



MINISTRY OF
ENVIRONMENTAL, GREEN
DEVELOPMENT & TOURISM,
MONGOLIA



NATIONAL DEVELOPMENT
INSTITUTE OF MONGOLIA

*Project title: **Vulnerability Assessment for Social-Ecological Systems and Policy Recommendation for Green Development Policy for 5 aimags at Local Level***

Khovd, Uvurkhangai, Arkhangai, Khentii and Bulgan

Vulnerability Assessment of 5 Green Aimags: *Case of Uvurkhangai & Arkhangai*

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*National Development Institute of Mongolia
Institute for Sustainable Development, NUM*

Tokyo
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Contents

- **Research Objective & Study Areas**
- **Indicators & Design of Vulnerability Assessment**
- **Result of Vulnerability Assessment & Analysis at Sum Level**
(Case of Uvurhangai, Arhangai aimags)
 - Ecological vulnerability
 - Social vulnerability
 - Integrated Vulnerability Assessment of Social-Ecological Systems
- **Dissociation & cooperation**

Research Objective

Section I

Analysis & Vulnerability Assessment

- Analysis for indicators of Ecological and Social systems
- Relation analyze for vulnerability indicators
- Ecological & Social Vulnerability Assessment by each sums of 5 aimags
- Integrated assessment for vulnerability analyze of social-ecological systems in sum level

Section II

Analysis of local Development Plan and Budget each 5 aimags and Sum level

- To identify the Green development Criterion for local level
- Analyze of Local Development Plan by Green development Criterion
- Analyze of Local Budget by Green development Criterion
- Field survey in selected sums

Section III

Policy Recommendation of Green Development Policy for 5 aimags

- Syntheses and Conclusion
 - Result of Vulnerability Assessment
 - Analysis of local Development Plan and Budget
 - Result of field survey

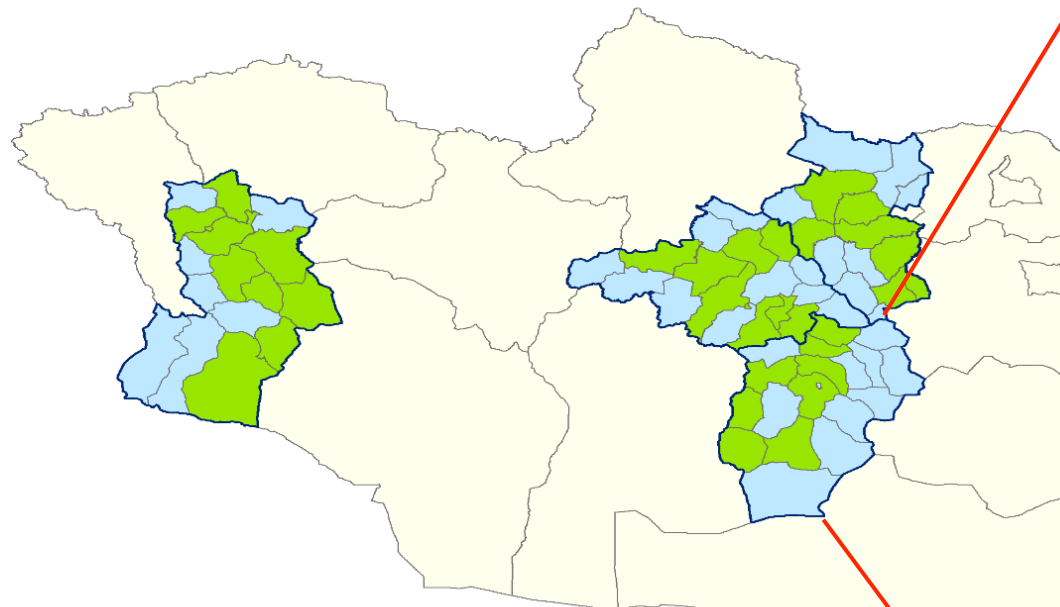
Study areas: *Khovd, Uvurkhangai, Arkhangai, Khentii and Bulgan*

Indicators for selecting sums

- Ecological region
- Population
- Remoteness
- Infrastructure

Total 86 sums of 5 aimags

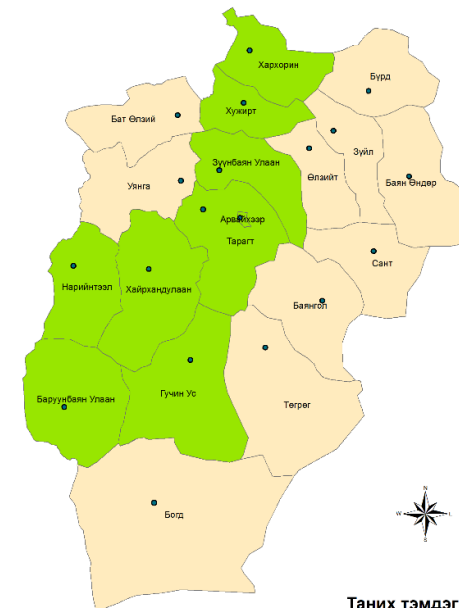
Судалгааны хамрах хүрээ, чанарын судалгаа хийх сумдын байршлын зураг



Таних тэмдэг

- Ногоон хөгжлийн 5 аймгийн хил
- Чанарын судалгаа хийх сум
- Ногоон хөгжлийн 5 аймгийн сумд
- Монгол улсын аймгуудын хил

Uvurkhangai aimag have 19 sums



Таних тэмдэг

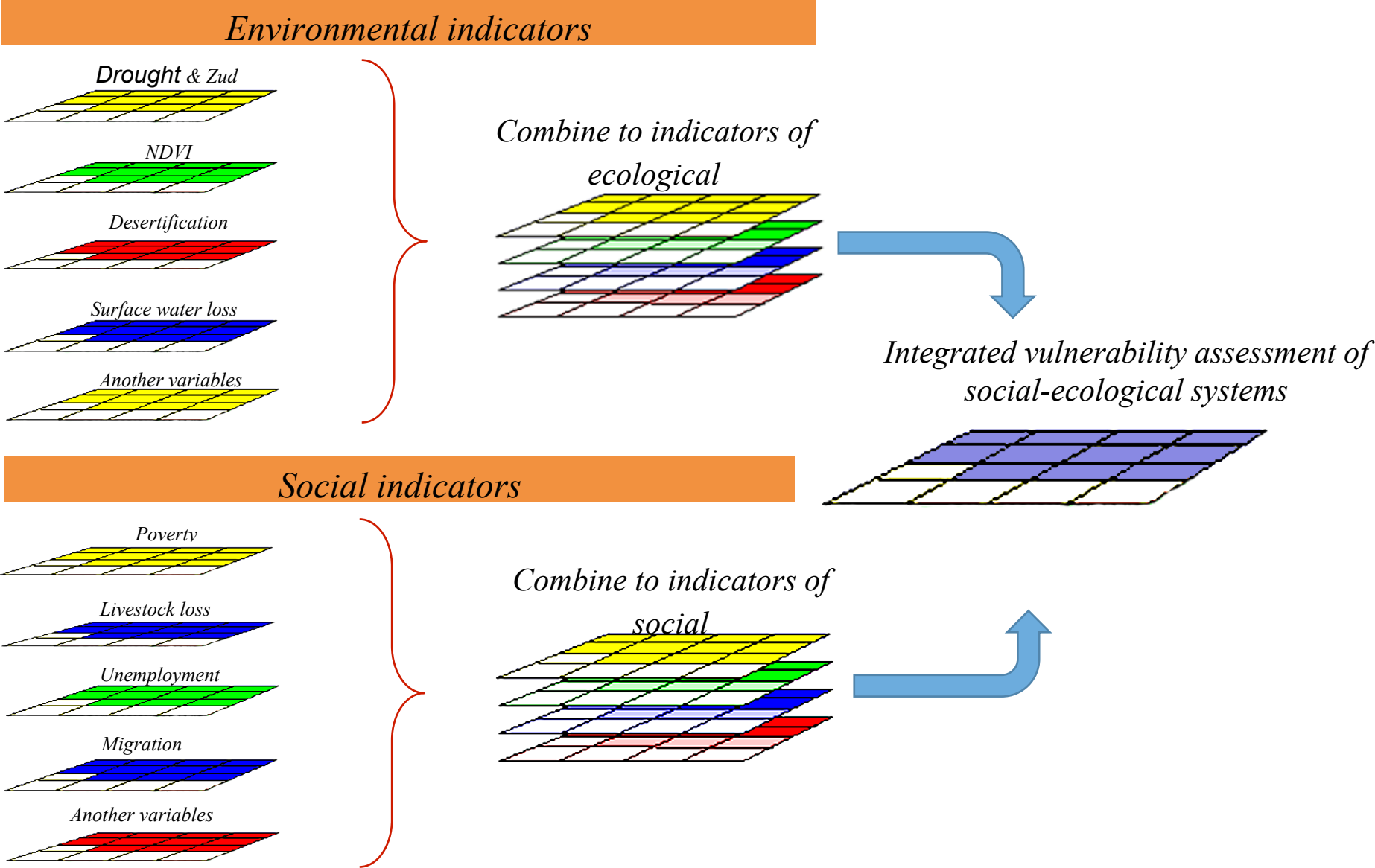
- Сумын төв
- Чанарын судалгаа хийх сум
- Сумын хил

“Ногоон хөгжлийн тэргүүлэх 5 аймгийн байгаль орчин, нийгмийн эмзэг байдлын судалгаа хийж, бодлогын санал зөвлөмж боловсруулах” бодлогын судалгаа



“Ногоон хөгжлийн тэргүүлэх 5 аймгийн сумдын байгаль орчин, нийгмийн эмзэг байдлын судалгаа хийж, бодлогын санал зөвлөмж боловсруулах” төсөл

General schema of Vulnerability assessment



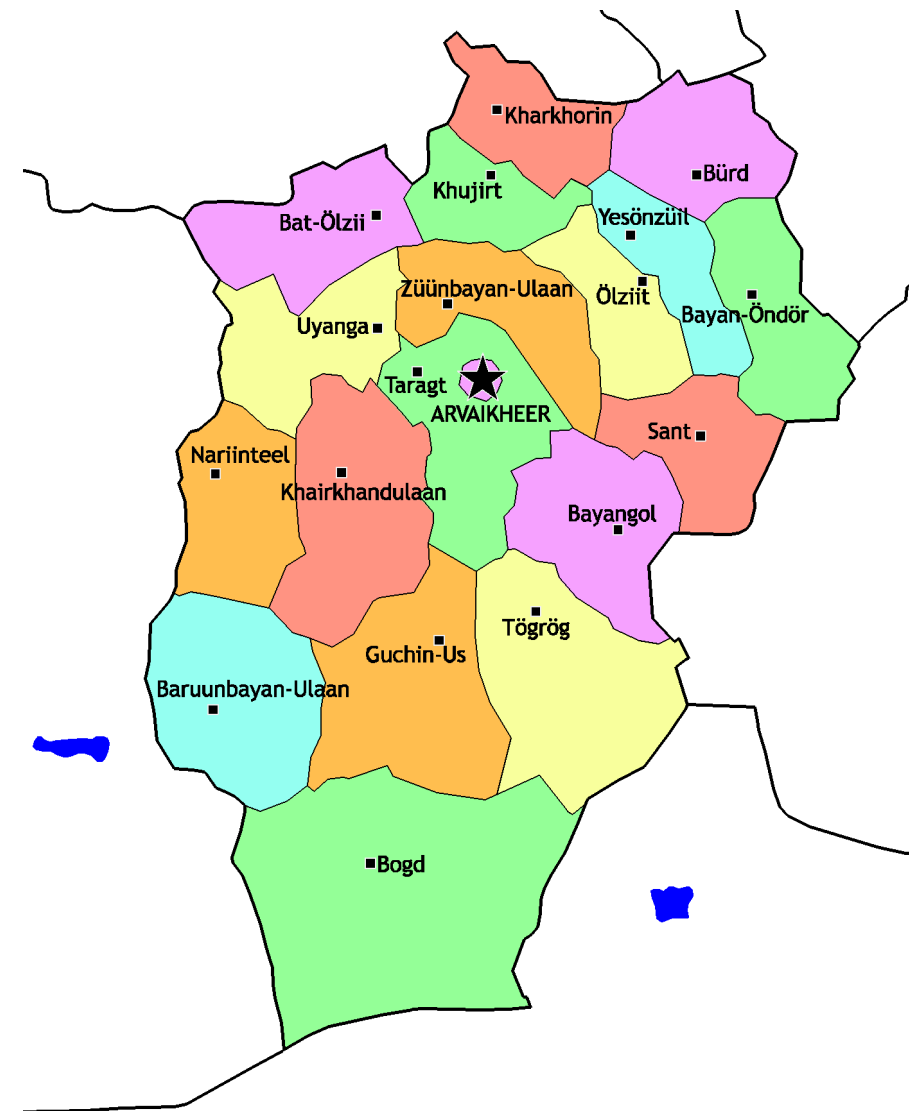
Ecological indicators

Level	No	Indicators	Unit of Indicators	Date	Method of Combine
Sum level	1	Dough, Zud index	Index	1995-2013	Geometric mean
	2	Vegetation index (NDVI), May to Oct average	Index	1998-2013	
	3	Desertification	Percent	2010	
	4	Surface water loss	Percent	2011	
	5	Pasture use index	Index	1990-2013	
	6	Land degradation (<i>wind erosion, soil Loss</i>)	Percent	2010	
	7	Prepared forage and hay cutting (<i>per capita livestock</i>)	kg/sheep.unit	2011-2013	
	8	Livestock loss	Percent	1990-2013	
Aimag level	9	Air pollution	mg/m ³	2004-2013	Arithmetic mean
	10	Water pollution	mg/l	2011-2013	
	11	Soil pollution	mg/kg	2011-2013	

Indicators of Social systems at sum level

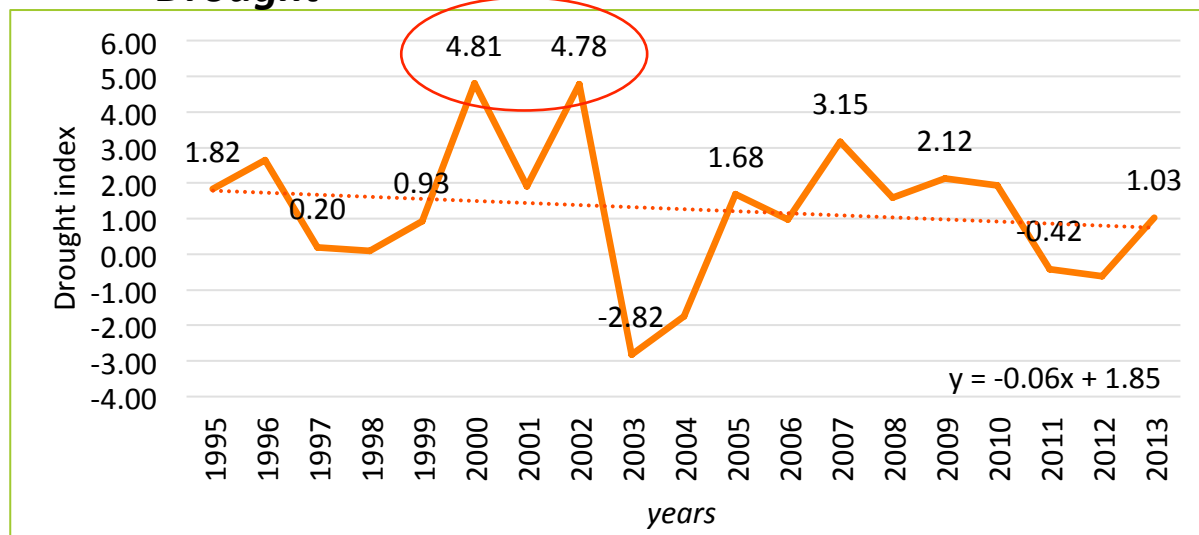
Level	No	Indicators	Unit of Indicators	Date	Method of Combine
Sum level	1	Crop products (per capita person)	kg/person	2011-2013	Arithmetic mean
	2	Migration, Population changes (growth & decrease)	Percent	1989-2000, 2000-2012	
	3	Unemployment	Percent	2012-2013	
	4	Poverty	Percent	2000, 2010	
	5	Bank saving (per capita person)	tug/person	2010-2013	
	6	Livestock risk based on livestock loss during drought and zud years Ган-зудын эрсдлийг тооцсон нэг хүнд ногдох мал	Sheep.unit/person	2013	
	7	Livestock per capita person	Sheep.unit/person	2002-2013	
	8	Number of Doctor and medical nurse (per capita person)	Percent	2002-2013	
	9	In-patients number in hospital	Percent	2002-2013	

Uvurkhangai aimag: Some Result of Analysis and Vulnerability assessment



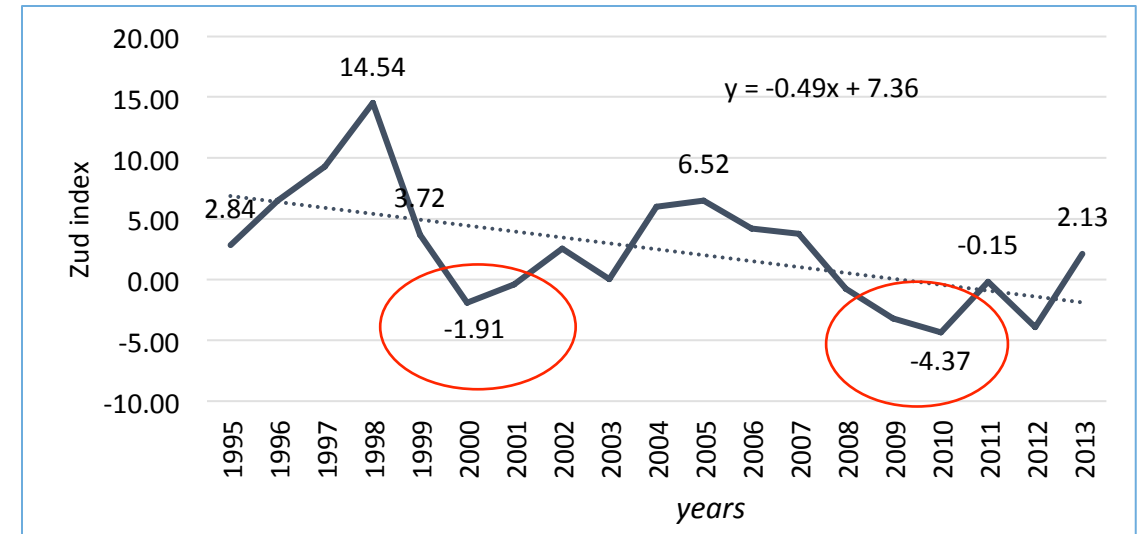
Dynamics of drought, zud and integrated drought-zud in Uvurkhangaig aimag

Drought



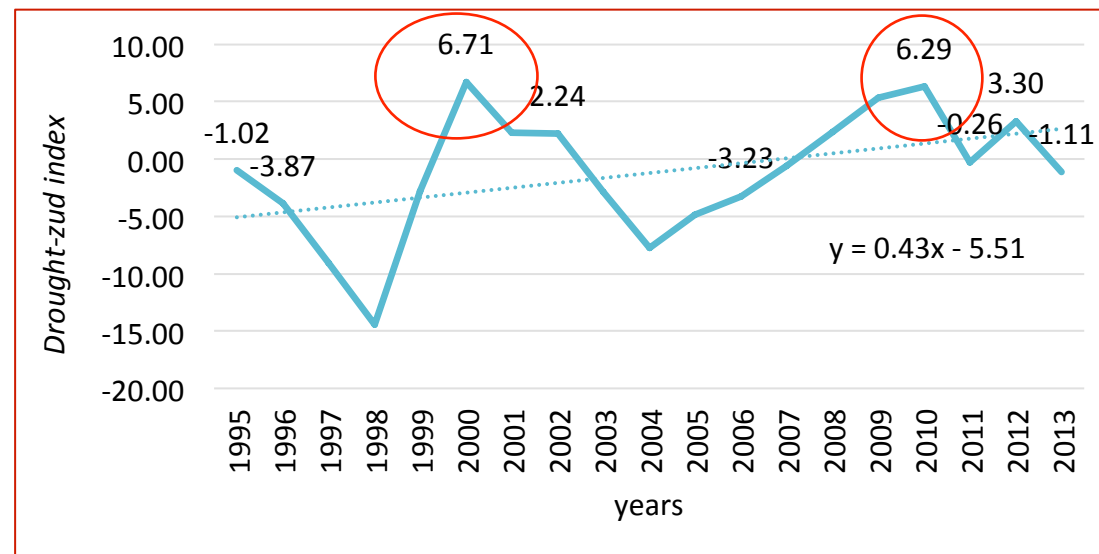
In dynamic of drought index from 1995 to 2013 when the highest value was 4.81 in 2000 and 4.78 in 2001.

Zud



If zud index shown minus value that means observed more zud. In dynamic of zud index from 1995 to 2013 when the lowest value of zud index was -1.91 in 2000 and -4.37 in 2010.

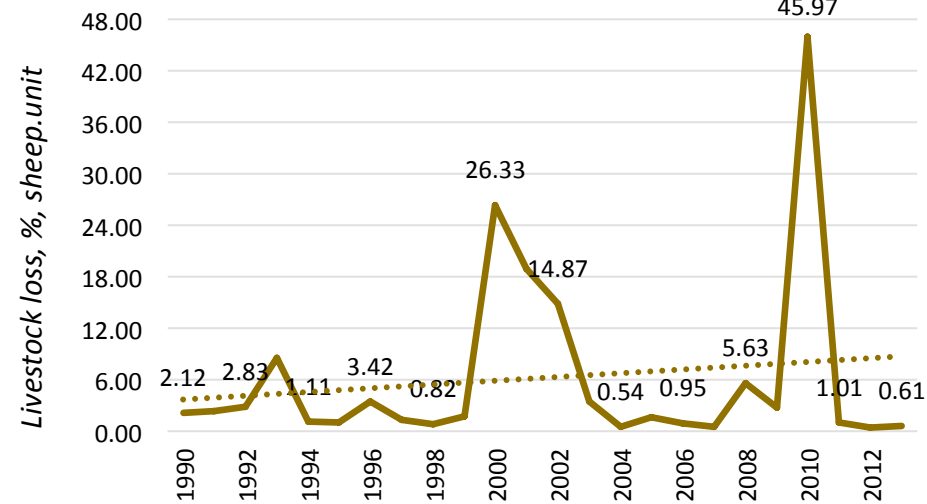
Integrated drought-zud



In dynamic of drought-zud index from 1995 to 2013 when the highest value of drought-zud index was 6.71 in 2000 and 6.29 in 2010.

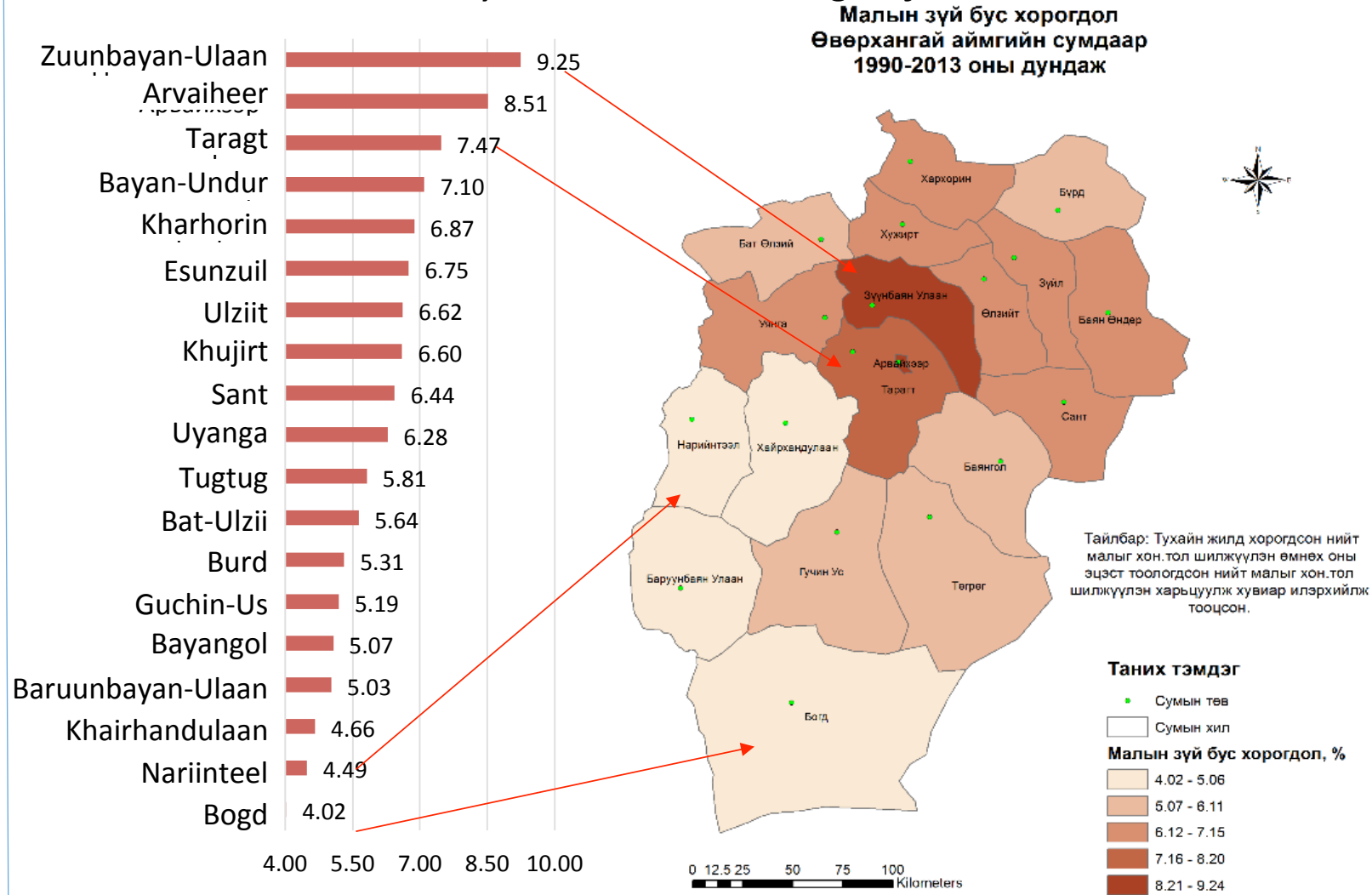
Livestock loss, Uvurkhangai aimag

Dynamic of livestock loss for 1990-2013 at aimag level



In dynamic of livestock loss from 1990 to 2013 when high value was 26.3% in 2000 and 45.9 in 2010.

Livestock loss by each sums, average of 1990-2013



Livestock loss, 1990-2013, %, sheep.unit



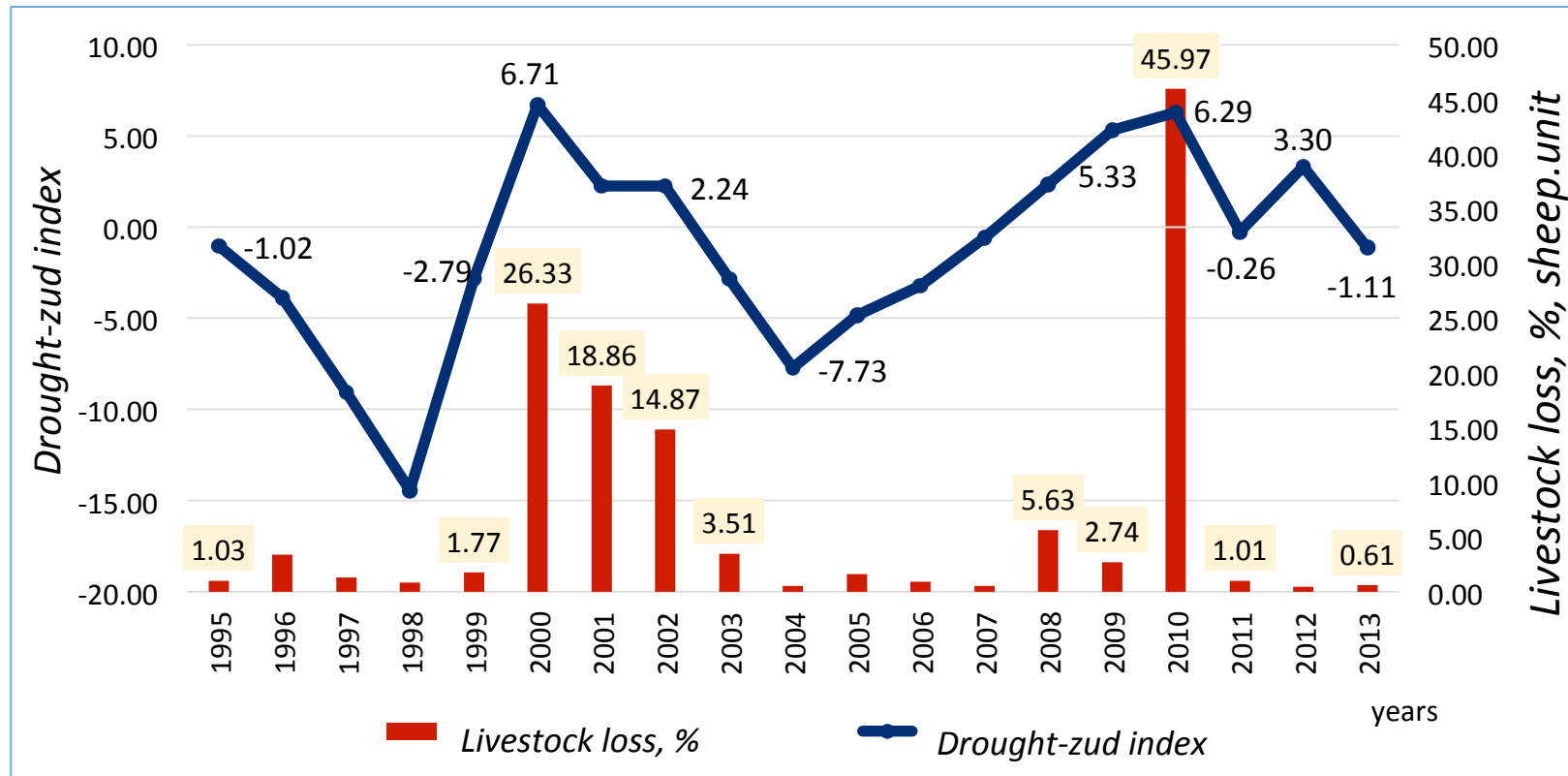
БАЙГАЛЬ ОРЧИН,
НОГООН ХӨГЖЛИЙН ЯАМ



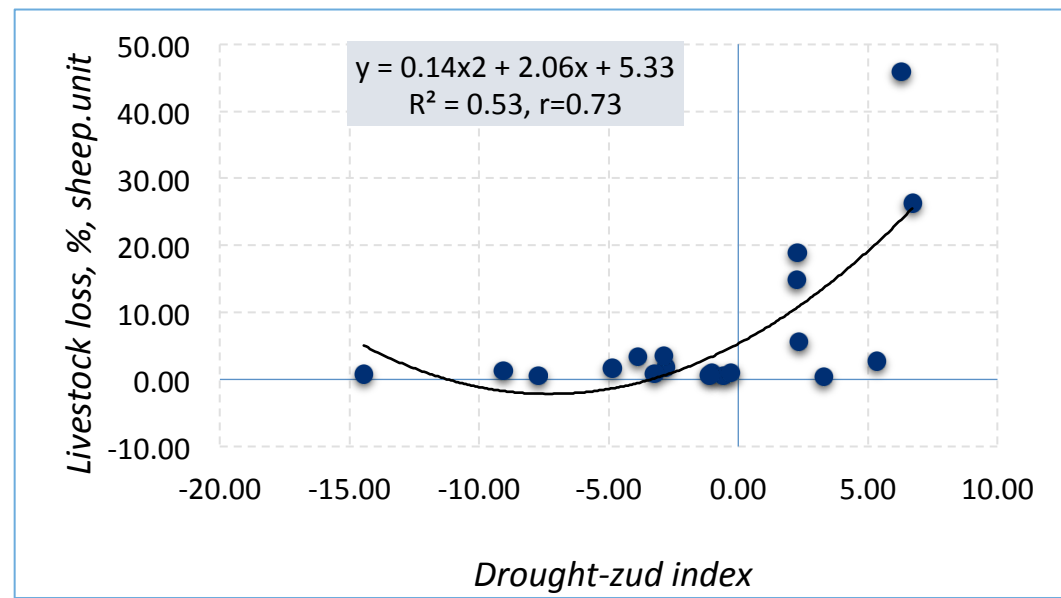
ҮНДЭСНИЙ
ХӨГЖЛИЙН
ХҮРЭЭЛЭН

"Ногоон хөгжлийн тэргүүлэх 5 аймгийн сумдын байгаль орчин, нийгмийн эмзэг байдлын судалгаа хийж, бодлогын санал зөвлөмж боловсруулах" бодлогын судалгаа

Analysis between drought-zud index and livestock loss in Uvurkhangai aimag level

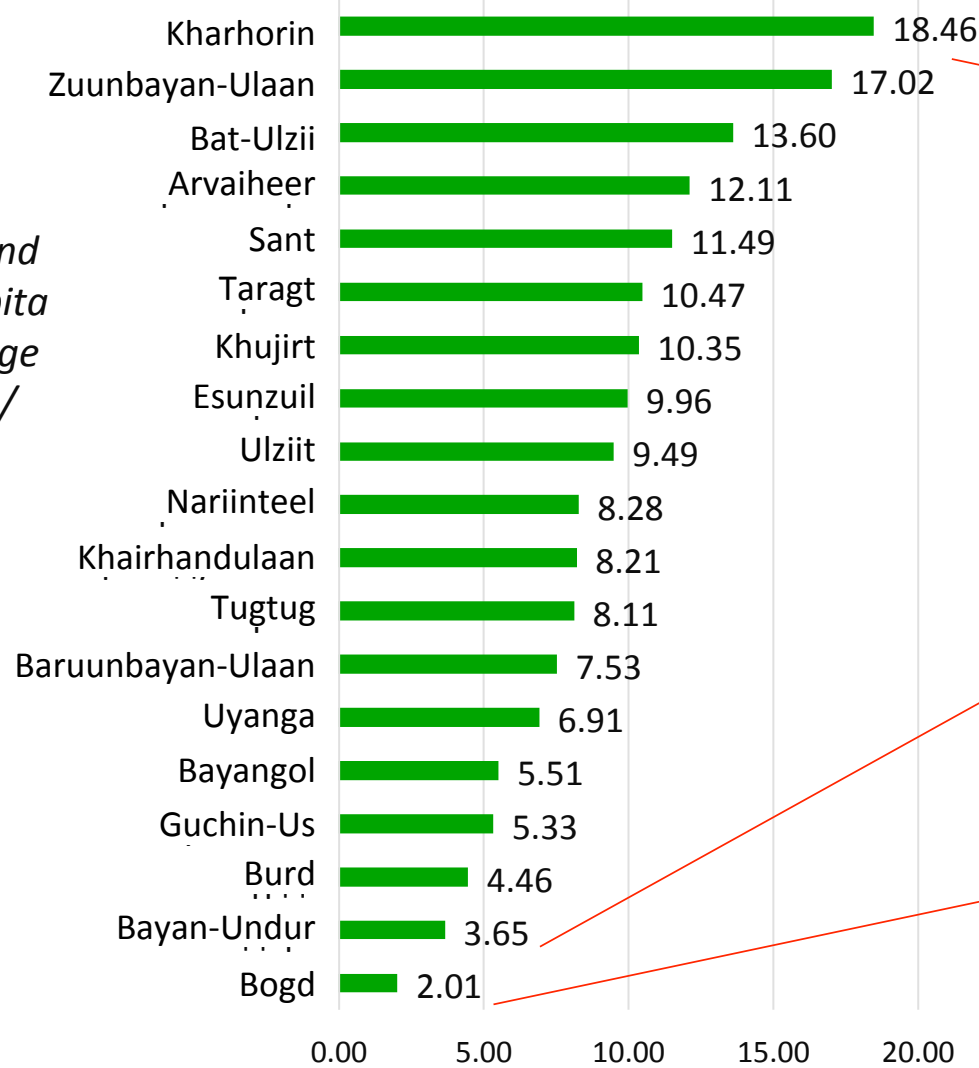


The results of dynamical analysis shown that drought-zud index were increased and the number of livestock loss were increased. Correlation coefficient was 0.73 for 1995-2013.

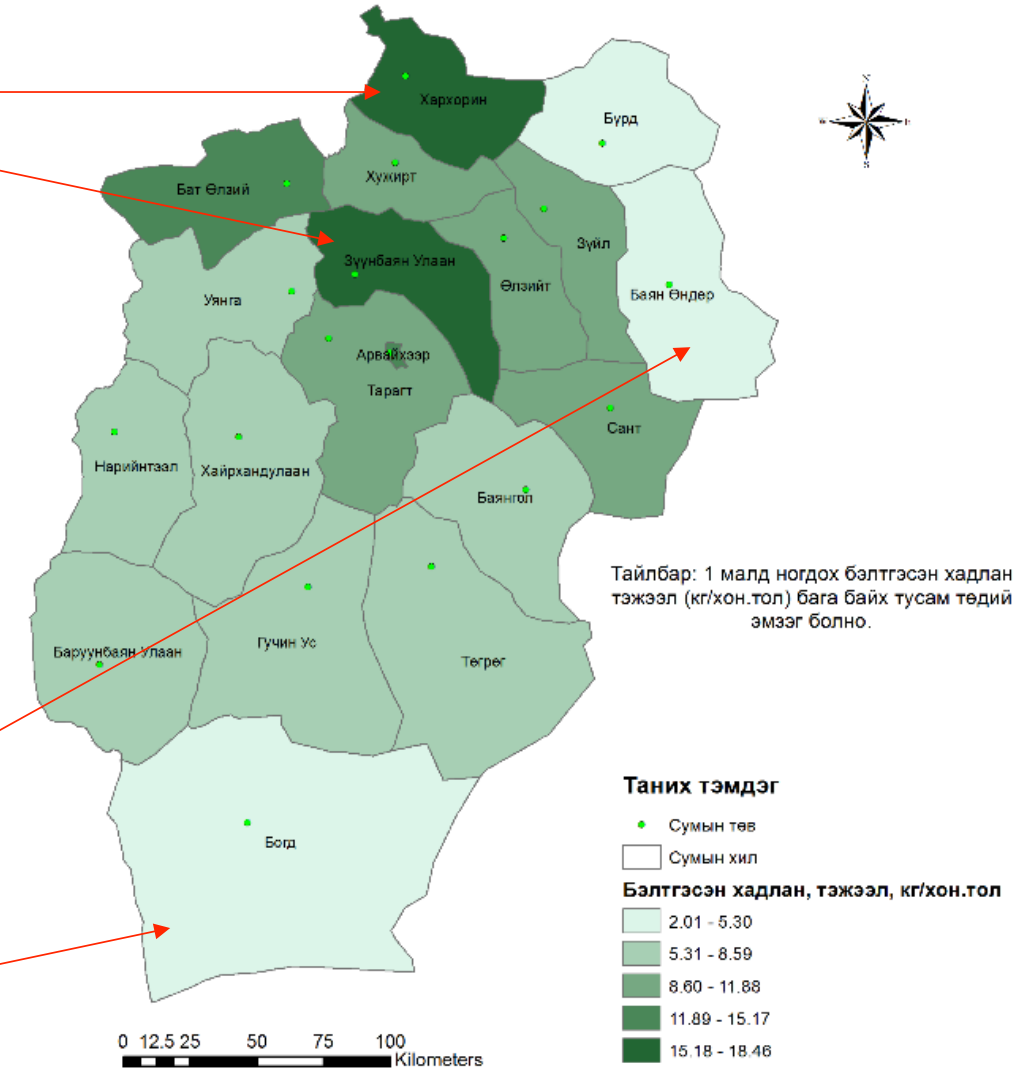


Prepared forage and hay cutting at sum level

Prepared forage and hay cutting per capita livestock for average of 2011-2013 (kg/sheep.unit)

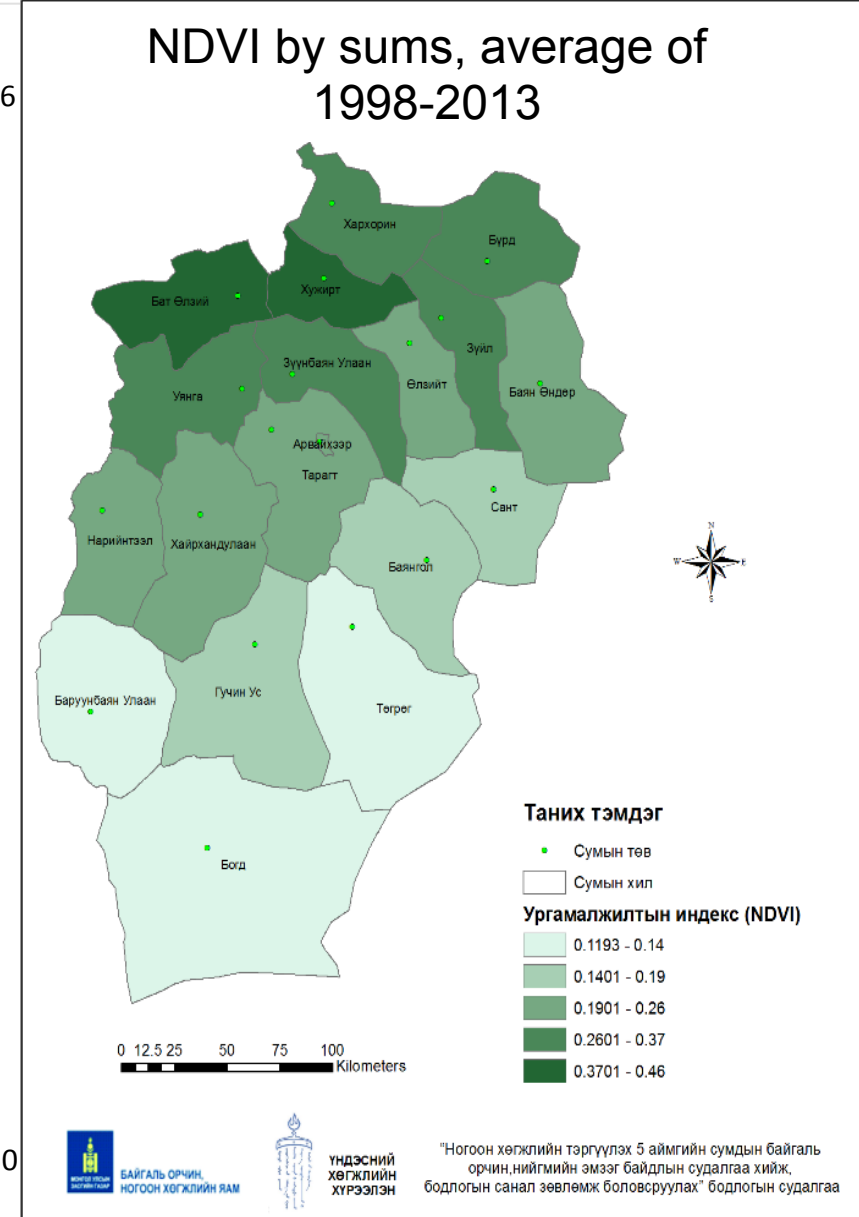
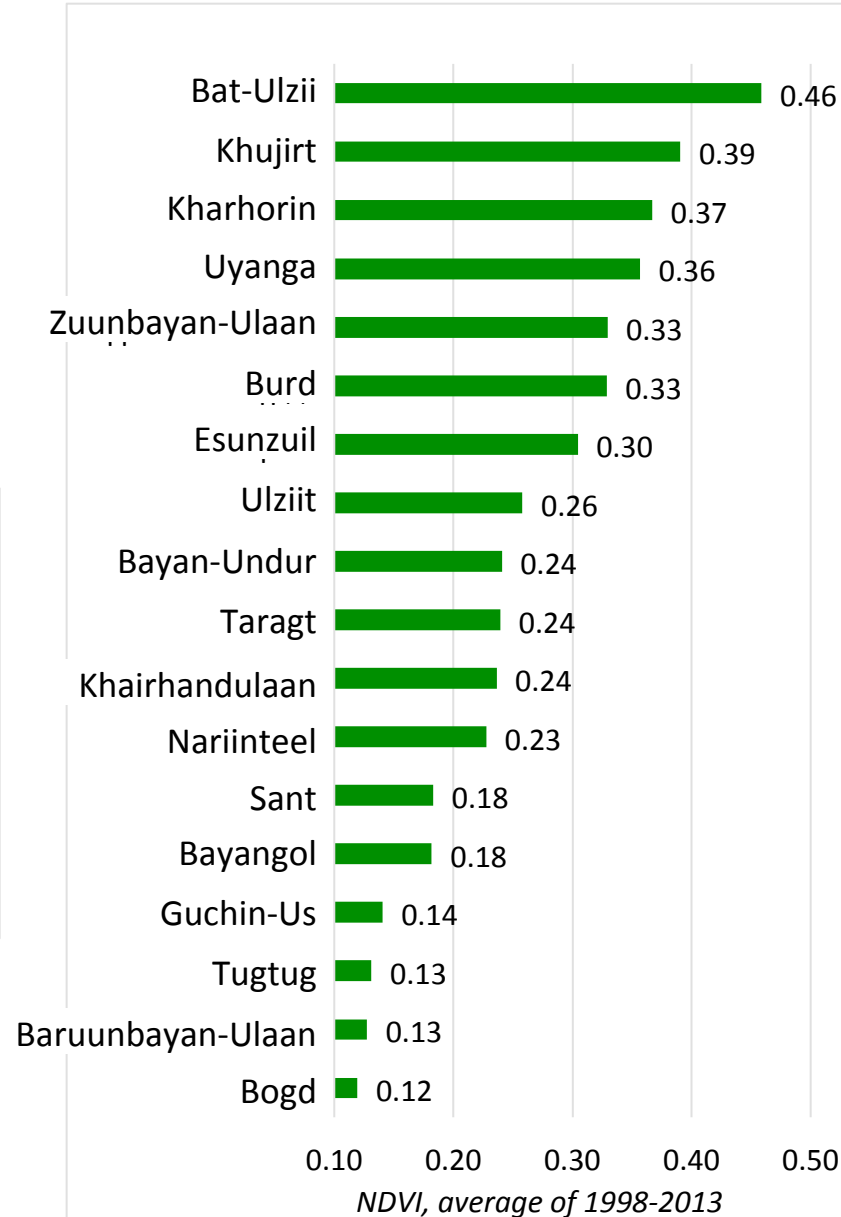
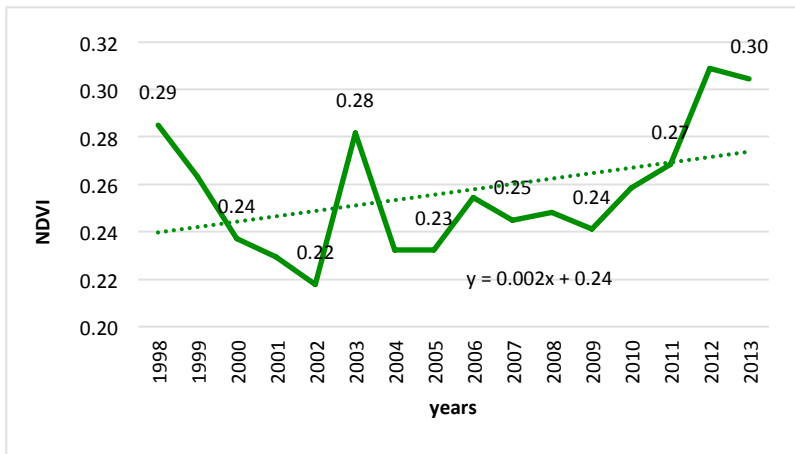


Prepared forage and hay cutting, kg/sheep.unit

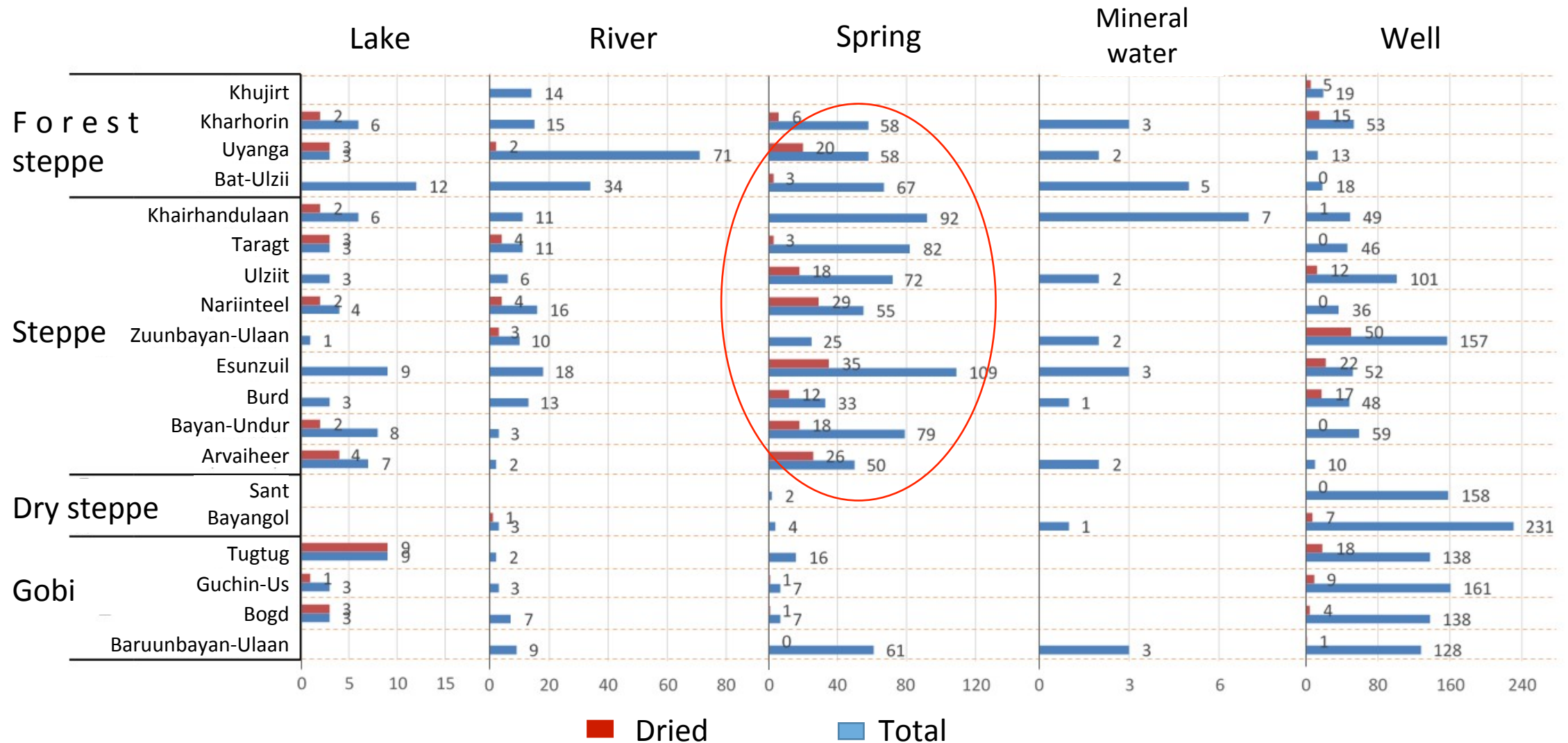


Vegetation index (NDVI), Uvurkhangai

Dynamic of NDVI for 1998-2013

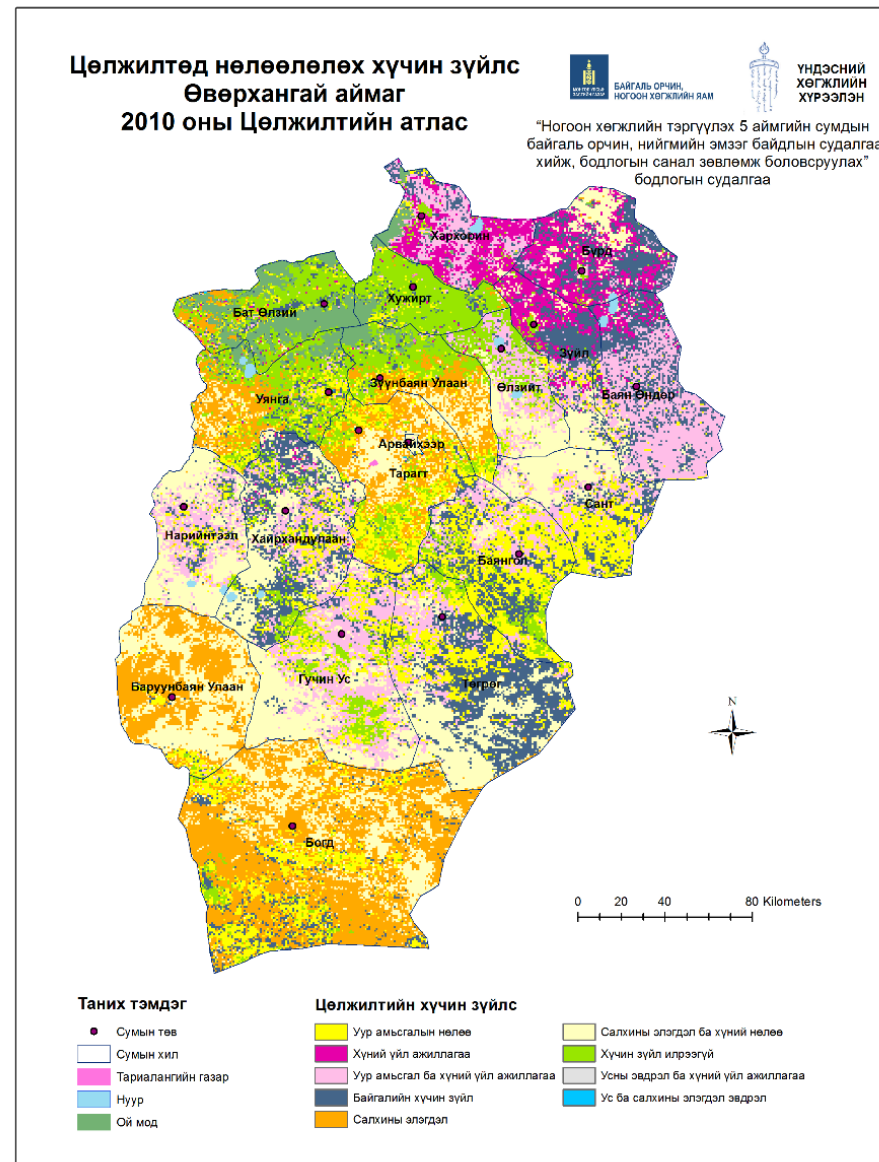
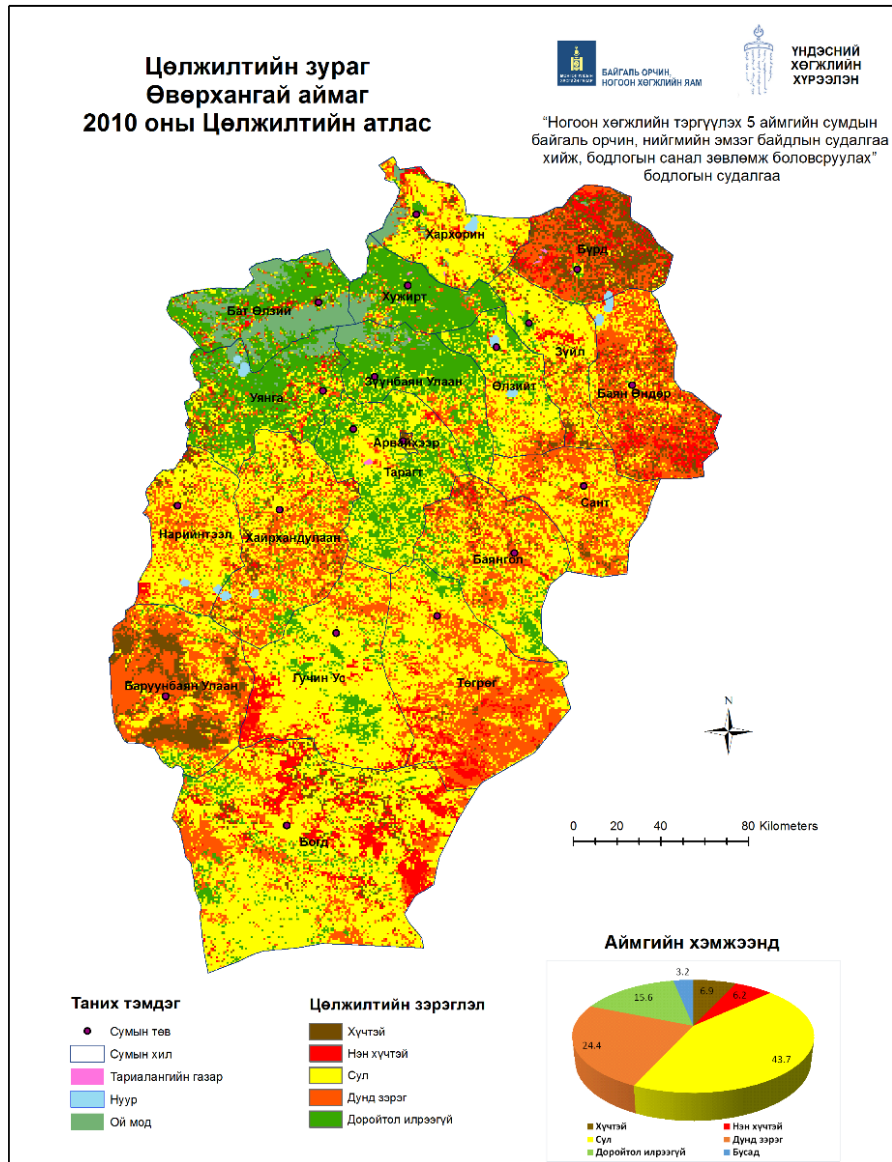


Surface water distribution and dry-up in sums by ecological regions, Uvurkhangai aimag



Source: Surface water count data . 2011. Ministry of Environment, Green Development and Tourism, Mongolia

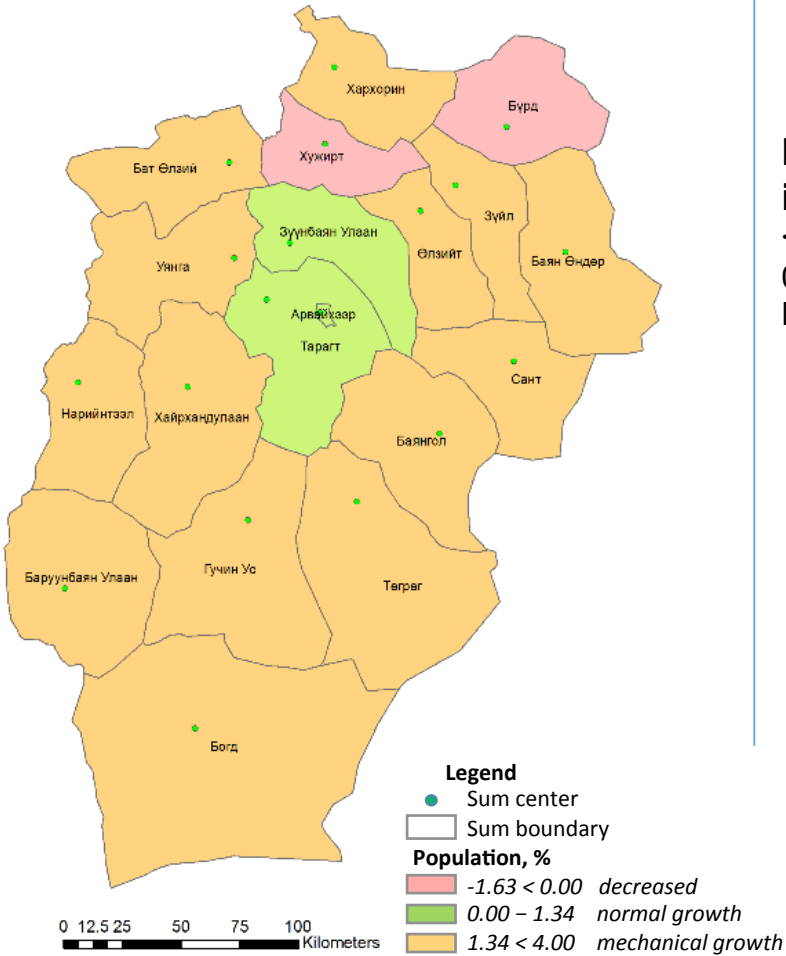
Desertification & land degradation of Uvurkhangai aimag



Source: Desertification Atlas. 2010. Geocology Institute, Mongolian Academy of Science & Environmental Information Center, National Agency of Meterlogy and Environmental Monitoring.

Population changes at sum level, Uvurkhangai

a). Average annual growth in sums, 1989-2000



National level (NL)

– Average annual growth was 1.34% from 1989 to 2000.

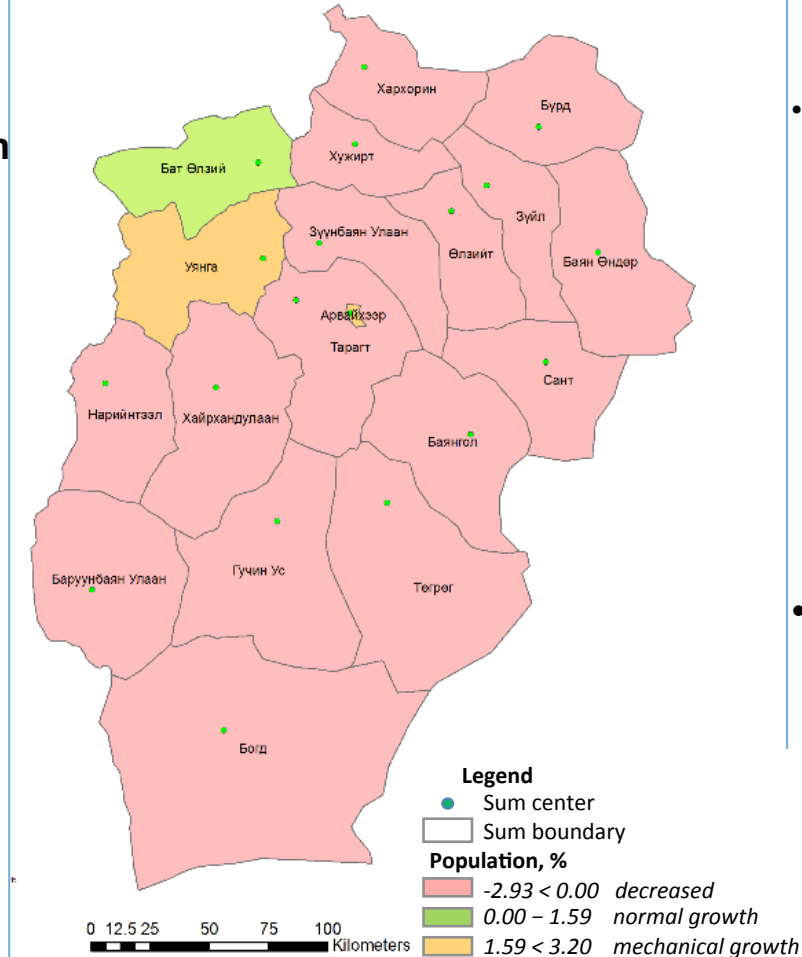
How changes population in Sums, if

<0 , -> Decreased
 0 – NL, -> Normal growth
 NL <, -> Mechanical growth

Population changes form 1989 to 2000 (total 19 sums)

- 2 sums was Decreased (*Khujirt, Burd*)
- 3 sums was Normal growth (*Zuunbayan-Ulaan, Arvaiheer, Taragt*)
- 14 sums was Mechanical growth

b). Average annual growth in sums, 2000-2012



- **National level (NL)**
 - Average annual growth was 1.59% from 2000 to 2012.
- **How changes population in Sums, if**
 - <0 -> Decreased
 - 0 – NL -> Normal growth
 - NL < -> Mechanical growth

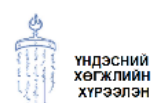
Population changes form 2000 to 2012 (total 19 sums)

- 16 sums was Decreased
- 1 sum was Normal growth (*Bat-Ulzii*)
- 2 sums was Mechanical growth (*Uyanga, Arvaiheer*)



ҮНДЭСНИЙ ХӨГЖЛИЙН ХҮРЭЭЛЭН

"Ногоон хөгжлийн тэргүүлэх 5 аймгийн сумдын байгаль орчин, нийгмийн эмзэг байдлын судалгаа хийж, бодлогын санал зөвлөмж боловсруулах" бодлогын судалгаа

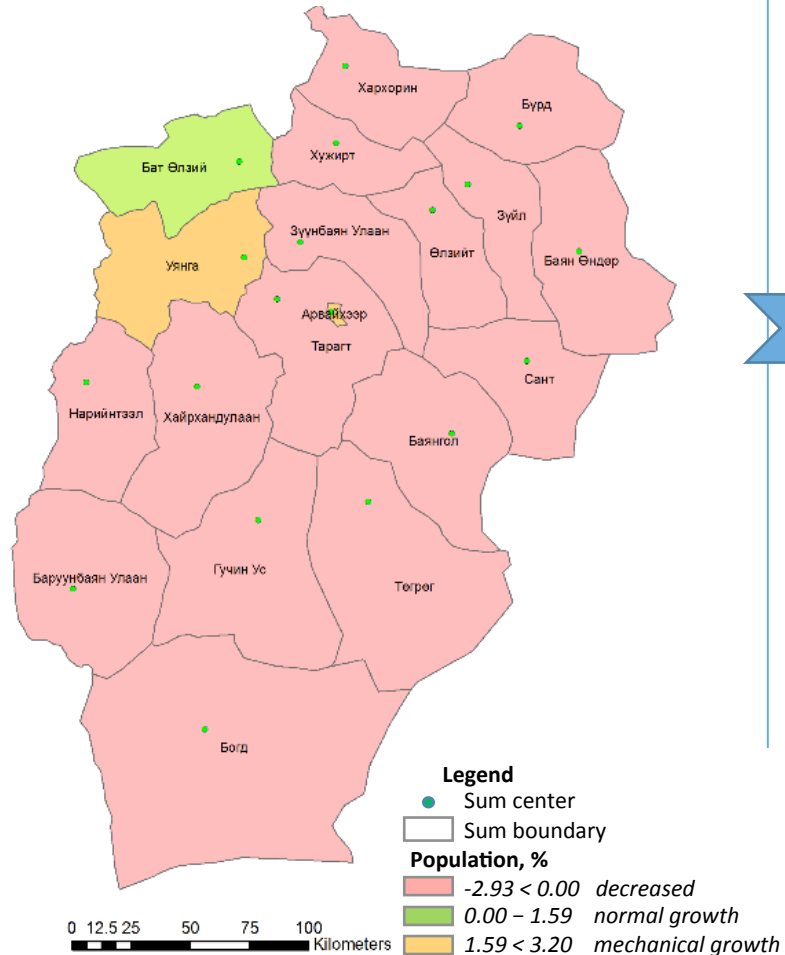


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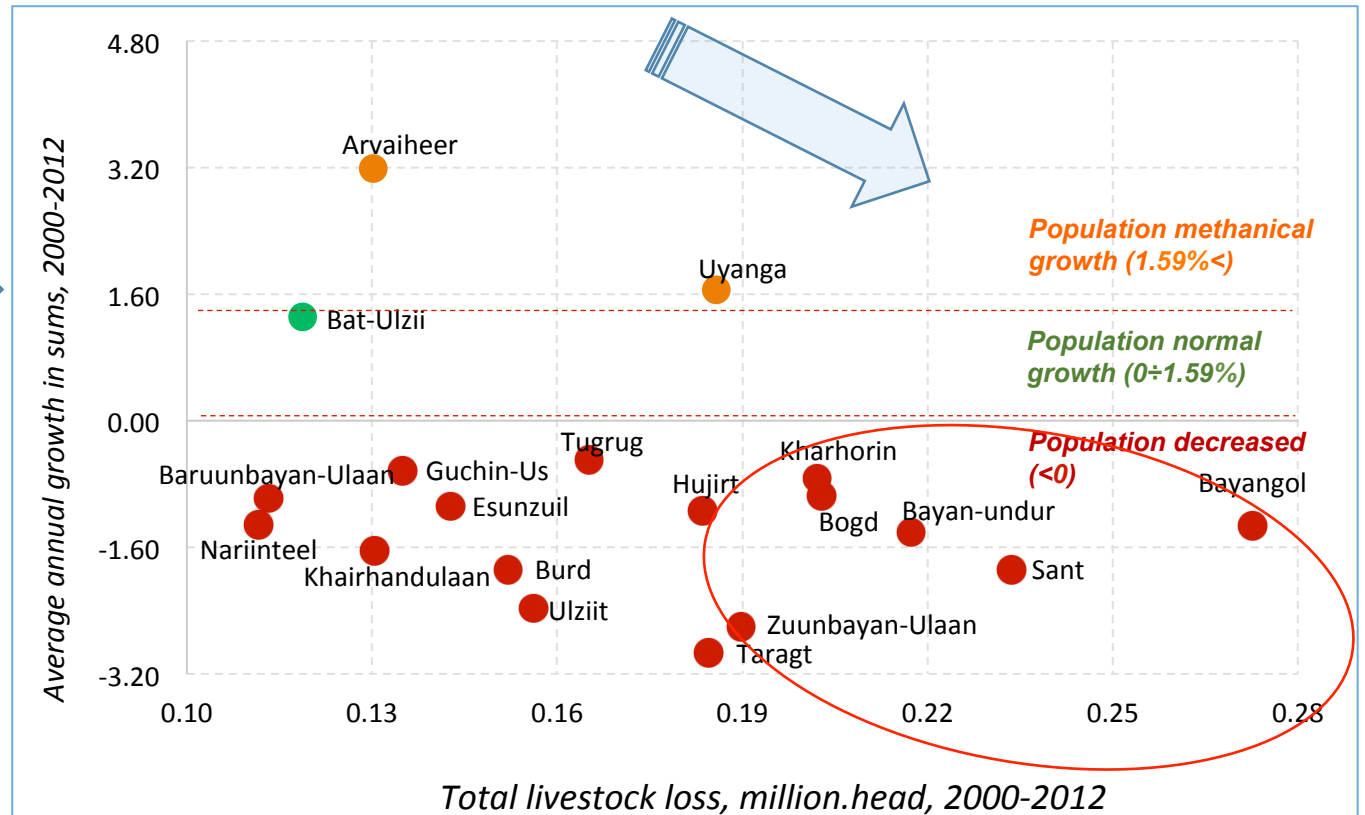
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Analysis for population changes and livestock loss by sums

b). Average annual growth in sums, 2000-2012



Spatial relation for average annual population changes and total livestock loss by sums.



This analysis showing that total livestock loss increased when population number were decreased from 2000-2012.

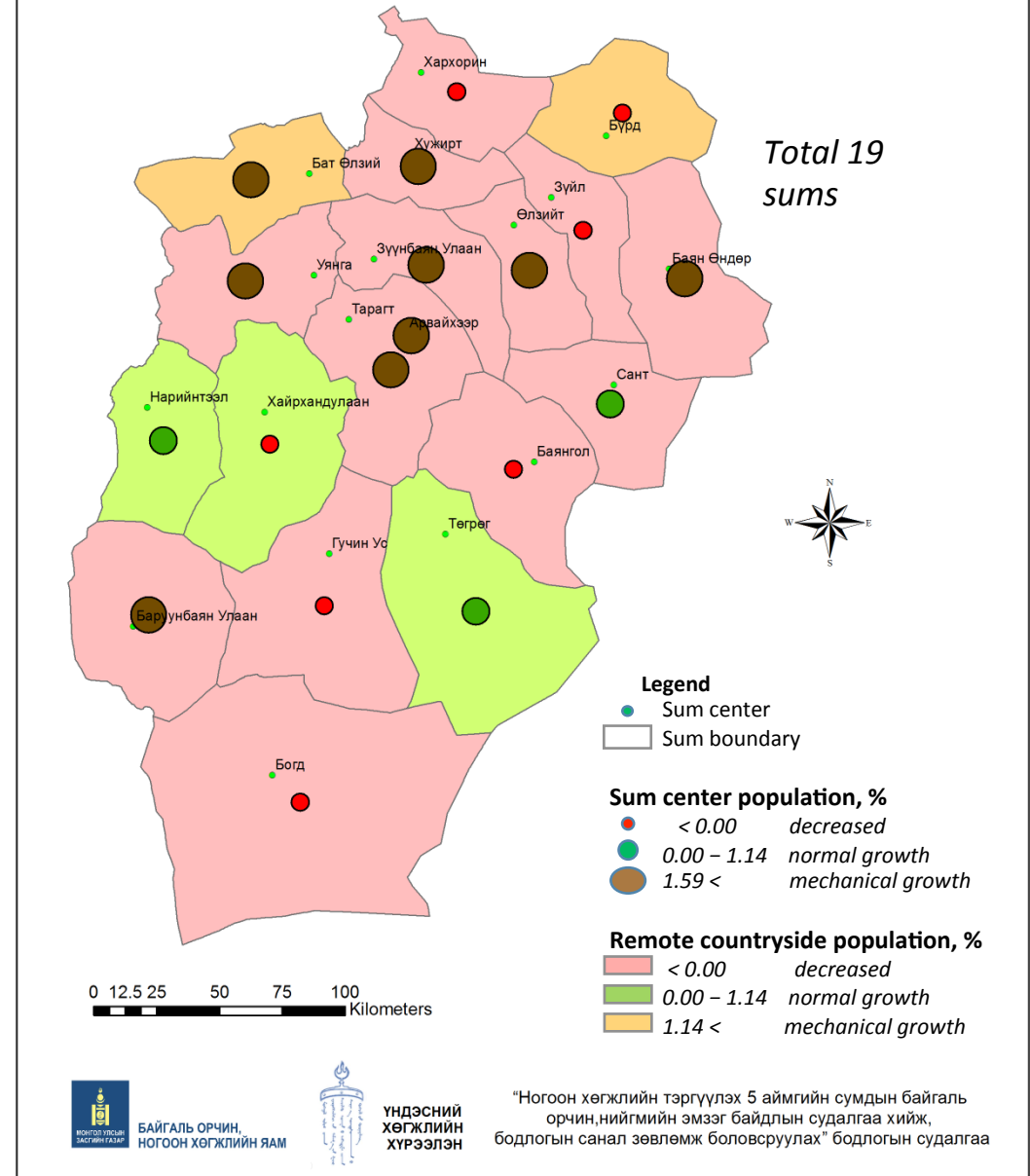
Population changes by location, Uvurkhangai

- **National level (NL)**
 - Average annual growth is 1.14% from 2002 to 2013
- **How changes population in Sum center and remote countryside area, if**

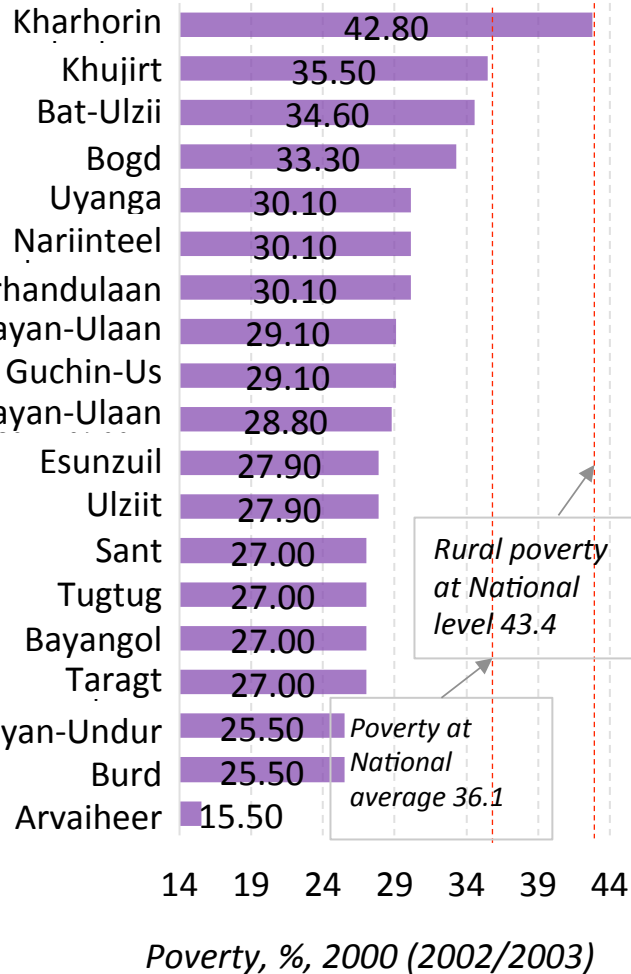
• Decreased	<0
• Normal growth	0 - 1.14
• Mechanical growth	1.14 <
- **Sum center population**
 - 7 sum centers was Decreased
 - 3 sum centers was Normal growth
 - 9 sum centers was Mechanical growth
- **Remote countryside area population (without Arvaiheer sum of aimag center)**
 - 13 sums are Decreased
 - 3 sums are Normal growth
 - 2 sums are Mechanical growth

Remote countryside population (Herders) are decreased and more inconstant

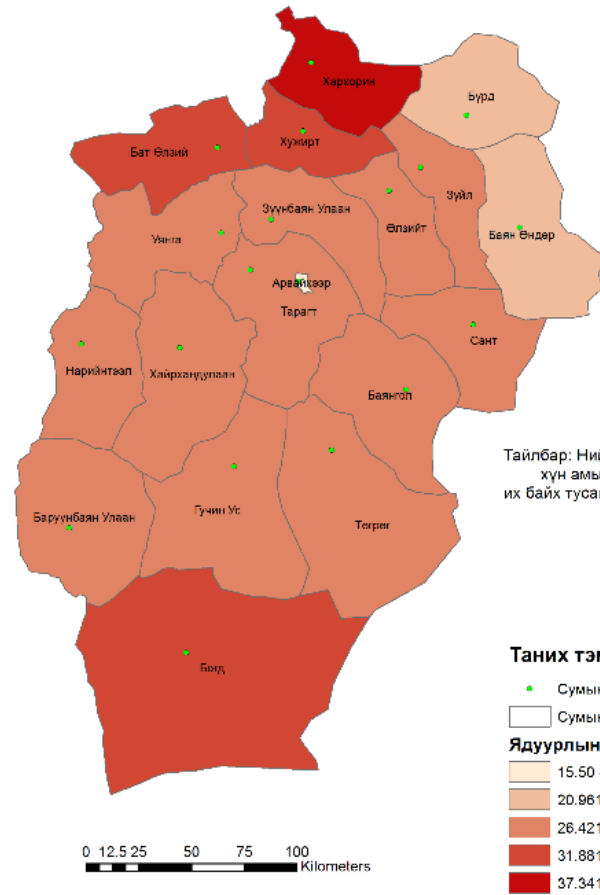
Average annual growth by sum center and remote countryside in sums, 2000-2012



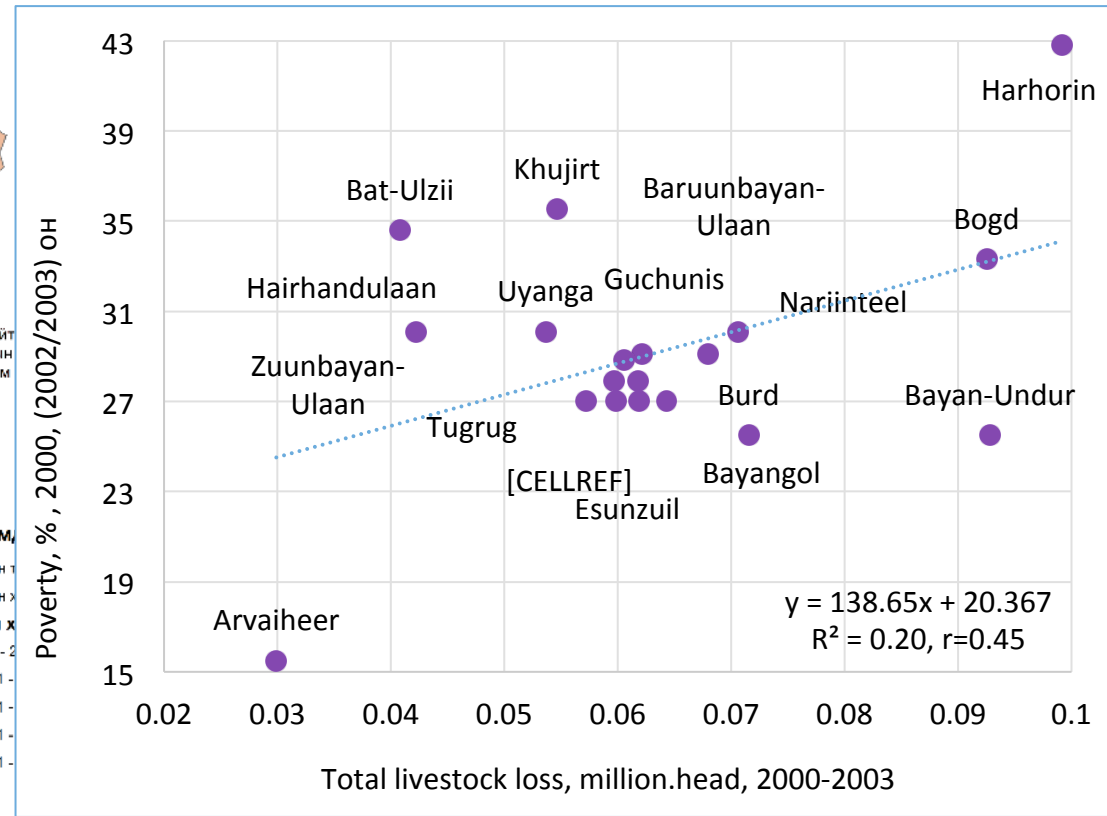
Poverty at sum level, 2000, Uvurkhangai



Poverty by sums, Uvurkhangai. 2000



Spatial relation for poverty and total livestock loss by sums.



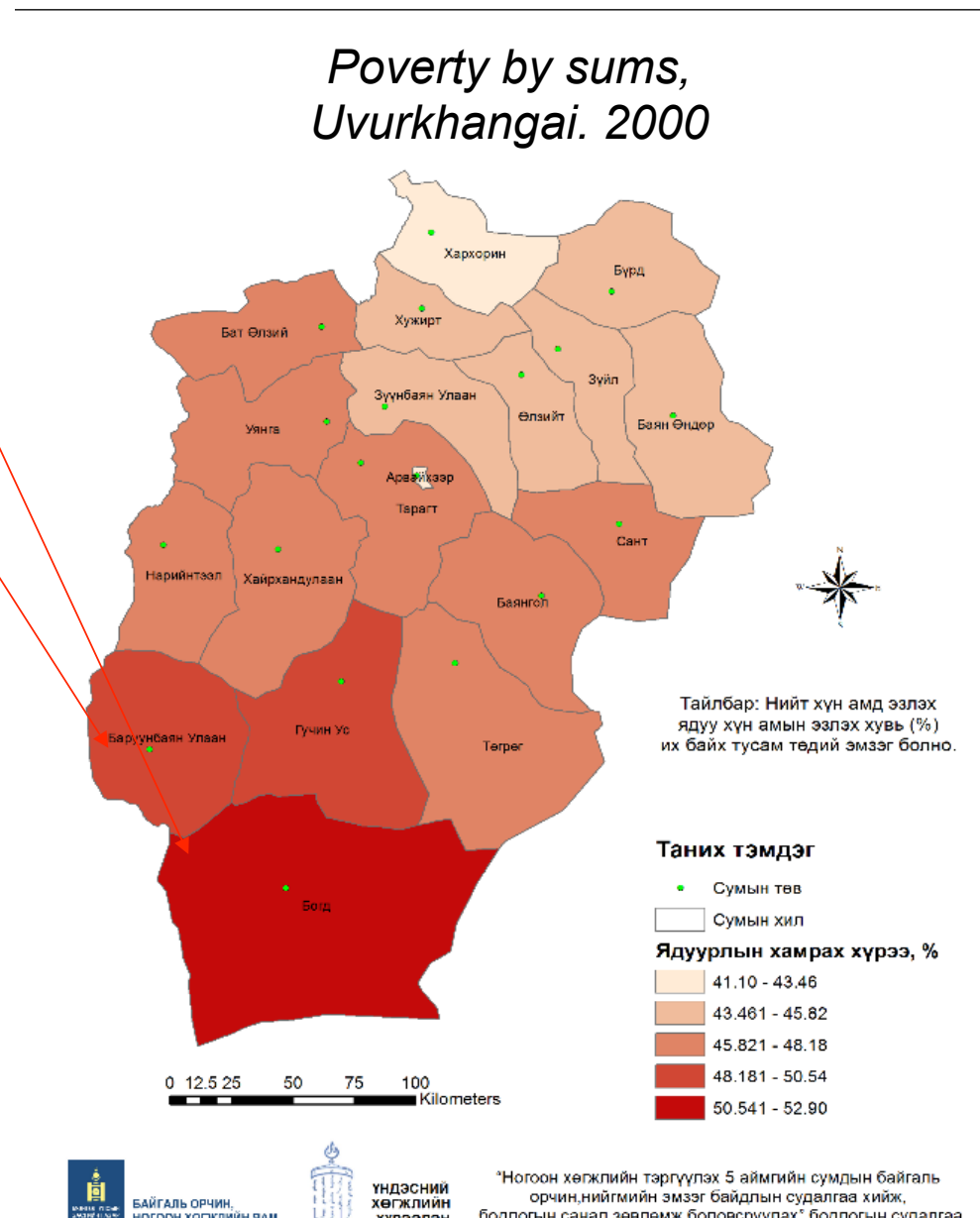
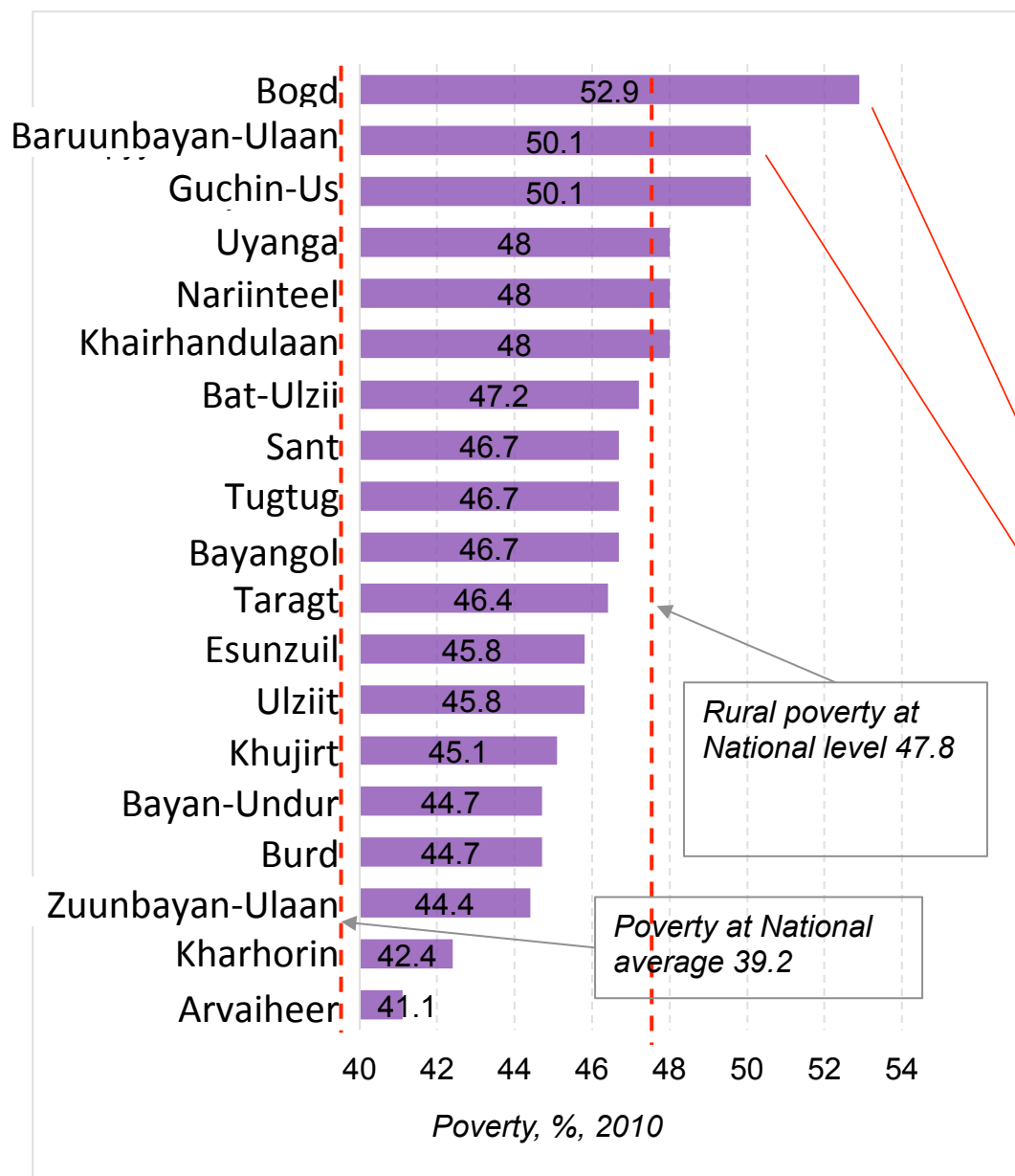
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Үндэсний хөгжлийн хүрээлэн

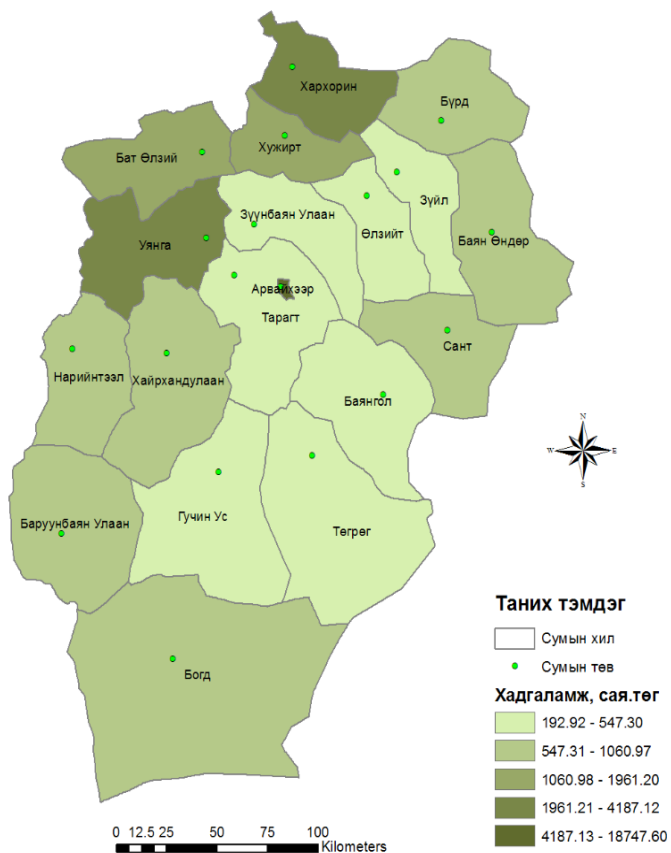
"Ногоон хөгжлийн төргүүлэх 5 аймгийн сумдын овигвь орчин, нийгмийн эмзэг байдлын судалгаа хийж, бодлогын санал зөвлөмж боловсруулах" бодлогын судалгаа

Poverty at sum level, 2010, Uvurkhangai

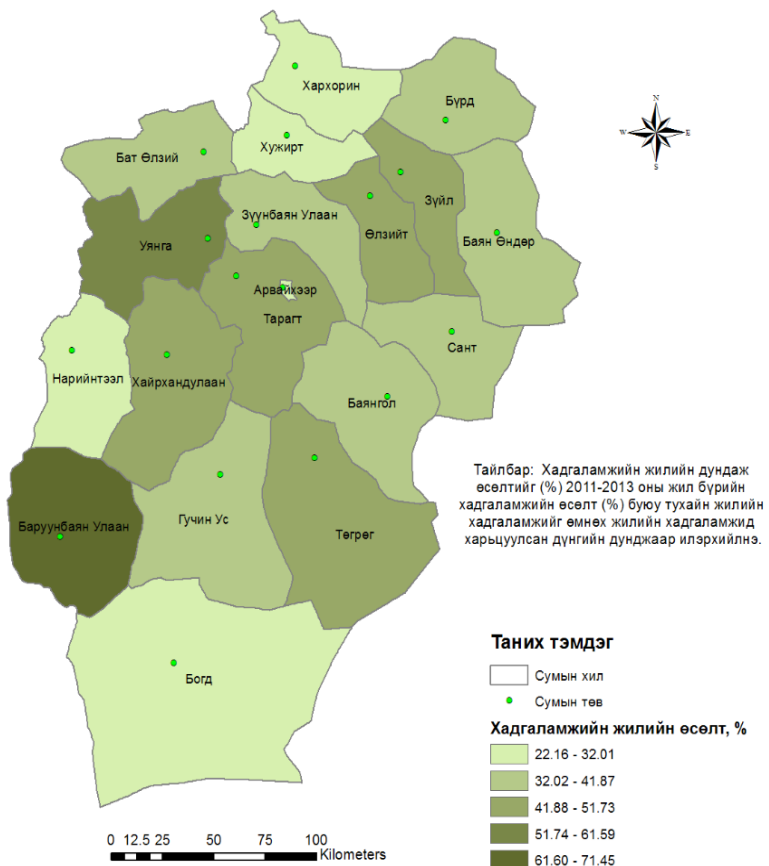


Bank saving by sums, Uvurkhangai

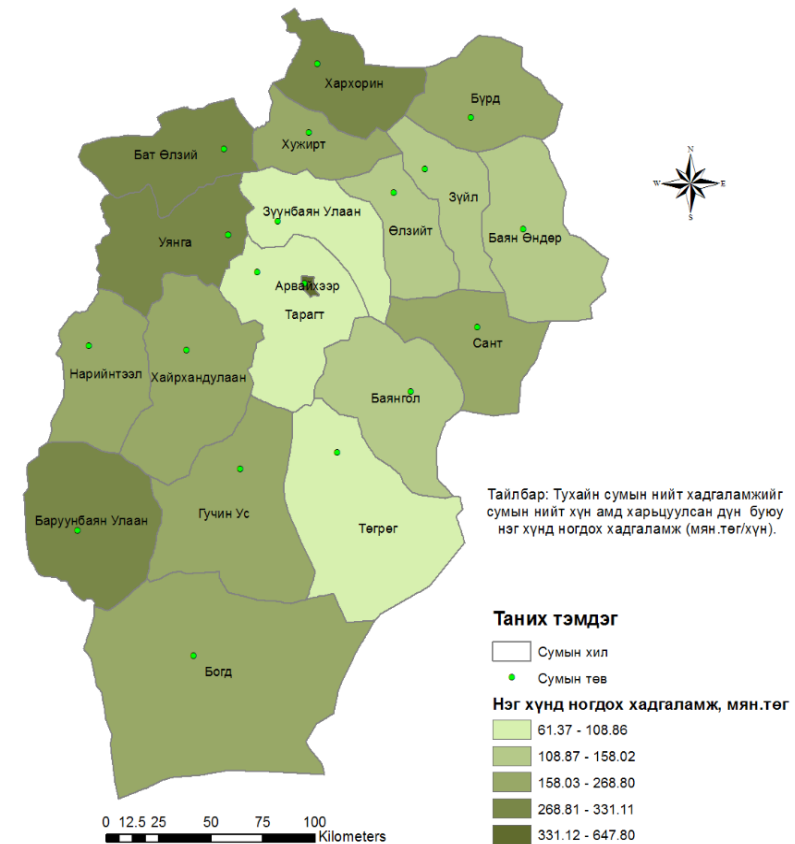
Bank saving, million.tug, average of 2010-2013



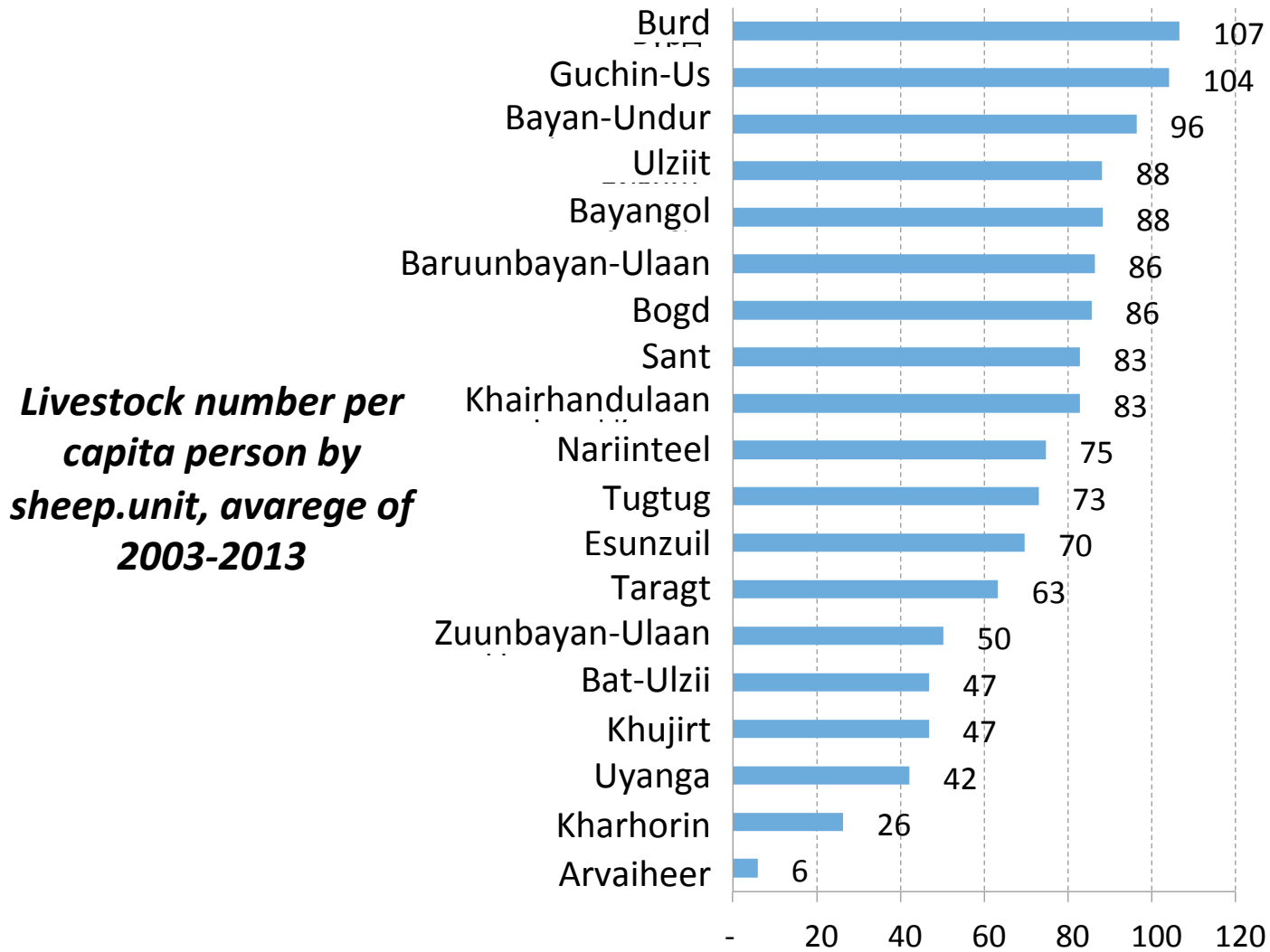
Average annual growth of Bank saving, %, from 2010 to 2013



Bank saving per capita person, thousand.tug, average of 2010-2013



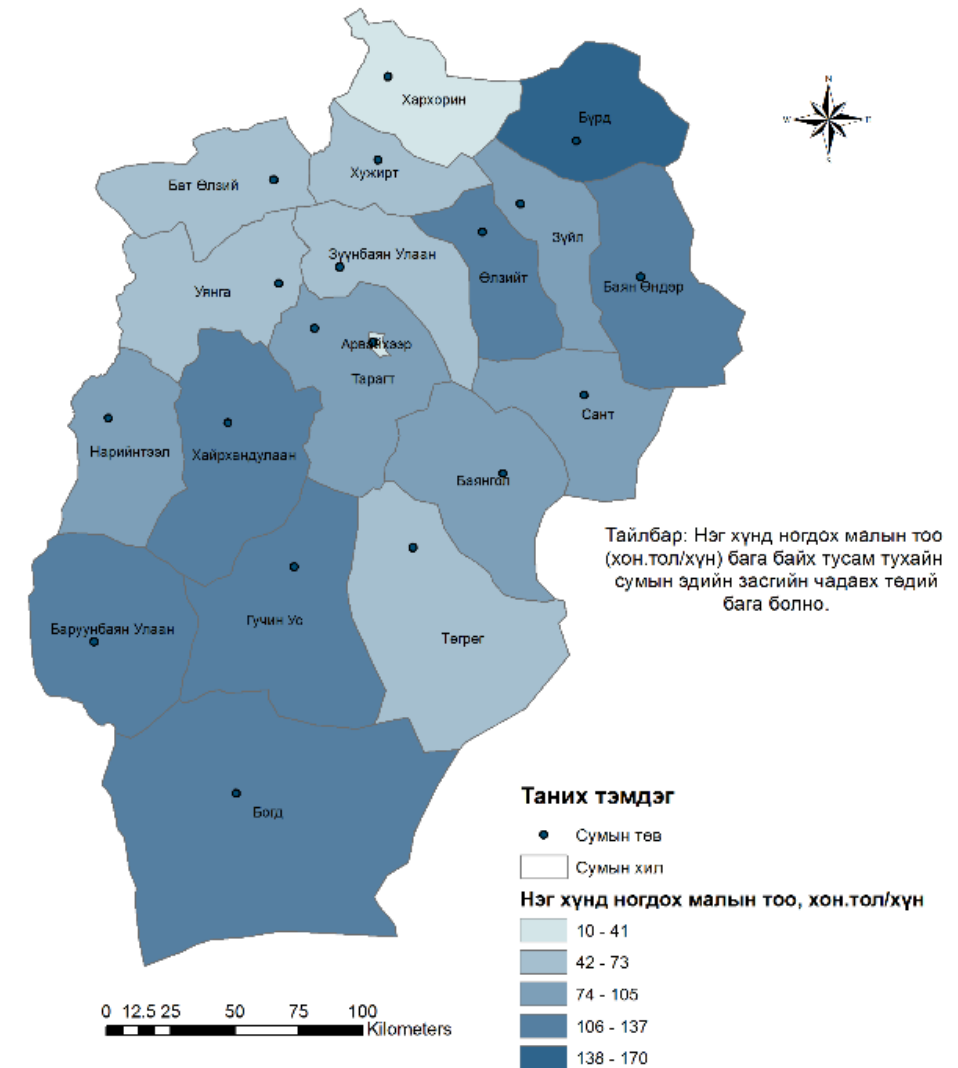
Livestock number, per capita person



Livestock number per capita person by sheep.unit, avarege of 2003-2013

Livestock number, per capita person, sheep.unip

Livestock number per capita person by sheep.unit, avarege of 2003-2013



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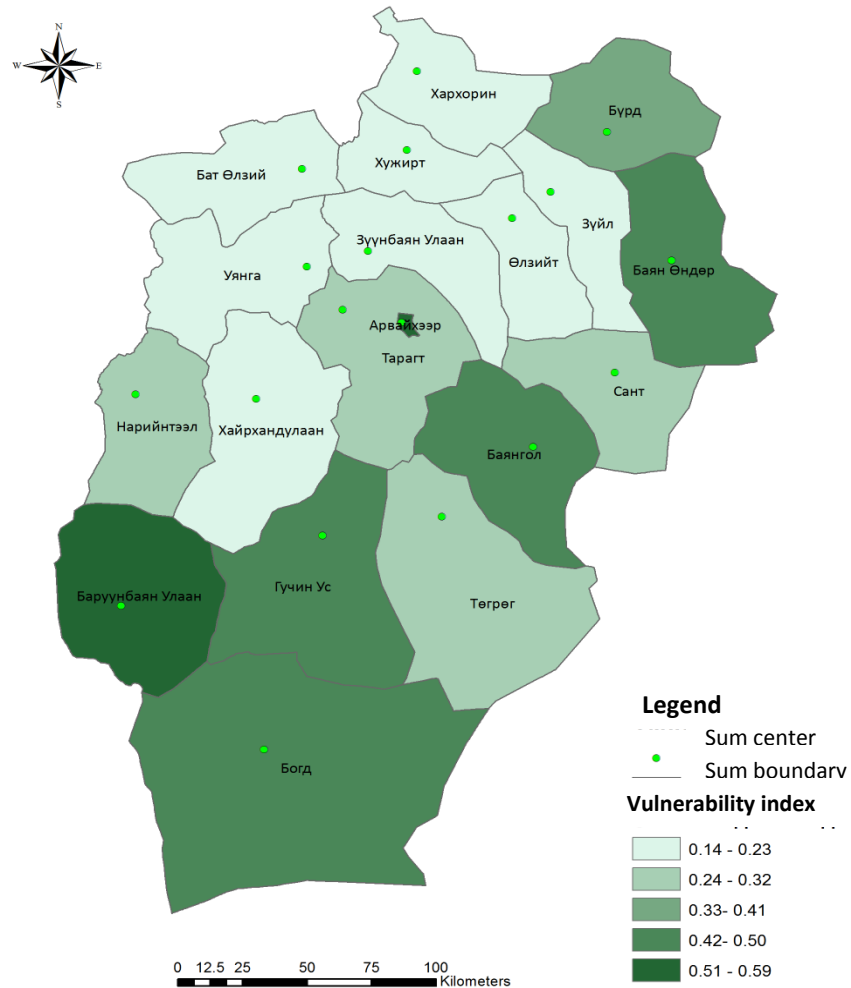


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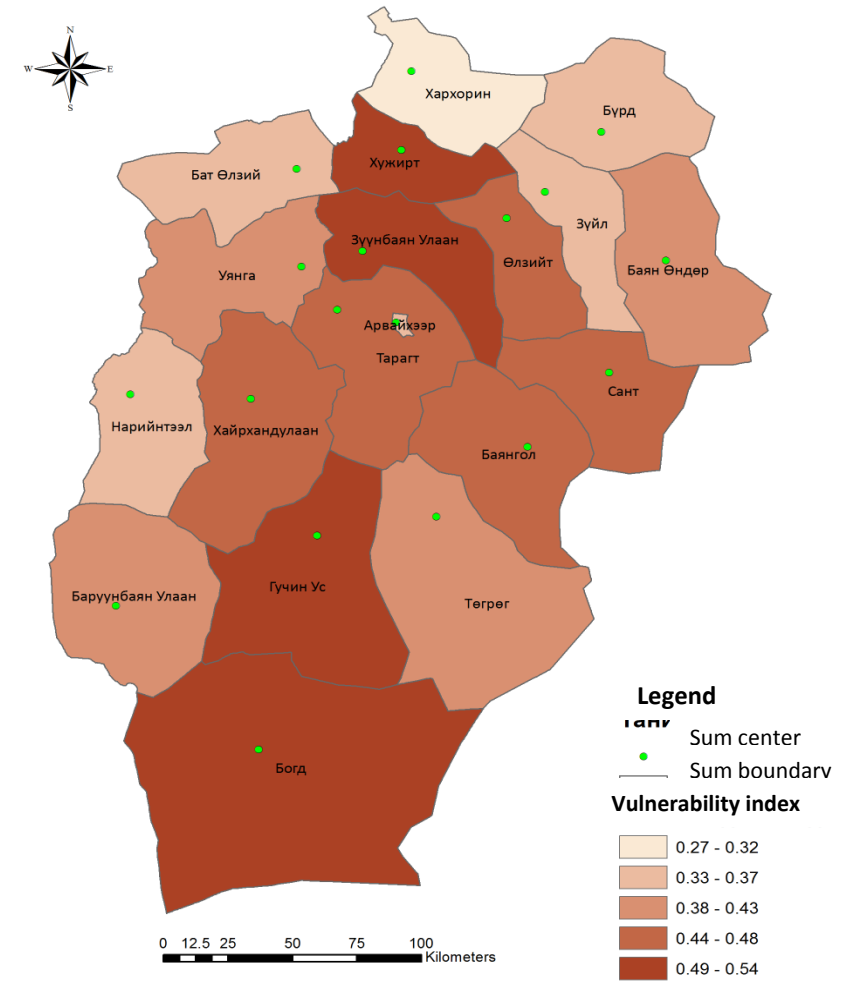
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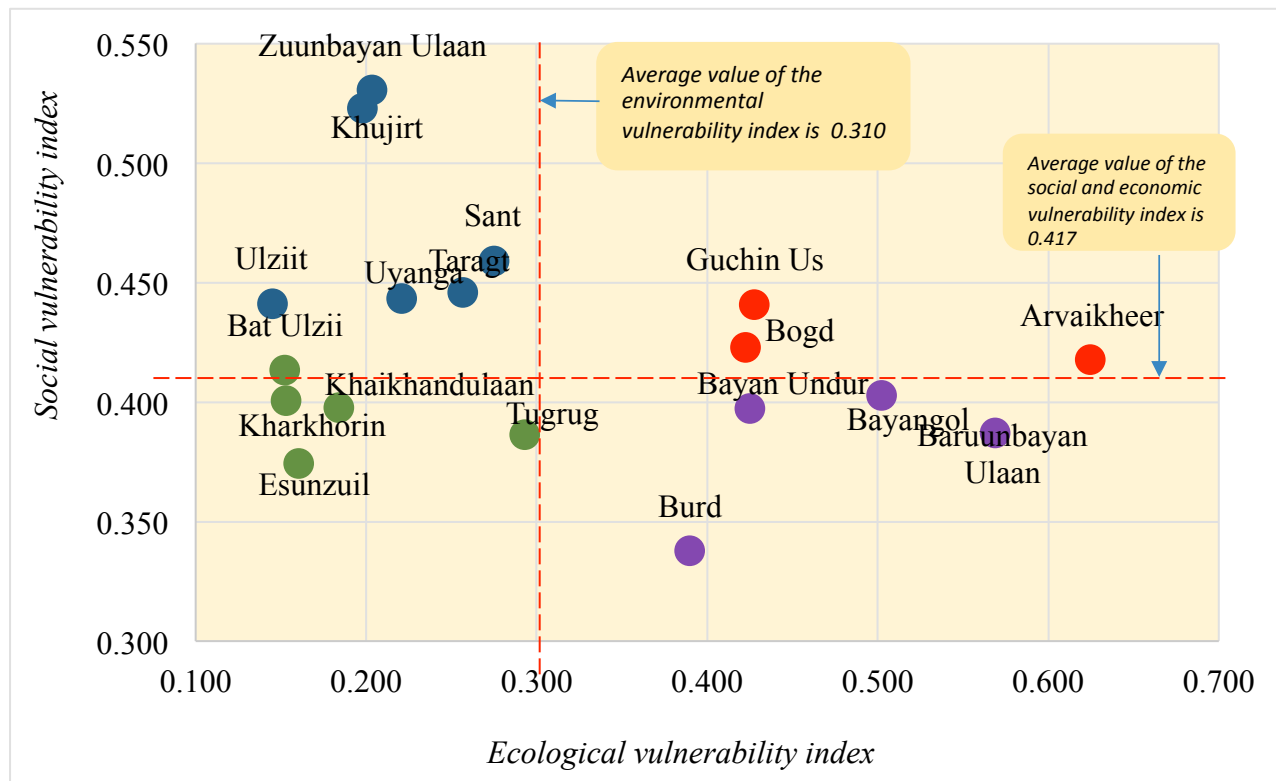
Vulnerability assessment, Uvurkhangai aimag

Combined ecological vulnerability assessment by sums

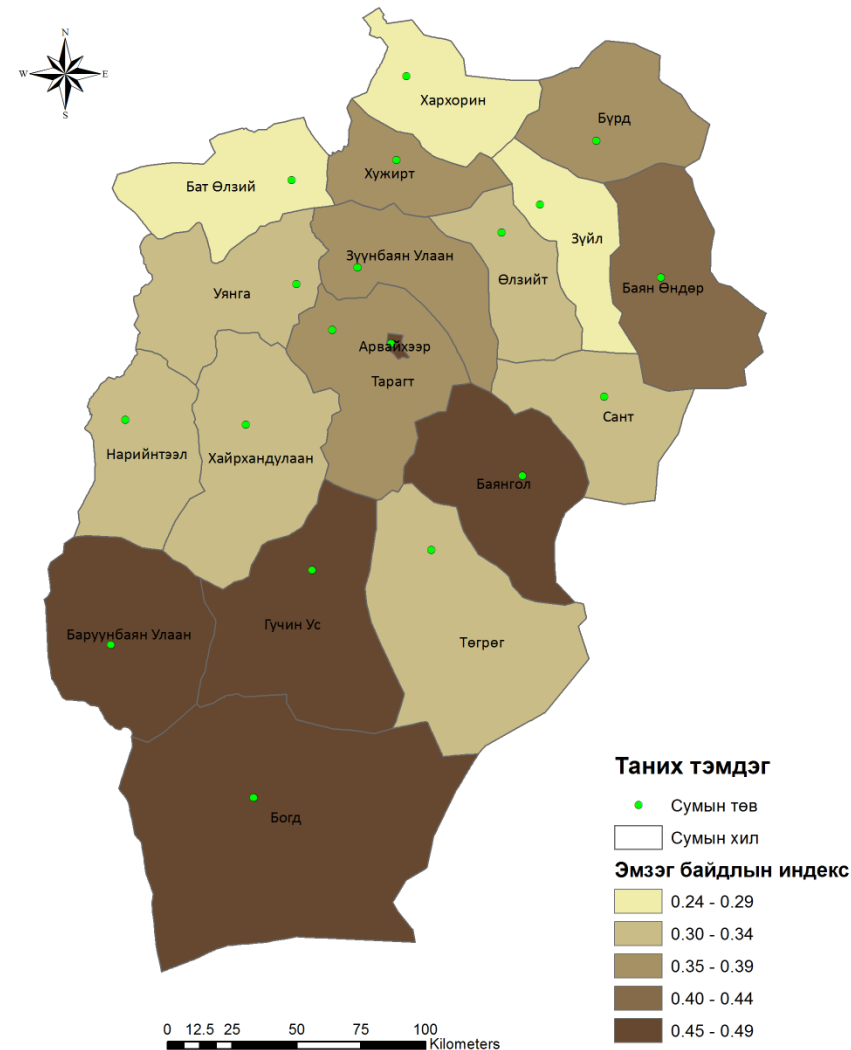


Combined social vulnerability assessment by sums





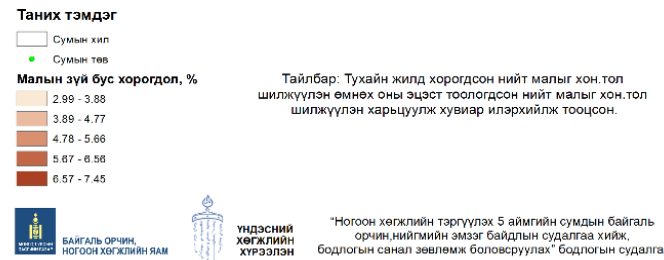
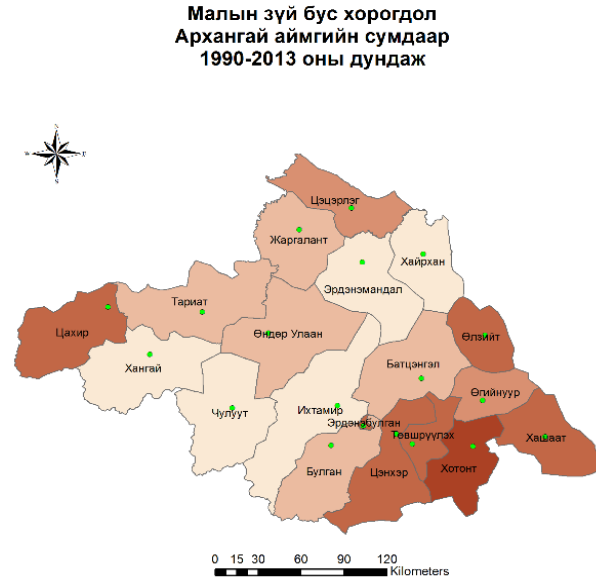
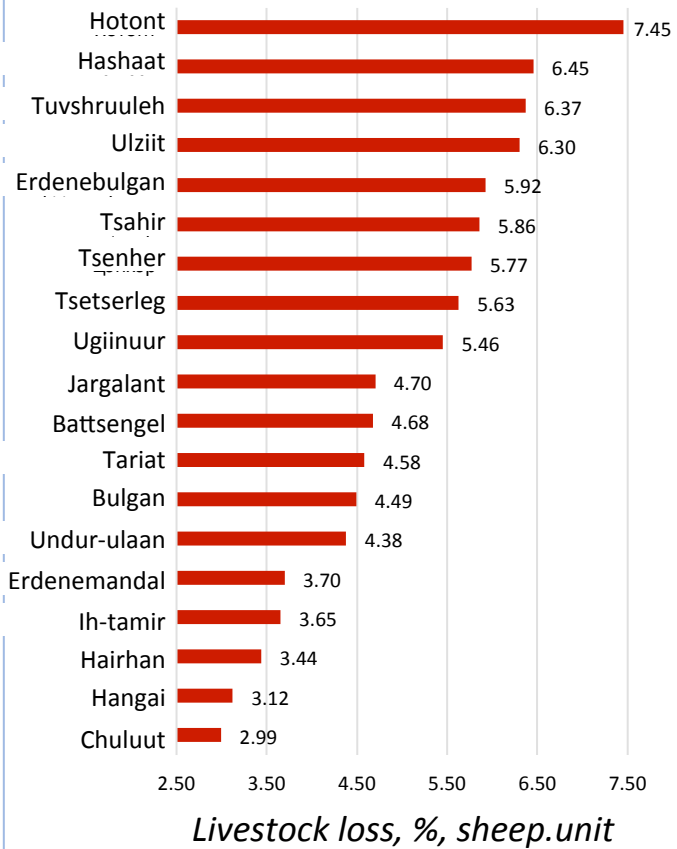
Integrated vulnerability assessment of social-ecological systems by sums



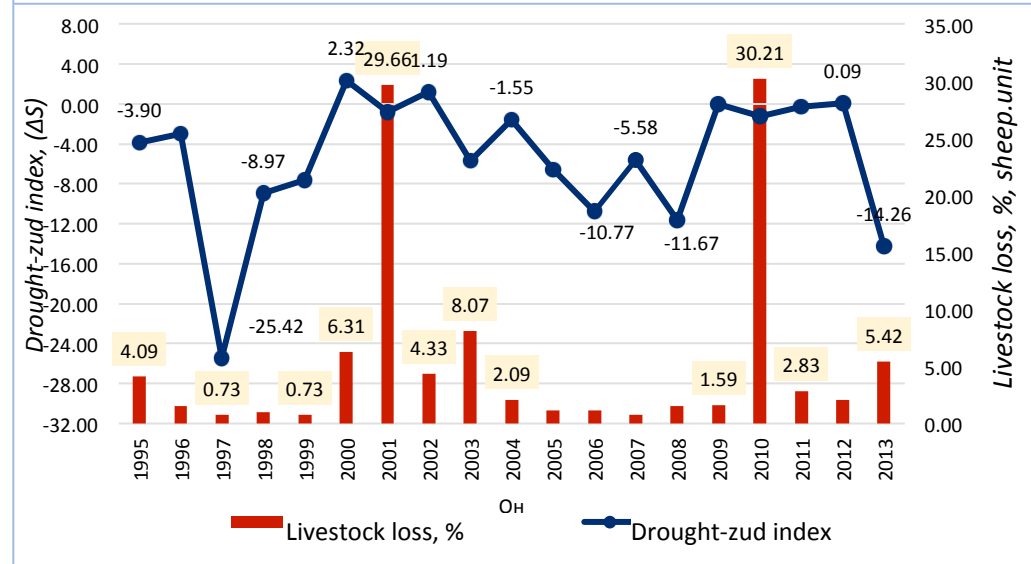
Arkhangai aimag: Some Result of Analysis and Vulnerability assessment



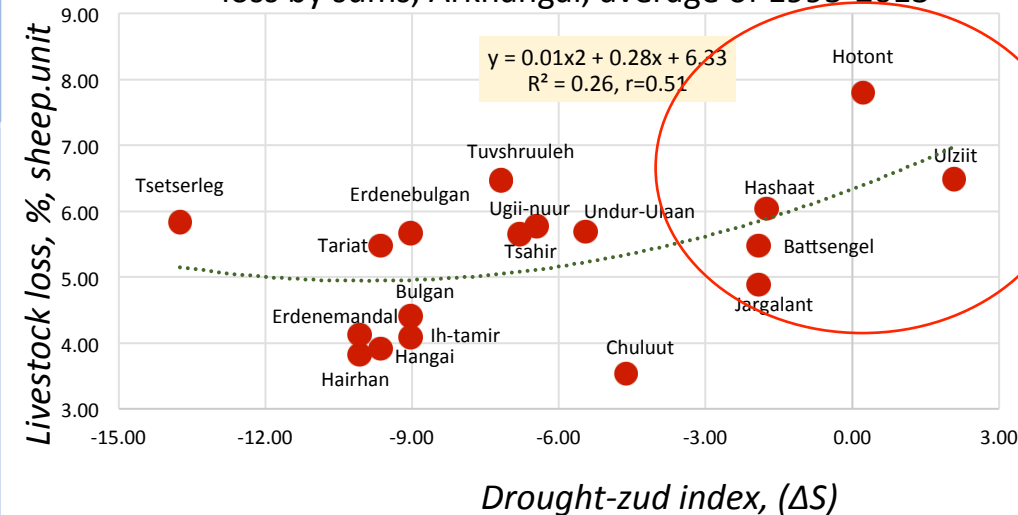
Livestock loss by sums, average of 1990-2013, Arkhangai



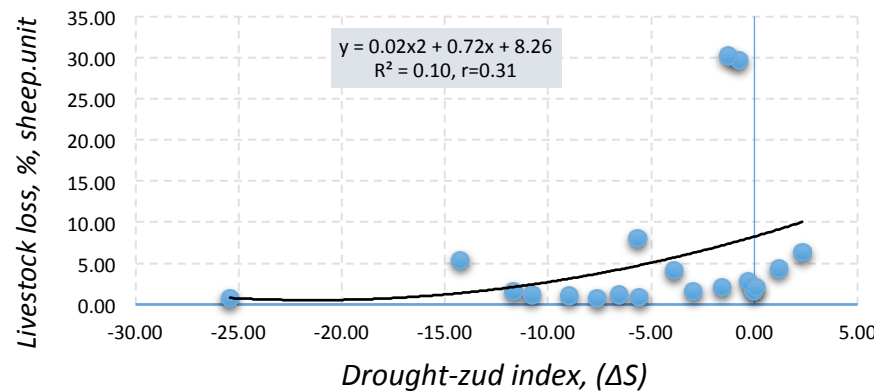
Dynamic of livestock loss and drought-zud index for 1990-2013, Arkhangai



Spatial relation for drought-zud index and livestock loss by sums, Arkhangai, average of 1995-2013

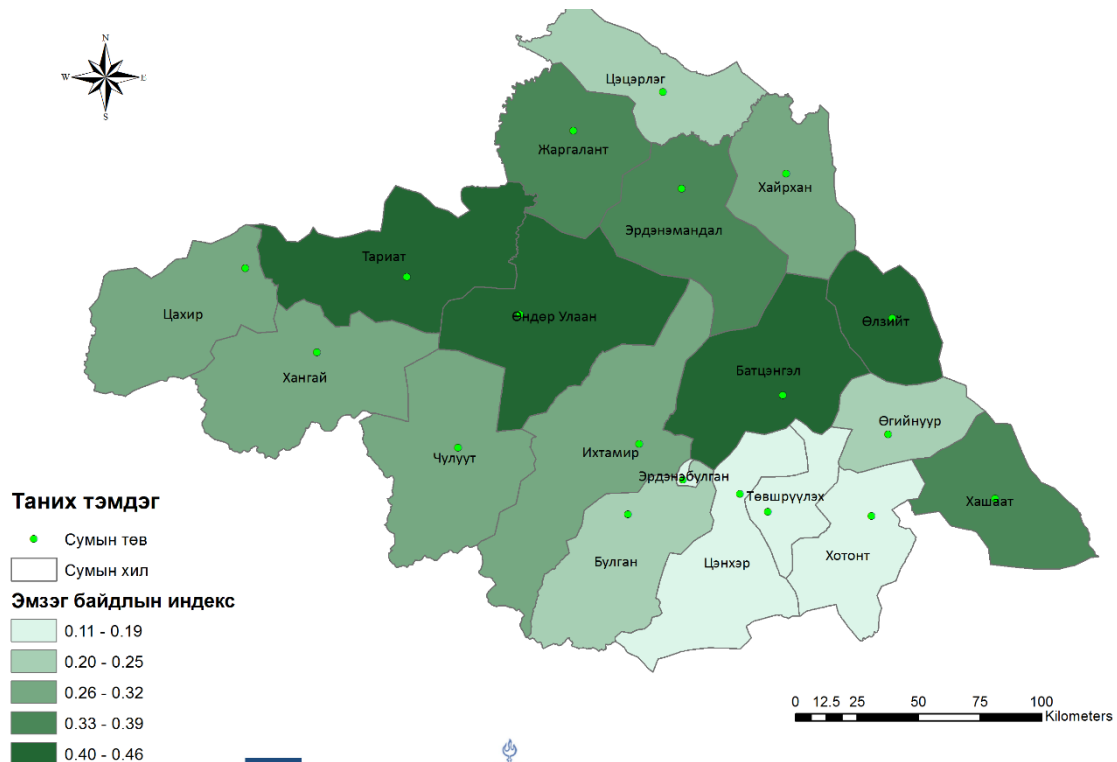


Relation for Livestock loss and drought-zud index for 1990-2013, Arkhangai



Vulnerability assessment, Arkhangai aimag

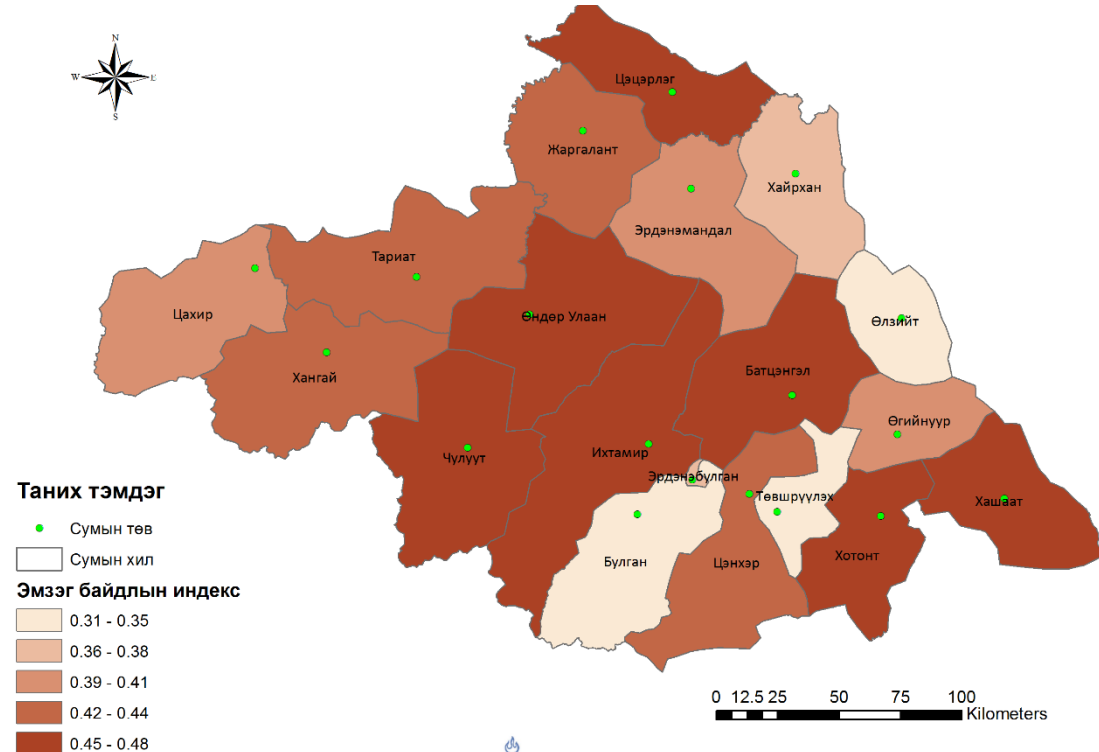
Combined ecological vulnerability assessment by sums



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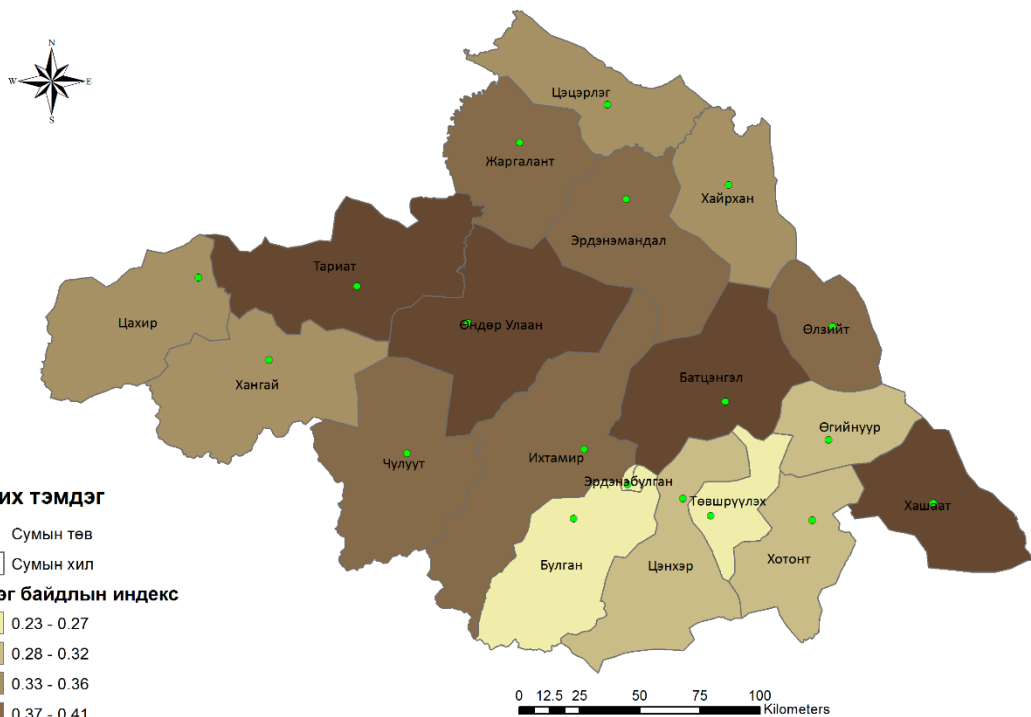
Combined social vulnerability assessment by sums



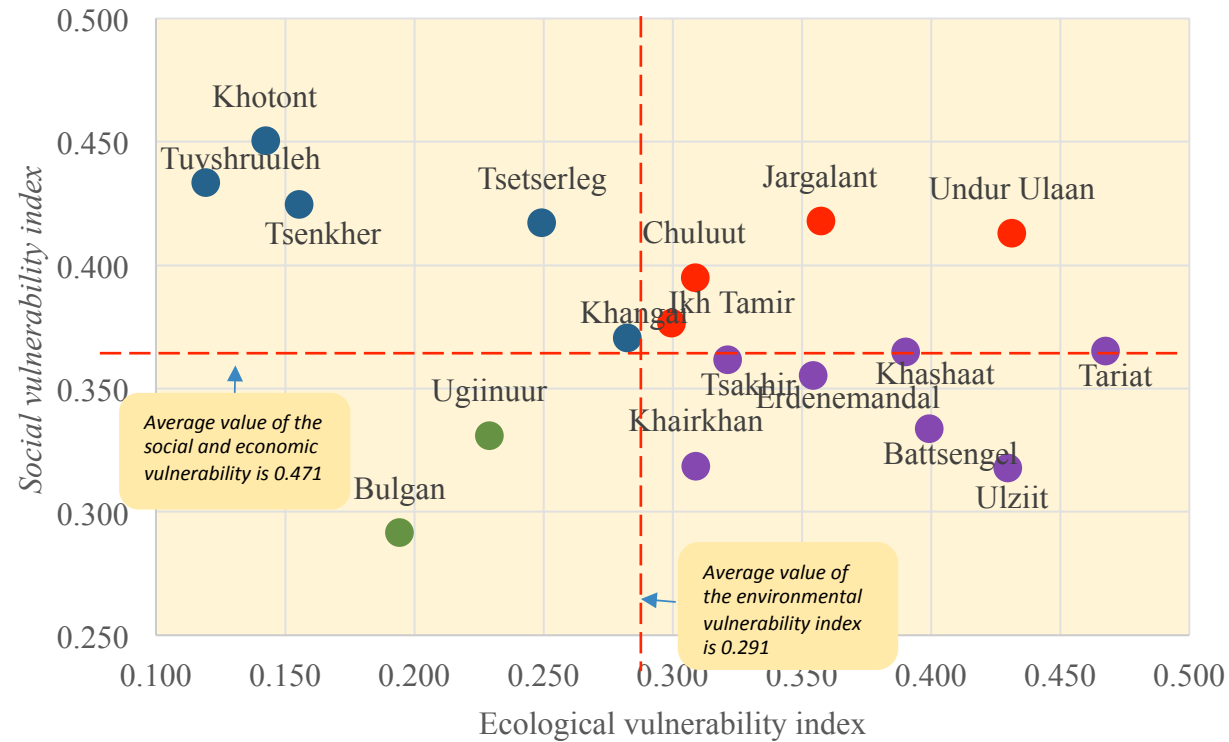
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Integrated vulnerability assessment of social-ecological systems by sums



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Discussion & Cooperation

- We identified more vulnerabilities areas and sectors in the Five aimags by this research.
- The results of this study is giving good messages for the policy makers
- More vulnerable sums are need to implement green policy such as increasing “green” budget, to develop capacity of adaptation and resilience, to decrease the vulnerability and to coordinate the policy plan and budget based on this research.
- Identify needs of FREEZING SYSTEM in which sum to linking vulnerability and adaptation options.

Thank you very much for your attention.
Баярлалаа...



Livestock risk based on livestock loss during drought and zud years

