 |
| **6** | Number of internet users | number | + | 0 | 1 |

The indicators were based on 2015-2019 data and some data were solely based on the 2019 numerical data. According to the indicators, the group index was estimated 0.52 or moderate adaptive capacity. The number of medical institutions in 2018-2020, the number of people per doctor, the number of people covered by social insurance, household information connected to electricity, the number of mobile phone users in 2015-2019, and the number of Internet users in 2019 were used.

Among adaptive capacity indicators, the most vulnerable indicators were accessibility to health care services, while the strongest indicators were linked to power supply and mobile phone usage. The number of people covered by social insurance and the number of patients per doctor also pointed to vulnerable indicators.

In terms of access to health care services, Ulaanbaatar, Darkhan-Uul, Gobisumber and Dornogovi aimags had the lowest accessibility. Meanwhile, Orkhon, Umnugovi, Bayan-Ulgii, Zavkhan and Dornod aimags had the highest access. Regarding the number of patients per doctor, Orkhon, Bulgan, Arkhangai and Zavkhan aimags also have good results. Gobisumber and Dundgovi aimags were leading in terms of a number of people covered by social insurance, while Dornogovi, Selenge, Arkhangai and Bayan-Ulgii aimags had the lowest number.

*Table 8. Indexes of indicators*

| | Administrative unit (aimags) | **Access to health facilities** | **Number of people per doctor** | **Number people covered by social insurance** | **Number of households connected to electricity** | **Number of mobile phone users** | **Number of internet users** |
|---|---|---|---|---|---|---|---|
| | National average | 0.46 | 0.66 | 0.66 | 0.01 | 0.64 | 0.25 |
| **1** | Zavkhan | 0.15 | 0.04 | 0.77 | 0.01 | 0.66 | 0.01 |
| **2** | Gobi-Altai | 0.60 | 0.60 | 0.76 | 0.01 | 0.65 | 0.29 |
| **3** | Bayan-Ulgii | 0.13 | 0.33 | 0.82 | 0.00 | 0.68 | 0.30 |
| **4** | Khovd | 0.35 | 0.16 | 0.76 | 0.02 | 0.70 | 0.11 |
| **5** | Uvs | 0.33 | 0.40 | 0.78 | 0.00 | 0.69 | 0.15 |
| **6** | Orkhon | 0.01 | 0.00 | 0.77 | 0.00 | 0.60 | 0.05 |
| **7** | Uvurkhangai | 0.49 | 0.16 | 0.64 | 0.01 | 0.71 | 0.13 |
| **8** | Bulgan | 0.57 | 0.01 | 0.77 | 0.01 | 0.72 | 0.05 |
| **9** | Bayankhongor | 0.64 | 0.22 | 0.79 | 0.01 | 0.69 | 0.03 |
| **10** | Arkhangai | 0.52 | 0.06 | 0.83 | 0.01 | 0.76 | 0.22 |
| **11** | Khuvsgul | 0.52 | 0.55 | 0.80 | 0.01 | 0.71 | 0.14 |
| **12** | Tuv | 0.28 | 0.66 | 0.78 | 0.00 | 0.66 | 0.41 |
| **13** | Gobisumber | 0.85 | 0.53 | 0.01 | 0.01 | 0.58 | 0.15 |
| **14** | Selenge | 0.37 | 0.53 | 0.88 | 0.00 | 0.62 | 1.08 |
| **15** | Dornogobi | 0.75 | 0.19 | 0.90 | 0.01 | 0.55 | 0.14 |
| **16** | Darkhan-Uul | 0.85 | 0.20 | 0.70 | 0.00 | 0.60 | 0.27 |
| **17** | Umnugobi | 0.01 | 0.44 | 0.64 | 0.01 | 0.40 | 0.18 |
| **18** | Dundgobi | 0.64 | 0.67 | 0.16 | 0.01 | 0.71 | 0.29 |
| **19** | Dornod | 0.17 | 0.25 | 0.72 | 0.01 | 0.65 | 0.22 |
| **20** | Sukhbaatar | 0.24 | 0.33 | 0.76 | 0.00 | 0.65 | 0.24 |
| **21** | Khentii | 0.64 | 0.26 | 0.72 | 0.02 | 0.65 | 0.46 |
| **22** | Ulaanbaatar | 0.94 | 1.00 | 0.51 | 0.00 | 0.46 | 0.54 |

### 1.5.2. Self-assessment of local representatives

Within the scope of risk assessment, an open-ended survey regarding quality of and accessibility to health care services, cooperation between local people and herder cooperatives, climate change and disaster risk management was conducted among local authorities and environmental specialists. Of the respondents, 27 were female and 20 were male, of whom 6 were male and 13 were female, and 14 were male and 14 were female tourism and social policy and gender specialists.

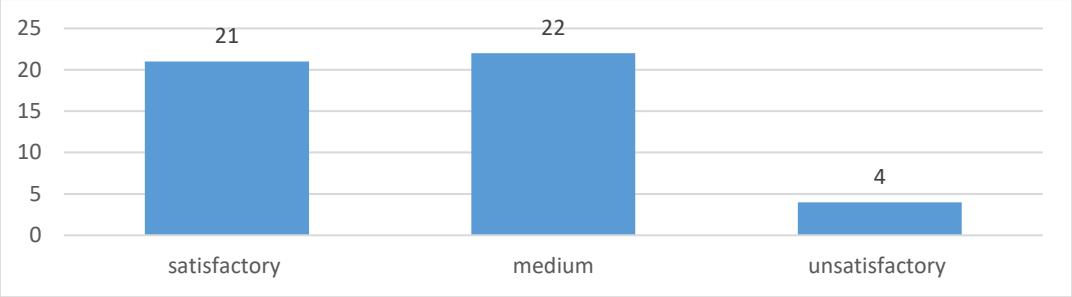



*Figure 8. Access to local health care services (n=47)*

Upon estimating the accessibility to local health care services in accordance with the criteria, the number of health care facilities was compared to the size of the population and it is concluded that the number of health care facilities were not sufficient at the national level. However, local representatives rated the health care services in their area as 45% as satisfactory and improving, 47% as medium and 8% as unsatisfactory. The survey participants' evaluation compared the current conditions to previous conditions. The results show that the accessibility to and quality of health care services vary from area to area and even dissimilarities were observed not only within aimag or soum level but also at the bagh level.

*Example 5 Umnugobi aimag*

*Access to health care is satisfactory. In recent years, large investments have been made in the health sector. Plus, international projects and programs to promote public health are under implementation.*

*Example 6: Tuv aimag*

*It is inevitable that access to health care needs to be improved.*

*Survey participants of Arkhangai, Bayan-Ulgii, Uvurkhangai, Zavkhan and Khuvsgul aimags mentioned that the access to health care services was poor and needed to be improved. Especially for nomadic herder households, access to health care services is limited.*

*Example 7: Uvurkhangai aimag*

*There are a lot of problems related to health care service accessibility. Accessibility is extremely unsatisfactory. Plus, the required human resource is insufficient. Due to climatic conditions, herders have been increasingly making otor movement (remote pasture) in recent years and their inaccessibility to health care services has also grown.*

*Example 8: Zavkhan aimag*

*Access to healh care services is challenging. There are many soums and baghs where herders travel 200-300 km for medical services. The fact that they make otor movement during winter raises a challenge for people to access health care services.*

*Example 9: Khuvsgul aimag*

*Despite existing facilities, staff and equipment are unsatisfactory.*

*Factors hindering the accessibility to health care services are related to the number of health care facilities at the local level, number of patients per doctor, as well as distance and skills of medical professionals. Two soums in Gobi-Altai aimag and one soum in Zavkhan aimag are not connected to the central power grid. Despite other aimags and soums are connected to the central power grid, it is not the case at bagh level and research or data on this matter is incomplete.*

*Example 10: Khentii aimag*

*The soum is fully connected as well as 3 baghs. Herders use renewable energy and a detailed research is unavailable.*

Mobile phones and the internet are available at all aimag and soum levels and are utilized at all communication levels.

*Example 11: Bulgan aimag*

*The use of internet and mobile phones have been fully introduced in our aimag. Weather forecast is delivered to the herders via mass messaging.*

*Example 12: Uvurkhangai aimag*

*It is fully introduced and used. Soums report weather forecast as well as soum organized events; each soum has an internet page and aimag integrated information site is accessible to everyone and all groups, including schools and kindergartens have information pages and citizens access them quite frequently. Nationwide pages also appear to have been accessed regularly. In addition, gender-related information is routinely shared with 10 local community groups.*

According to the survey participants, in spite of existing disaster management, prevention, relief and adaptation programs in the local area and previously implemented programs, public awareness and knowledge are still inadequate. Participants also mentioned local

disaster risk programs such as “Gobi Wolf”, “Mazaalai”, “Local Communities with Adaptive Capacity” and “Green Gold” that were implemented by local authority, NEMA and international donor organizations such as World Vision, Mercy Corps.

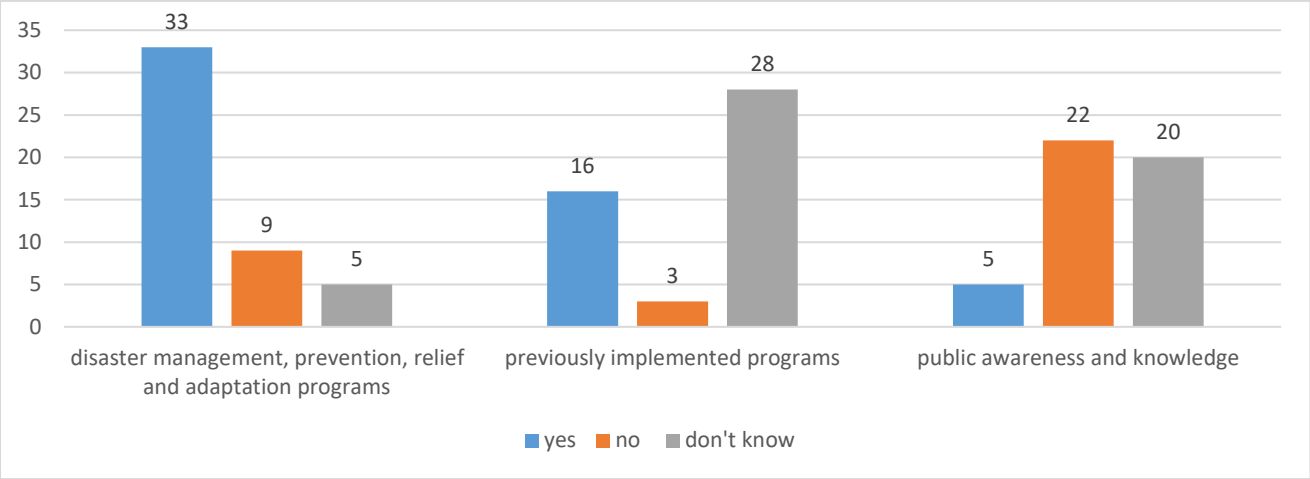



*Figure 9. Local disaster prevention program and public awareness (n=47)*

Notwithstanding trainings and information provided within the scope of the above-mentioned projects, the results are unsatisfactory, as it can be seen from the responses of the survey participants. Of the participants, 29 responded that the training was conducted, and information was given to the public, while 18 responded that it was not conducted, and they were not aware.

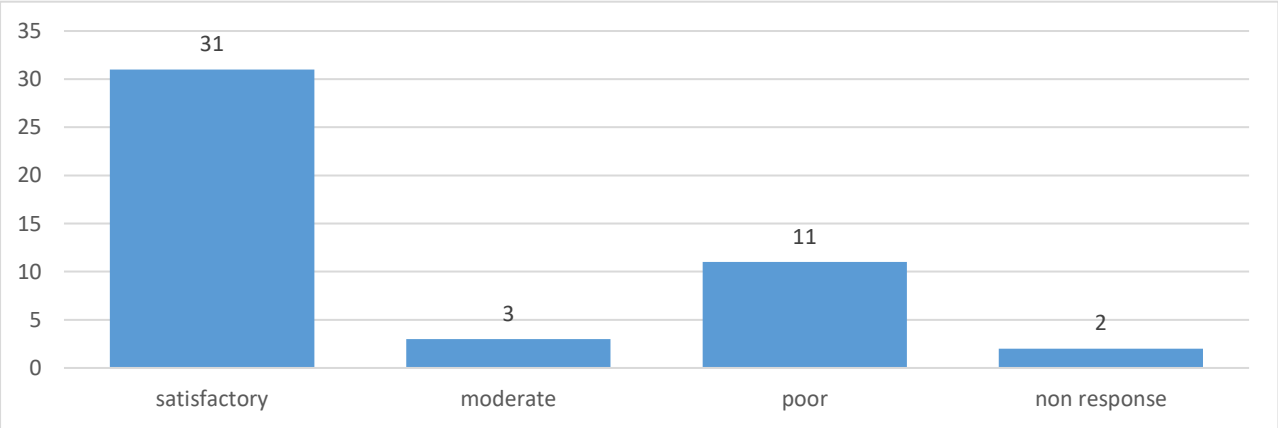



*Figure 10. Capacity to provide services to local communities in the event of a disaster (n=47)*

The capacity to provide services to local people during disaster or emergency situations was considered satisfactory by 66% or 31 of the respondents, moderate by 3% or 6, poor by 11 or 24% and 2 participants or 4% left this question unanswered.

Although there are herder cooperatives, farmers' cooperatives, associations of the self-employed and small and medium enterprise groups in all rural areas, the level of cooperation with local authorities varies. Of the 47 government employees surveyed, 42 work with local herders, farmers, artisanal miners, and SME cooperatives to provide loans, organize trade fairs, fund forest rehabilitation, and offer business management training. Respondents from Sukhbaatar and Dornod aimags did not have clear information regarding how local partnerships and cooperatives take place.

It can be concluded that at the local level, infrastructure for communication and power supply have been established. Herders, farmers, artisanal miners and other types of business entrepreneur cooperatives and groups are organized and are cooperating with local and international organizations and continue to gain some support services.

Additionally, the local government agencies have full potential to review their action plans aimed at citizens, evaluate their results, present climate change and disaster risk prevention measures and conduct community-based activities.

## 2.5. VULNERABILITY

Based on the primary and secondary data, the climate change sensitivity assessment for gender and marginalized groups was carried out and it was concluded that our country as a total has "**high sensitivity**" to climate change.

**Exposure:** In terms of amount of land damage recorded between 2003 and 2019 and a number of cases of drought and *dzud* that occurred since 1940, the climate change exposure points at **high sensitivity** with an the **exposure index of 0.12**.

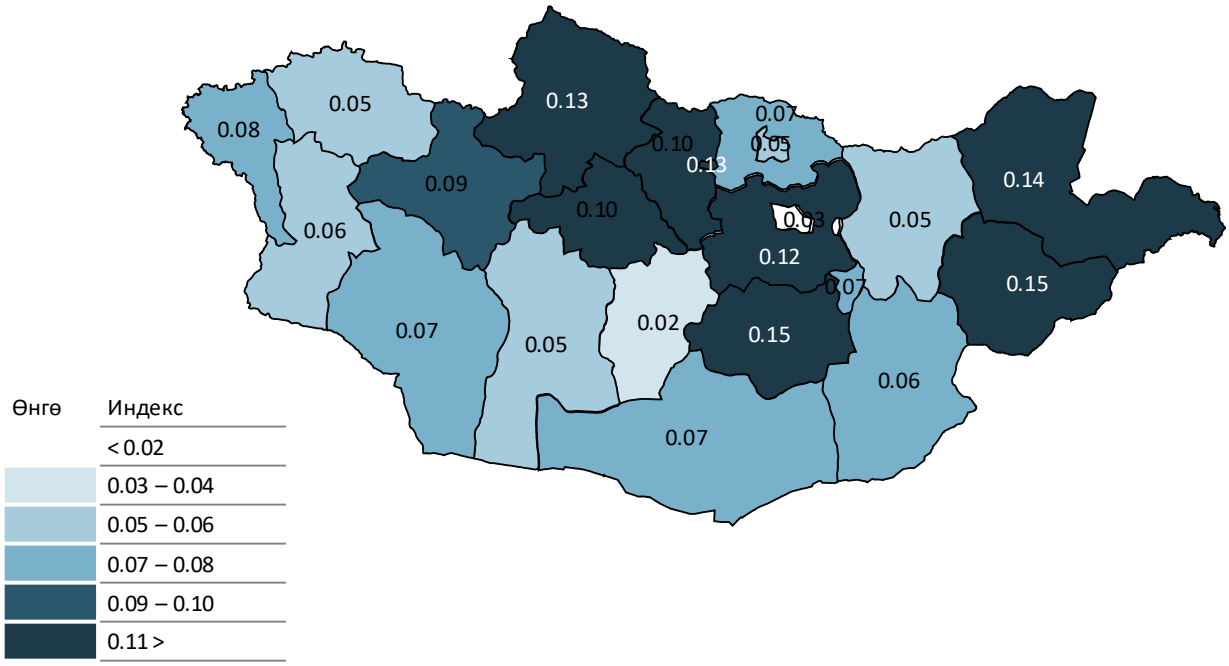



*Figure 11. Exposure index by aimag*

**Sensitivity:** According to the criteria, the **sensitivity** of the group index was **0.054 or medium**. The sensitivity index was highest in Zavkhan aimag at 0.063 and lowest in Ulaanbaatar and Orkhon aimags at 0.01, respectively.

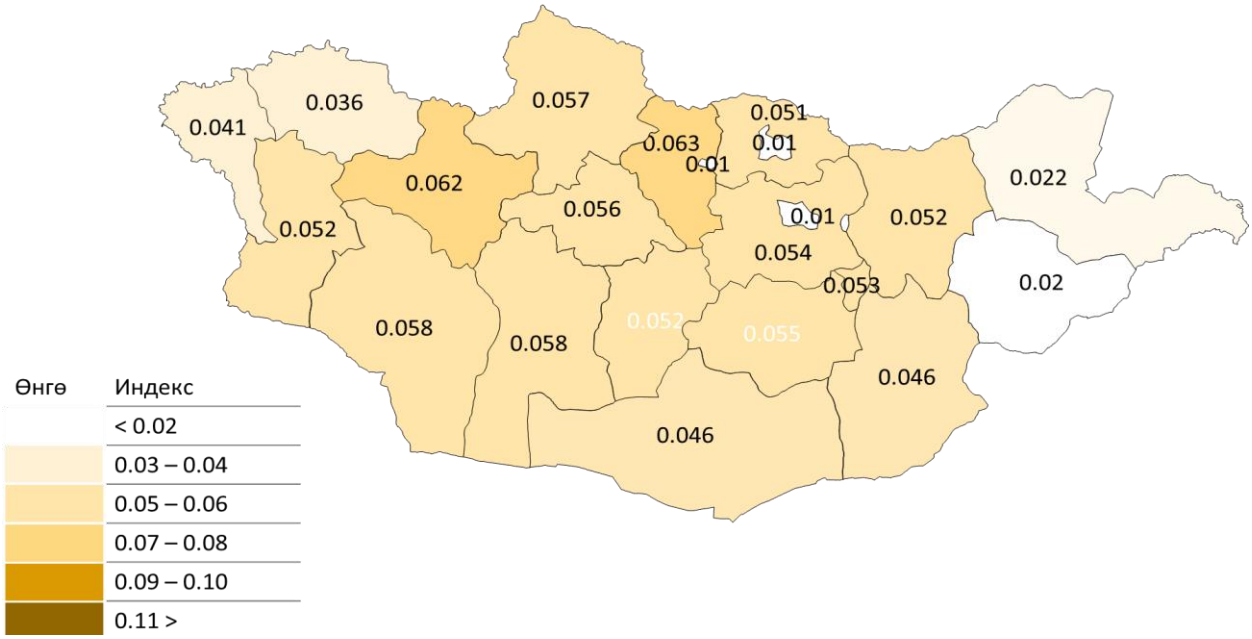



*Figure 12. Sensitivity index by aimag*

**Adaptive capacity:** According to the criteria, the group index was **0.029 or low sensitivity**. The adaptive capacity index is highest in Orkhon aimag at 0.02 and lowest in Ulaanbaatar and Gobi-Altai aimags at 0.09.

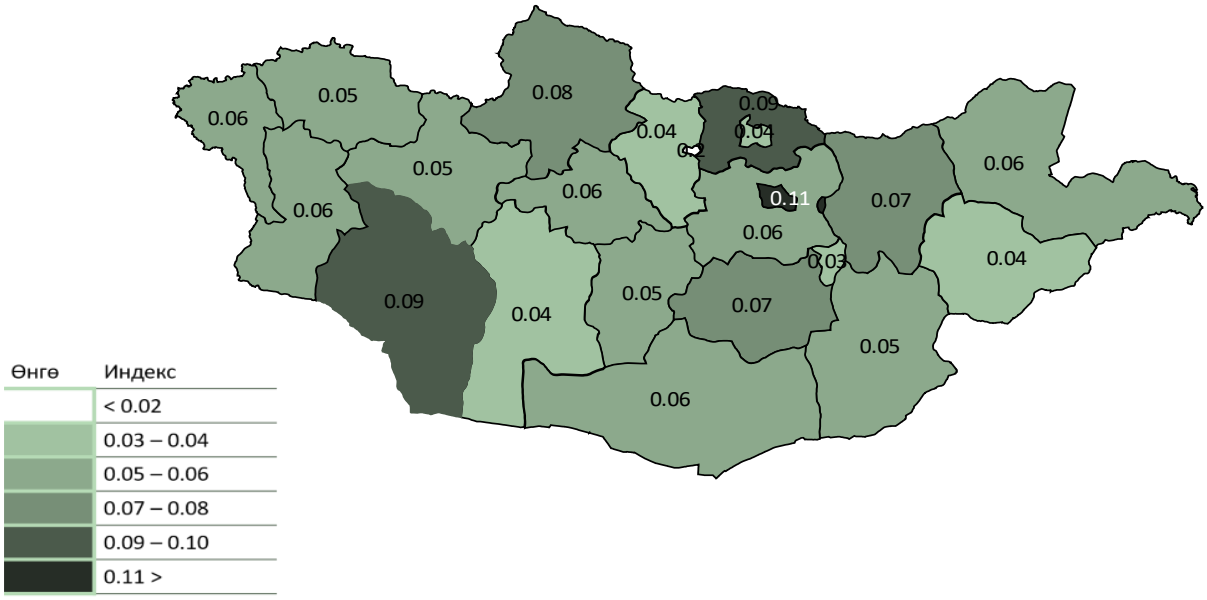



*Figure 13. Adaptive capacity index by aimag*

**Vulnerability:** Upon calculating the index for each component of the sensitivity assessment for climate change, the overall vulnerability index was **0.153 or higher**.

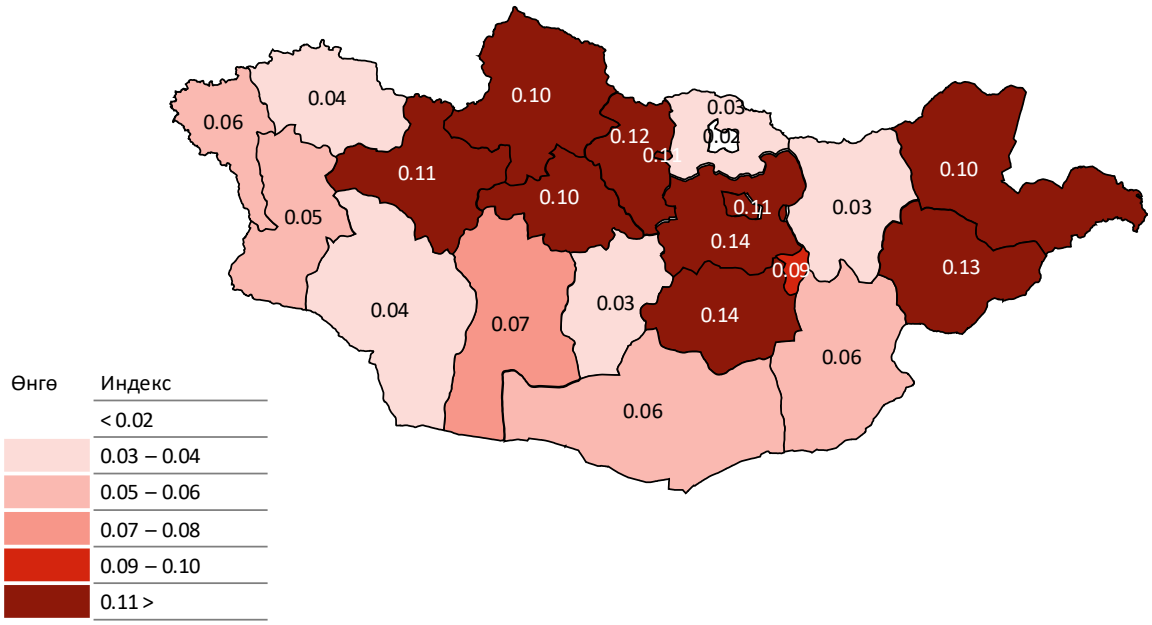



*Figure 14. Vulnerability index by aimag*

Main factors contributing to the high vulnerability to climate change are environmental and primarily the frequency of drought and dzud as well as land degradation. Other criteria had more social and infrastructure qualities. Upon reviewing each of these criteria, the infrastructure-related indicators such as access to electricity, internet and mobile phone usage and accessibility to health care services per capita were satisfactory and the vulnerability was low. However, some indicators contributing to higher vulnerability were the number of patients

per doctor, level of social insurance coverage, poverty, unemployment, and life expectancy. Although, it is necessary to include the number of herder households in the sensitivity criteria, since it is a traditional occupation, the number of herder households at the local level will be inevitably high. The fact that our country is experiencing land degradation and a high frequency of drought and *dzud* will severely affect herder households, informal sector workers, poor households and the unemployed. Therefore, it can be concluded that, these lead to a high vulnerability.

# CHAPTER 3. CONCLUSION AND RECOMMENDATIONS

Climate change has been observed in Mongolia and has had a significant impact on the climate and environment, which in turn affects people's daily activities, herding, farming and other pursuits.

The purpose of the assessment was not to identify environmental impact of climate change but to study how this phenomena impacts social life, identify groups affected by climate change and contribute to development and implementation of relevant policies and programs.

In this context, an attempt was made to employ social indicators as a criterion and explain their dynamics in relation to climate change. Changes in social indicators were purely influenced by social, economic, political, international and geographical factors and it has been observed that, in recent years there has been a strong tendency to be impacted by climate change. The most clear example of this is, following major *dzuds* that occurred in the country between 2000 and 2010, a large number of herders moved to urban areas.

## 3.1 CONCLUSION

Vulnerability assessments for gender and marginalized groups of Mongolia were completed upon adopting an international methodology developed by the IPCC and identified regions and groups vulnerable to climate change. At the national level, the vulnerability index is 0.153 or vulnerable and by location, Zavkhan, Bulgan, Tuv, Sukhbaatar, Dundgobi and Dornod aimags have the highest vulnerability of 0.11, 0.12 and 0.14, respectively. Meanwhile, the indices of Uvurkhangai, Selenge, Khentii and Darkhan-Uul aimags show the best indexes of 0.02 and 0.03.

- In terms of each group indicators, with its share in informal agriculture, poverty and herder households were high, Zavkhan aimag was the most sensitive.
- In terms of social groups, herder households with low living standards as well as those with no fixed employment or income and those who sustain their livelihood with natural resources were the most sensitive.
- In terms of gender, both men and women are affected and are equally sensitive. However, men are at greater risk of direct physical exposure. Whereas, despite climate change, women already experience basic inequality issues such as economic capacity, participation in decision making, gender-based violence and unpaid household labor due to stereotypes. When women are affected by climate change, the inequality may further worsen. In particular, women herders, women with children

under the age of 18 and single mothers have less social participation and those living in rural areas have no possibility to take part in events organized in aimag and soum centers and the people who are far from social services are more sensitive to climate change. Men tend to face physical risks more and disaster mortality for men is highest.

- Young herders living below the poverty line are equally sensitive. This is because the main source of income for most herders comes from livestock products and they have a limited capacity to generate other sources of income, most have basic or secondary school education, are lacking vocation and female herders have a higher level of education than the male.

In terms of adaptive capacity, infrastructures such as communication and electricity supply have been established; herders, farmers, artisanal miners and other types of business entrepreneur cooperatives and groups are organized and are cooperating with local and international organizations and continue to gain some support. These indicators show that public information network has been established at the local level.

Meanwhile local government bodies have full potential to review their community-based action plans, evaluate results, present climate change and disaster risk prevention measures and conduct community-based activities. Unfortunately, they have been unable to do so. However, in order to make use of this potential and carry it out, all levels of data, records, and research need to be improved.

Concerning the records and data collection, access to health care services in rural areas is satisfactory; citizens are provided with electricity, mobile phones and internet access. However, the data collected from local communities claim that the access to health care services is unsatisfactory. In terms of availability of numerical data, there was a lack of data records on sex and age disaggregation at the national level; in particular, there are many issues such as inadequate classification of emergency situation or disasters; while gender classification exists, the location was unavailable or the location related data only exists starting from the recent year.

Concerning the records and data collected from local level, accessibility to health care services was poor yet power supply, mobile phone and internet usage and public information networks are well established. However, there is a need to use this infrastructure and improve research and data

## 3.2 RECOMMENDATION

Based on the results of the vulnerability assessment, following recommendations are made:

A. In order to develop a climate change adaptation plan and take characteristics of each aimag and local area into account, it is necessary to make the vulnerability assessment more in-depth from the social aspect at the aimag level and enrich it with participatory-quality research data. In other words, involve representatives of social groups of each local area and apply a participatory self-assessment methodology; and, while doing so, it is necessary to conduct separate interviews and discussions with representatives of aimag's different local groups. For example, grouping by occupation, age and gender.
B. For the purpose of ensuring gender equality in the development of climate change adaptation plan, it is crucial to ensure gender equality in the planning team, implementation team, regions and projects and programs; cooperate with gender experts and consultants; organize and make decisions in cooperation with the National Committee on Gender Equality. While doing so, it is important to create conditions for equal participation of both sexes.
C. A baseline survey on public awareness of climate change has not been conducted. According to experts of 21 aimags, awareness in most areas is insufficient and there is a general tendency to understand climate change only as a weather change.
D. Low income herder households and the unemployed with lower living standards, living in rural areas are dependent on environment and climate. In order to reduce this dependency and provide them with alternative sources of income that will increase their employment in the future, comprehensive measures shall be implemented.
E. Conduct a survey on public awareness, understanding and attitudes towards climate change, enhance outcome-based knowledge and disseminate systematic and comprehensive knowledge. Although mobile phones and internet are now available in most areas and it is possible to organize this electronically, attention must be paid to ensure that the most vulnerable groups such as those incapable of using internet or with low living standards or the elderly are not left out.
F. There is a need to improve official records and statistics on climate change and hydro-meteorological hazards; enter them into a transparent and open database and make regular statistics grouped by gender, location and age.
G. Make the statistical data and records more detailed and enable the option to view the national level indicators by aimag, gender and age group. In particular, it could be possible to make the criteria for sensitivity and adaptive capacity more refined if: information on social insurance and welfare, poverty indicators, herder household indicators and livestock structure were available at the household level; agricultural indicators were viewed in terms of workforce gender, age group, utilised equipment and location.

H. At the local level, ensure that local specific information is provided by age, gender, education, and gender of the head of the household. For example, the number of participants in various capacity building trainings, the number of herders, farmers' cooperatives, artisanal miners, and SMEs should be recorded by age group and gender.
I. Introduce risk management projects and programs planning at the local level in an inclusive manner, categorizing local people by age, gender and living standards.
J. It is recommended to study climate change at the local level, with the participation of local people, herders, farmers, artisanal miners and SMEs, to conduct self-assessment, and to develop an adaptation and coping program based on this assessment.
K. As we didn't review aimags' disaster management programs and plans, it is necessary to conduct a gender audit and assess whether gender and social participation is ensured.
L. Cooperate with other organizations and projects implementing programs and activities aimed at vulnerable groups and herders, and ensure the coordination with current activities and that there are no duplications or gaps.

# APPENDIXES

## APPENDIX 1. INTERVIEW QUESTIONS

1. How do you measure climate change?
2. How is climate change taking place in our country?
3. In your opinion, which group is most affected by climate change?
4. How do you see the impact of climate change on local communities?

## APPENDIX 2. SURVEY QUESTIONS

1. Aimag name:
2. Workplace
3. Position
4. Gender
5. How is the impact of climate change is visible in your community? What kind of changes have taken place in the past few years? /Please think about the cases such as drought, dzud, disaster or a change of precipitation observed in your aimag_ local area/
6. What were the positive and negative consequences of these changes? How do you see its impact on lives and livelihoods of the local people, local society and economy?
7. Which social groups are most vulnerable to these climate change consequences?
8. What is the difference between men and women in their exposure to climate change? How does climate change affect social groups such as the elderly, children and people with disabilities differently?
9. Which groups in which sectors are most at risk in the future?
10. What is people's living standard? What are the key sectors that sustain the livelihood and income for your local people?
11. In order to make a living, what forms of informal employment or natural-resource-based livelihoods are used by people? Do you have statistics and research about those people? What kind of research was done? /herder, farming, nut picking, artisanal mining, etc./
12. What percentage of your local population lives below the poverty line?
13. What percentage of your community is covered by social welfare programs?
14. What is the school dropout rate in your area? Is there a difference in dropout for boys and girls? From which class does the dropout difference is evident? Is there data or research that records and reviews it?
15. In recent years, has there been any new, unprecedented disease related to climate change?
16. What is the availability of health care services in your area? How far are the aimag center and soum hospitals for the citizens who reside in remote or rural areas?
17. Are there any partnership and cooperative for herders, farmers and the self-employed? If so, how do the locals work with them?
18. What are the possibilities to provide services to people living in rural areas during disasters or emergencies?

19. Are there any soums or baghs in your area that are not connected to the central power grid? Approximately how many households live without electricity?
20. Has any training or program on climate change been implemented in your area?
21. What are people's perception and knowledge on climate change?
22. Does your aimag or local area have a disaster management, prevention, response and adaptation program?
23. Has there been a disaster risk program in your aimag or local area? Who implemented this program?
24. Is the use of internet and mobile phones fully introduced in your area? Is internet or mobile phone used to disseminate any services or information? If so, for example, for which service?

## APPENDIX 3. DETAILED IMAGES AND TABLES FOR THE CRITERIA

**A. Data on summer, 2015-2019**


*Figure 15. Data on summer, 2015*

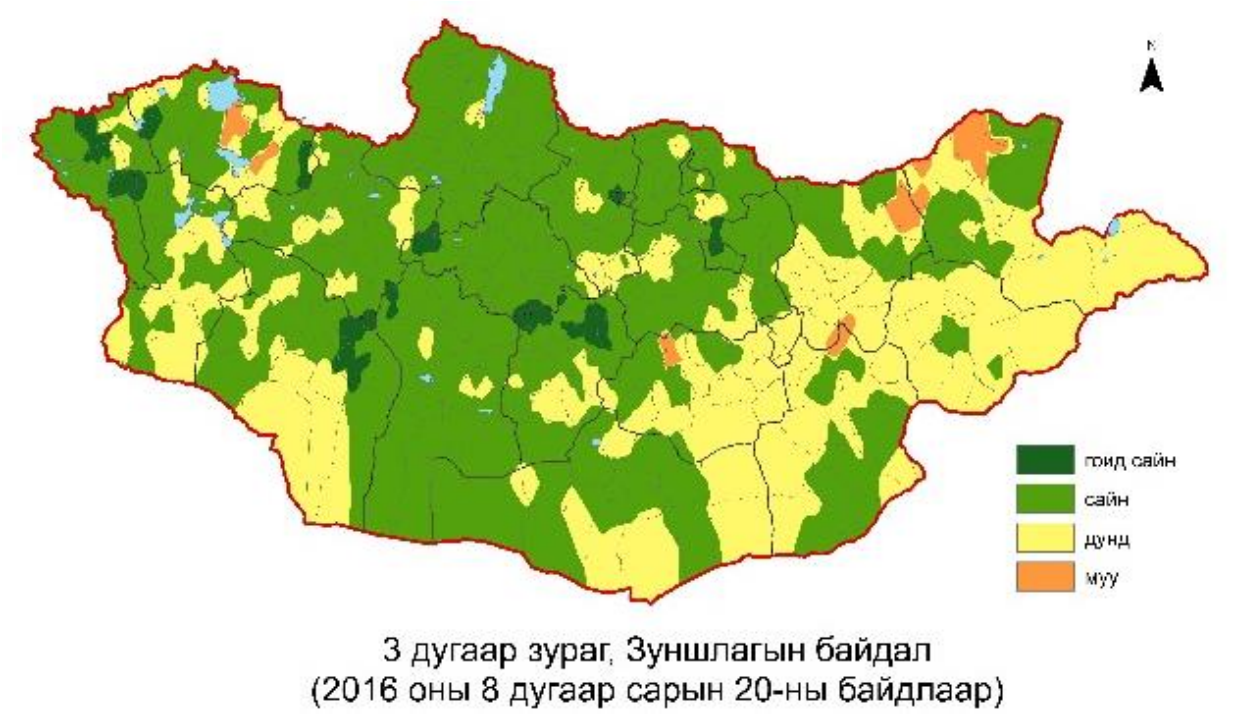



*Figure 16. Data on summer, 2016*

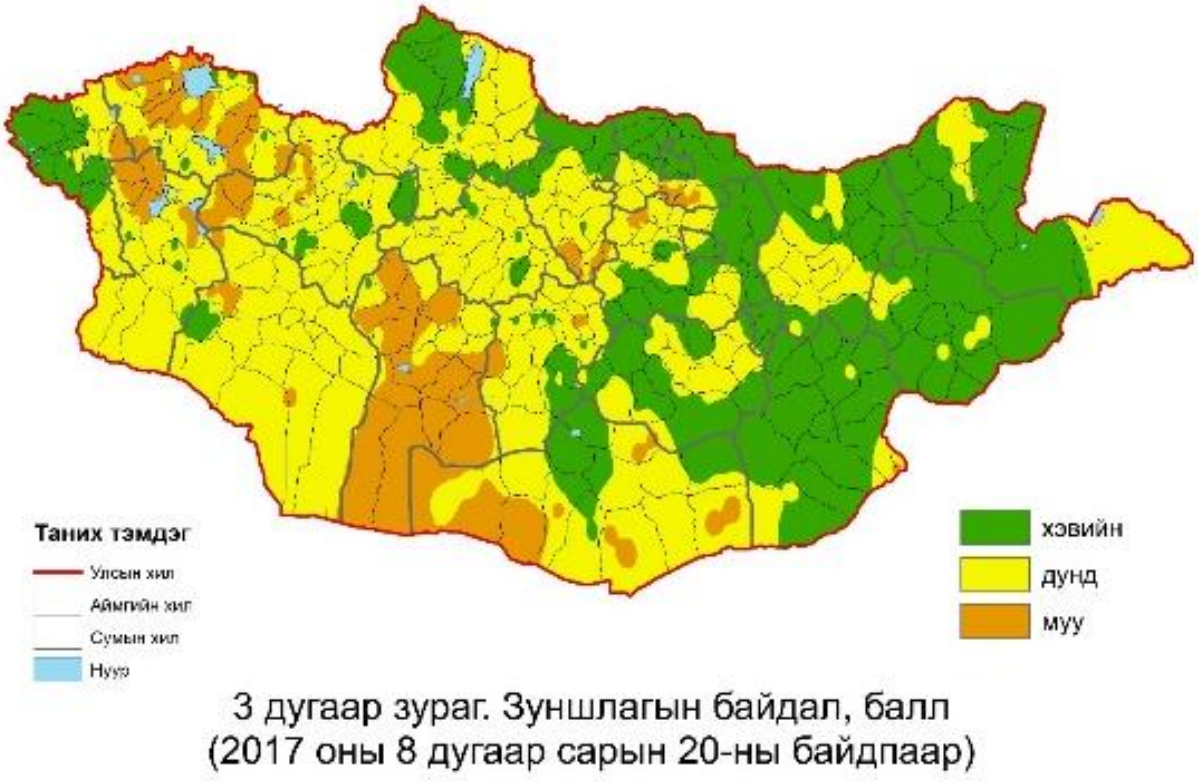
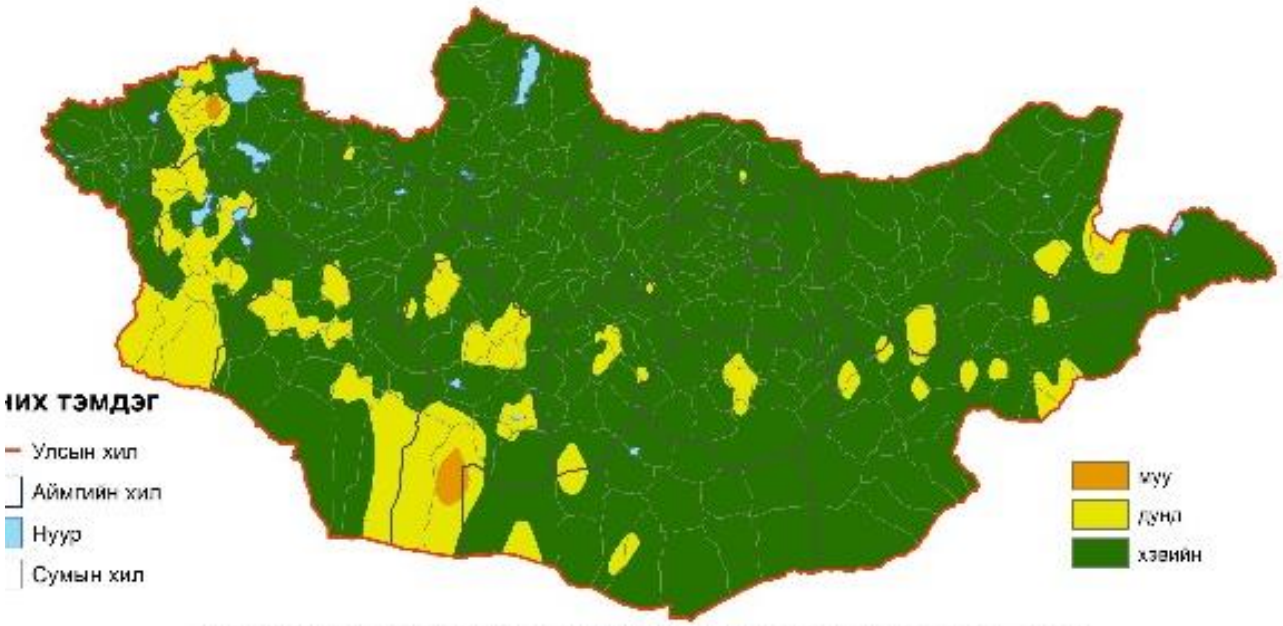
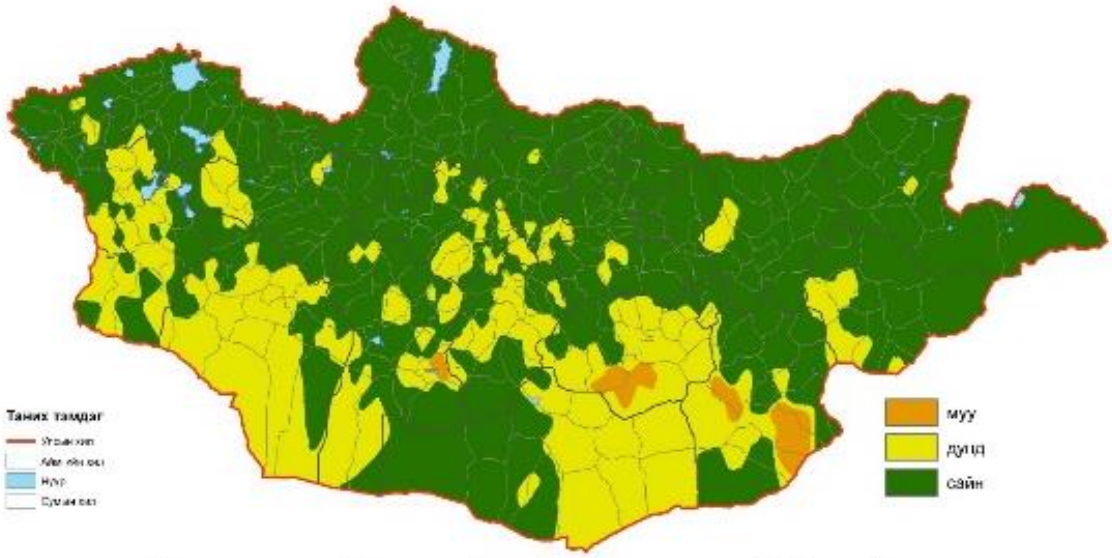



*Figure 17. Data on summer, 2017*




3 дугаар зураг. Бэлчээрийн ургамлын ургалтын байдал, балл
(2018 оны 8 дугаар сарын 20-ны байдлаар)

*Figure 18. Data on summer, 2018*




3 дугаар зураг. Бэлчээрийн ургамлын ургалтын байдал, балл
(2019 оны 8 дугаар сарын 20-ны байдлаар)

*Figure 19. Data on summer, 2019*

**B.2015-2020 snow thickness data**

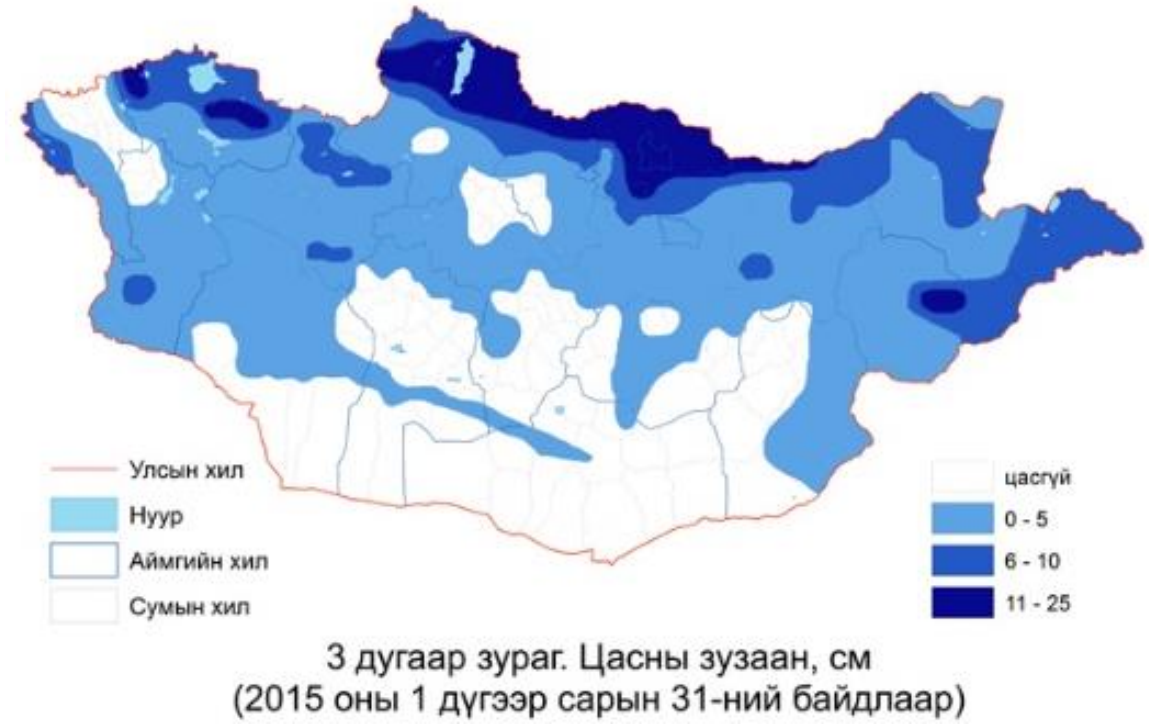



*Figure 20. Snow thickness in 2015, cm*

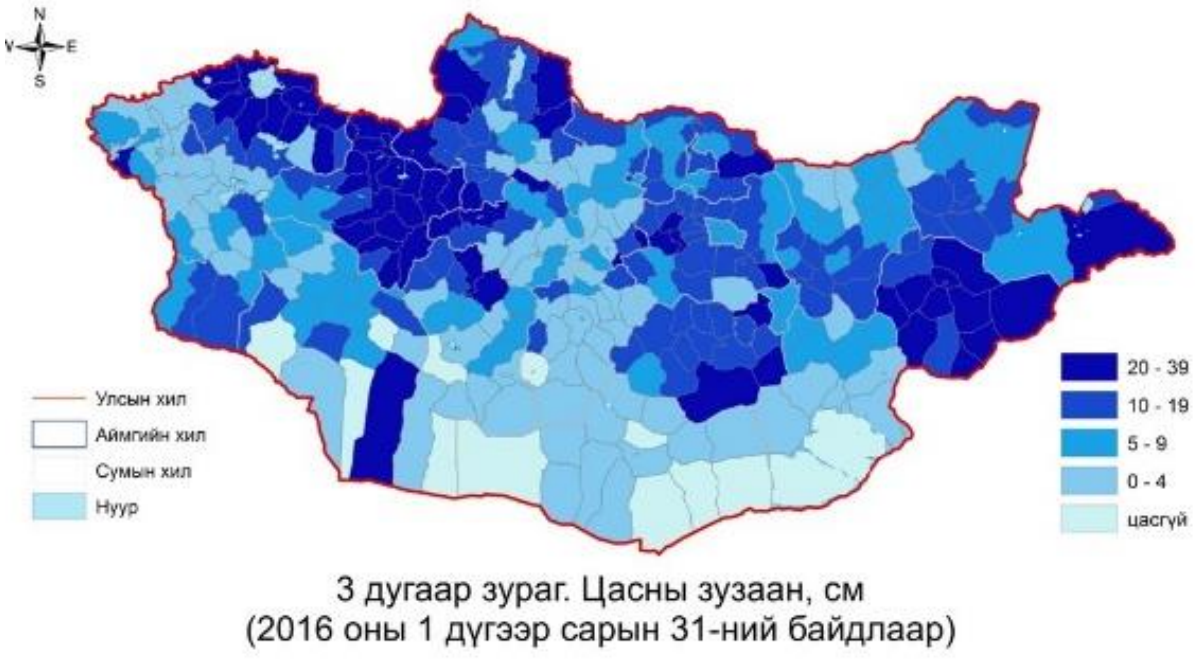
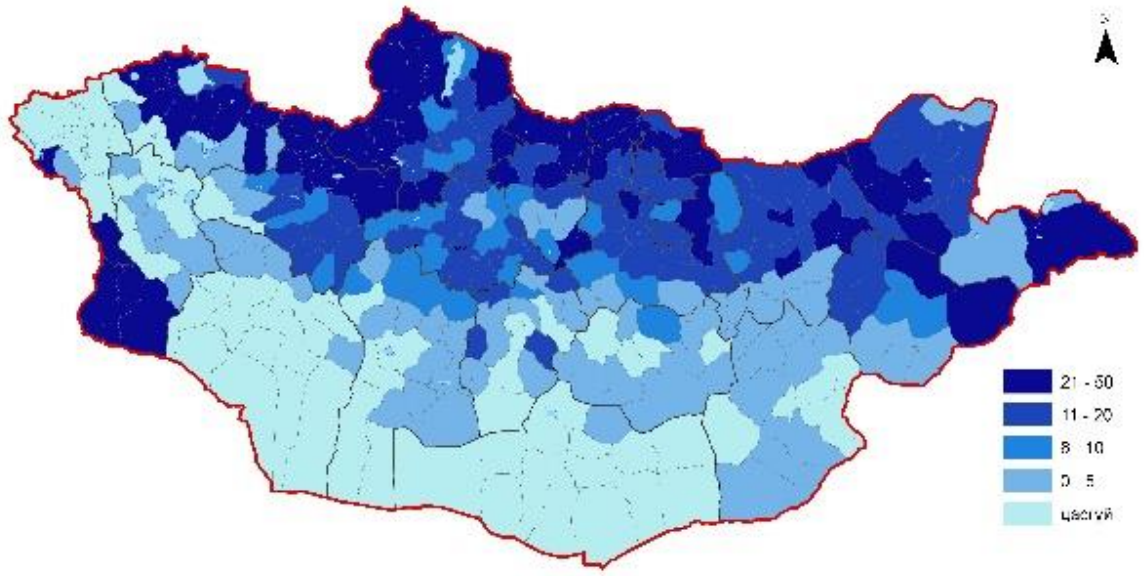



*Figure 21. Snow thickness in 2016, cm*




3 дугаар зураг. Цасны зузаан, см
(2017 оны 1 сарын 31-ний байдлаар)

*Figure 22. Snow thickness in 2017, cm*

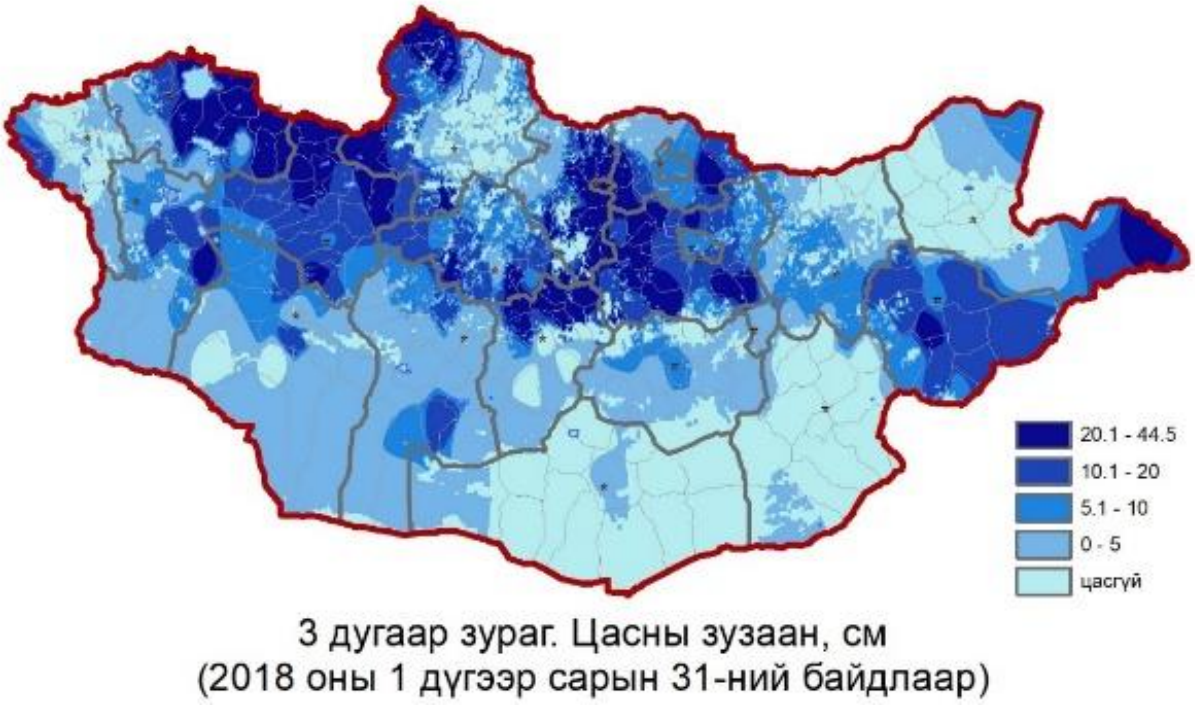



*Figure 23. Snow thickness in 2018, cm*


*Figure 24. Snow thickness in 2019, cm*

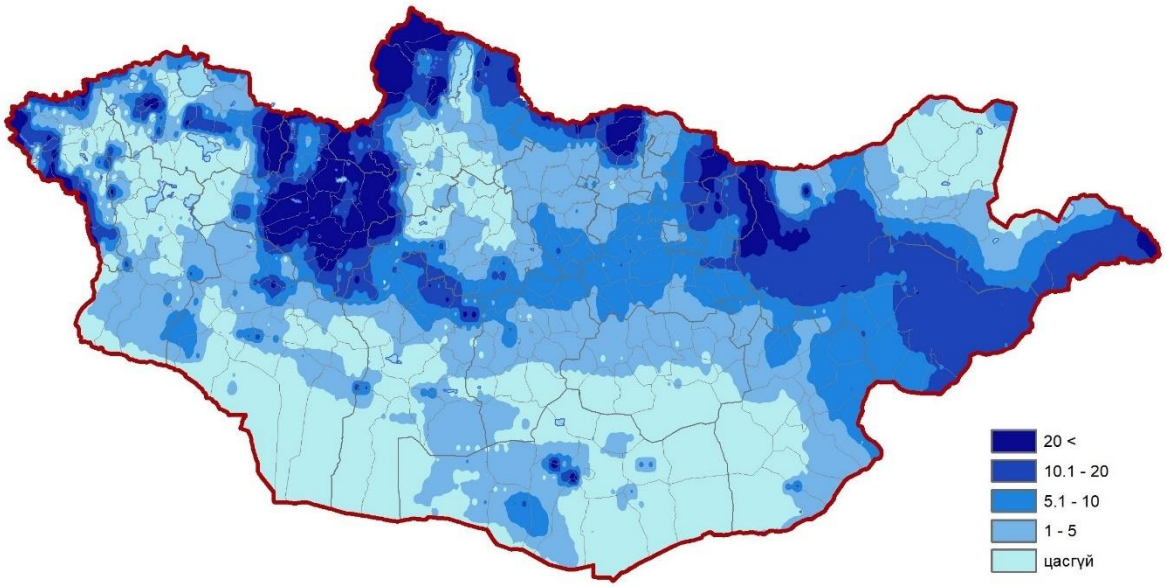



*Figure 25. Snow thickness in 2020, cm*

### C. Land damage (land classification)

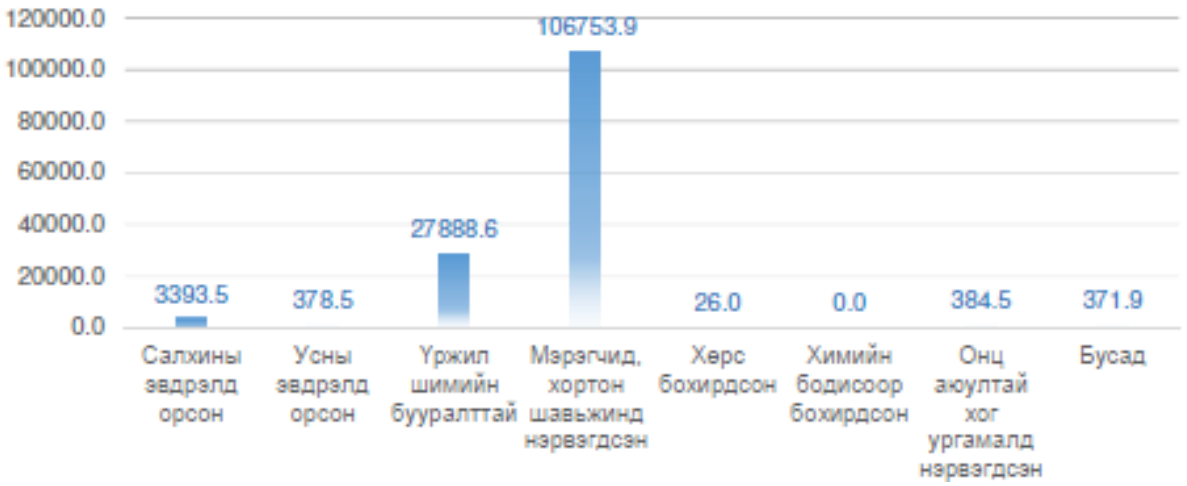



*Figure 26. Damage to arable land, ha*

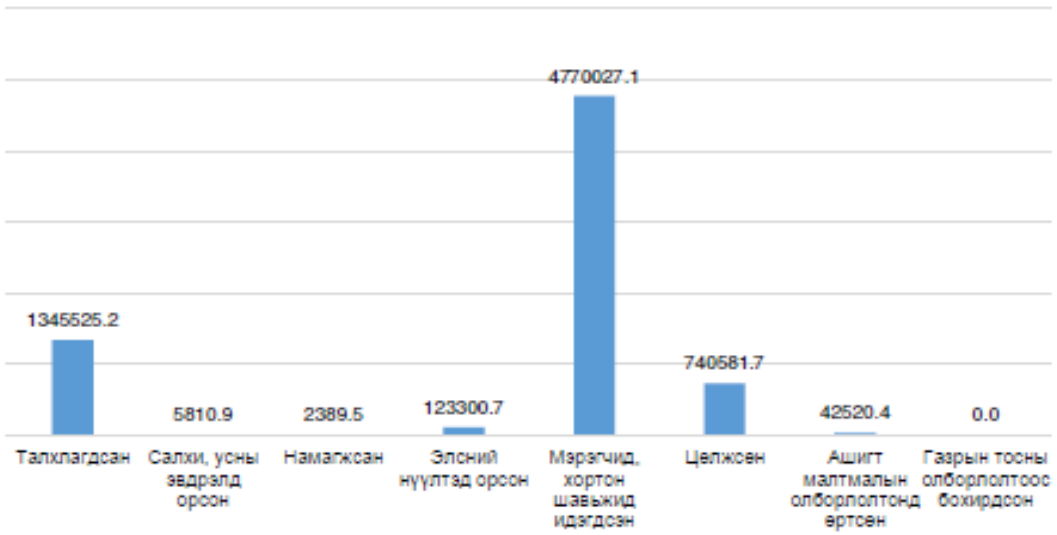



*Figure 27. Damage to pastures, ha*

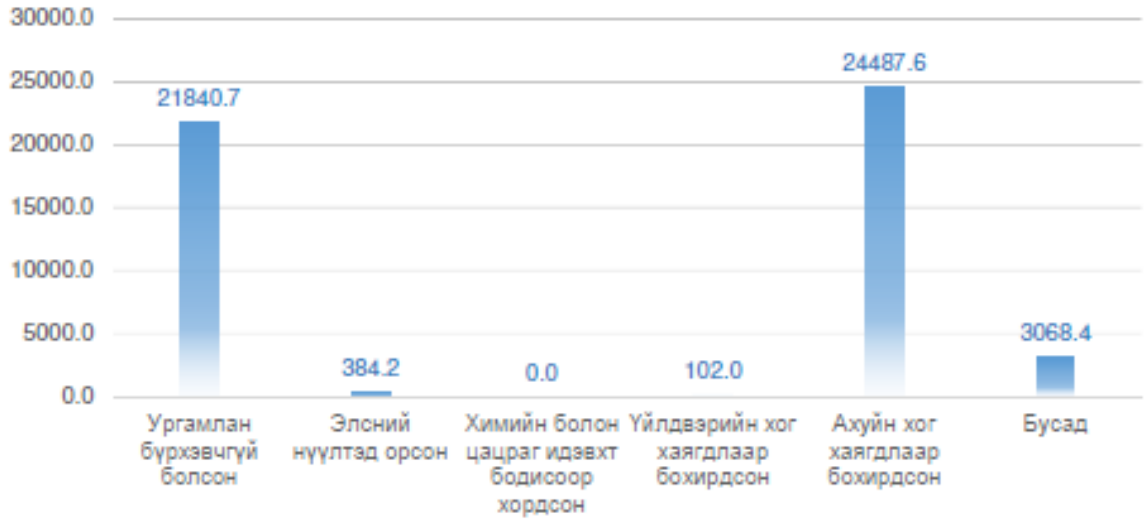


*Figure 28. Land damage in urban, rural or other settlements, ha*


*Figure 29. Damage to forest lands, ha*


*Figure 30. Damage to water reservoirs, ha*

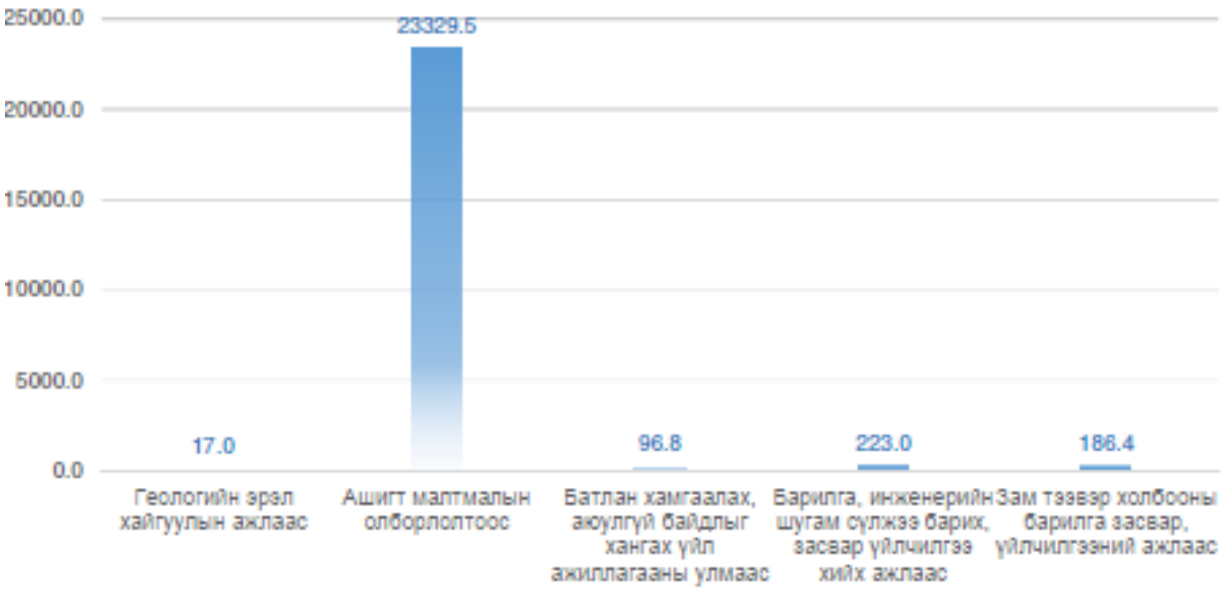



*Figure 31. Excavated and damaged land, ha*

*Table 9. Climate change in aimags*

| No | Aimag name | Emerging changes |
|---|---|---|
| 1 | Arkhangai | - Dzud, seasonal changes, fire, decrease in water volume<br>- Change is obvious. Rain that does not fall on time; extremely heavy rain or rainy windstorm |
| 2 | Bayan-Ulgii | - Flood and water disaster |
| 3 | Bayankhongor | - Drought, dzud |
| 4 | Bulgan | - Land is overgrazed due to a large number of migrants,<br>- Poor soil infertility; severe soil degradation, hence, plant yield is meager.<br>- Drought and dzud has resulted in livestock mortality increase. |
| 5 | Gobi-Altai | - Decline in precipitation and drought is occurring.<br>- 79.5% of the total area is desertified, soil salinity has increased and source of spring is drying up.<br>- Number of stormy days has increased, pasture yields are declining due to a lack of precipitation and there is a growing risk of dzud in winter.<br>- Wild animals, gazelles, saiga antelopes are in danger of freezing to death due to a sudden, extreme cold.<br>- A great number of birds are dying due to a biological pollution. |
| 6 | Gobisumber | - Summer has been unfavorable in recent years. There is a small amount of precipitation in the early summer months and rain is tendentially expected in early autumn. In May of this year, there were two natural disasters. There was a lot of duststorm and dryness.<br>- Geographically, our aimag belongs to the steppe, steppe and desert steppe regions. However, in recent years, the amount of precipitation has decreased and become similar to a Gobi region. |
| 7 | Darkhan-Uul | - Changes in precipitation |
| 8 | Dornogobi | - Overheating, drying of springs,<br>- Increased frequency of drought, strong wind and flood<br>- Vegetation cover is broken |
| 9 | Dornod | - Some years experience excessive dryness or drought; oil production areas have heavy snow in winter<br>- Soil loosened and soil structure has changed<br>- Number of small black flies has increased<br>- Amount of precipitation has changed the most |
| 10 | Dundgobi | - Decrease in precipitation<br>- Increase in dust storms<br>- Decrease in plant species<br>- Dust storms were observed preceding or concurrent with heavy rain and the amount of damage shows tendency to increase.<br>- Rain is late in summer and only wild leek and ramson grow |
| 11 | Zavkhan | - Late summer rain has changed the structure of pasture plants and raised challenges to prepare hay<br>- Spring and rivers are drying up<br>- Decrease in precipitation<br>- Frequent drought and dzud |
| 12 | Orkhon | - Incease in frequent heavy rainstorms and floods |
| 13 | Uvurkhangai | - Decrease in precipitation<br>- Inrease in drought and dzud<br>- Inrease in drought and desertification is happening<br>- Changes in plant yields<br>- Exceptionally warm in winter<br>- River and springs are drying up |
| 14 | Umnugobi | - Decrease in precipitation and increase in drought and dzud<br>- 60% of the territory is affected by drought and dzud |
| 15 | Sukhbaatar | - Dryness has increased in the last 15 years<br>- Increased sand movement in the southern part of the country<br>- Where 50 species of plants used to grow, it decreased to only 5 types of plants |

| No | Aimag name | Emerging changes |
|---|---|---|
| | | - Due to an extreme dryness, fire in spring and autumn have increased pasture destruction<br>- Recently, the number of rats has increased<br>- Sudden overheating and extreme cold<br>- In spring and autumn, wind increased and people started to call it Baruun-Urtiin ulaan<br>- The snow fell too late and there is not enough snow cover<br>- Plant growth is delayed |
| 16 | Selenge | - Overheating<br>- Decreased and late precipitation |
| 17 | Tuv | - Зуны улиралд хэт сэрүүн байдал ажиглагдаж болсон<br>- No precipitation<br>- Drought exists<br>- Excessive rainfall causes floods<br>- Extremely cool weather was observed in summer<br>- Poor crop yields in summer |
| 18 | Uvs | - Temperature rose by 2.1 degrees and the number of natural disasters increased<br>- More areas with desertification<br>- Summer is bad and there is no precipitation<br>- Heavy floods in some places<br>- Livestock losses are high in winter and spring |
| 19 | Khovd | - Drought and dzud are common<br>- Fodder price is increasing and the lives of herders are changing |
| 20 | Khuvsgul | - Precipitation has changed and it is more delayed<br>- Dzud and floods are happening |
| 21 | Khentii | - Precipitation is either non-existent or suddenly very heavy<br>- Ecological balance is lost<br>- Number and species of plants are declining |

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