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**Climate change impacts and ecosystem services
on nomadic livelihoods:
*a case study from Northeastern Mongolia***



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Outline

- Introduction
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- Methods
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- Discussion



Introduction

Ecosystem services (ES): *“The benefits people obtain from ecosystems to sustain or advance wellbeing”* (MA, 2005).

“Climate change has altered and will continue to alter the provision, timing, and location of ecosystem functions across landscapes” (Nelson et al., 2013).

“Climate change is having a significant impact on ecosystem services and is likely to become increasingly important as this phenomenon intensifies”
(Runting et al., 2017)

Significance:

The applicability of ES approach at a local scale (Grêt-Regamey, Sirén, Brunner, and Weibel (2016); Pandeya et al. (2016); Runting et al. (2017), *dry land ecosystem*

Research question:

How is nomadic livelihood changing and how is climate change influential this process by changing the provision of ecosystem services?

Nomadic livelihoods in Mongolia



The total land: 1.56 million km²

Total population: 3.12 million

The population density: 1.9 people per square kilometer

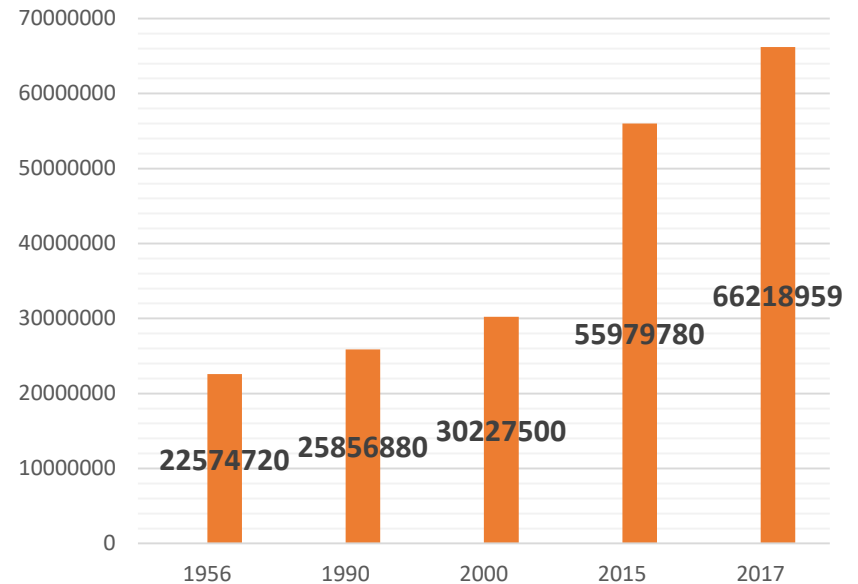
Climate change (CC): 2.14⁰ C of warming.

1921-1937: the first attempt to make livestock public property

1959: “*The year of the negdel victory*” or “pastoral cooperatives”. 90 percent of the private livestock were allocated to “the negdels

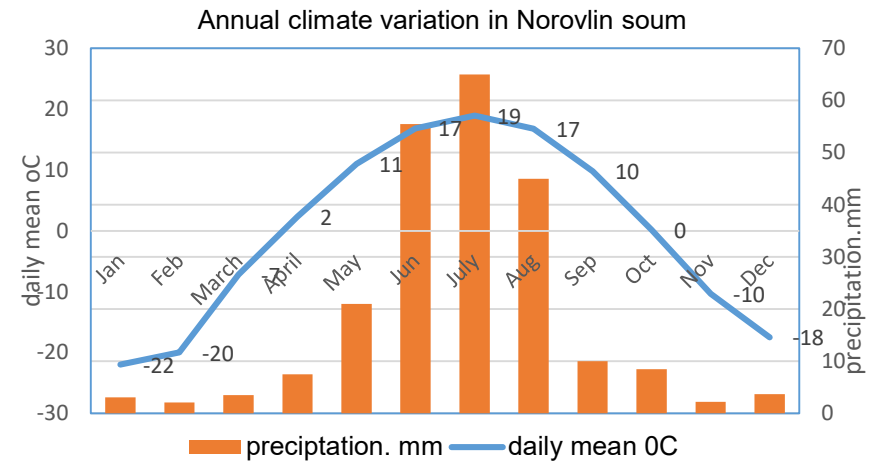
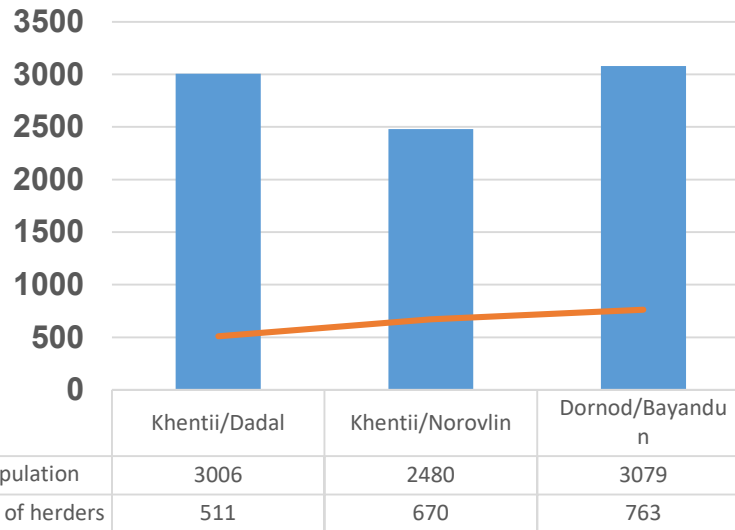
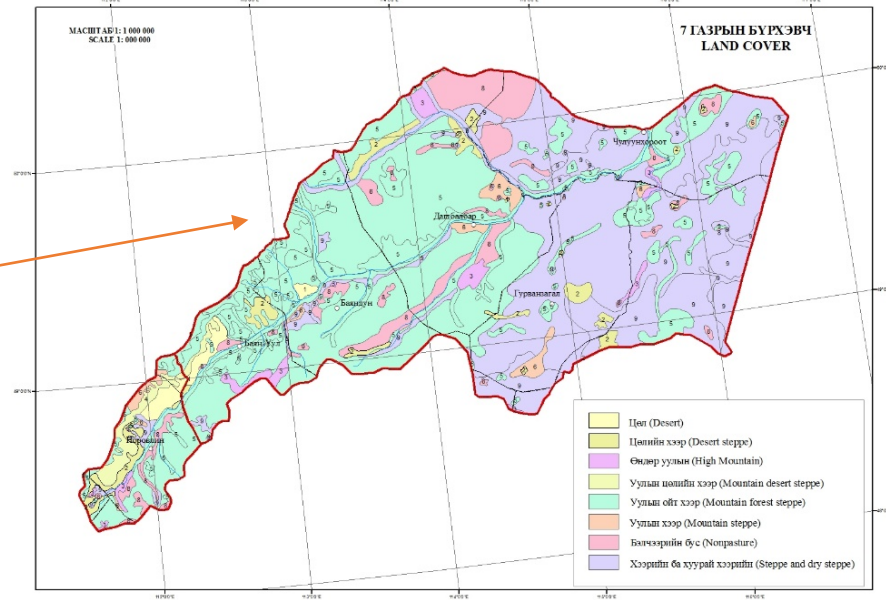
1991-1992: State owned *livestock* was *privatized* to the “negdel” members.

■ number of the livestock



Herder - A person who looks after a herd of livestock or makes a living from keeping livestock
The livestock - 5 types of animals: *sheep, goats, cattle, horses and camels*

Study area



Methods: Case study

Field work: June-July, 2018

Key informants interviews -10

Themes: *climate change impact on herders' livelihood and nature, the methods used to improve grassland, and water resources, natural resources management and livelihood*

Herders interviews -15

(i) herders' *perception* of climate change, (ii) their *knowledge* of climate change, (iii) changes to *practices*

Five broad themes: *household, livestock, herders' movement, pasture, and natural resource issues and traditional culture*

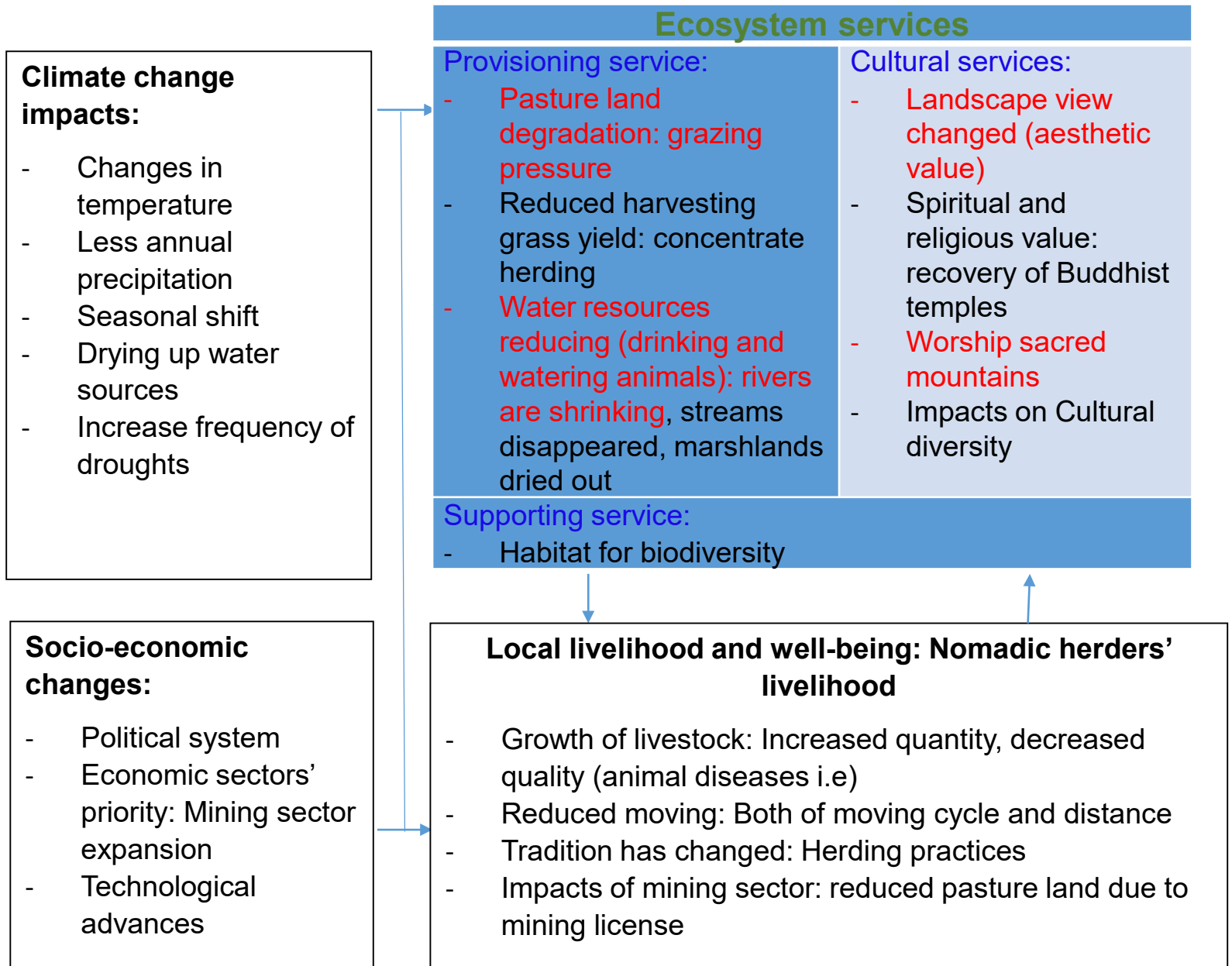
Code	age	education	gender	location
1	20-30	high school	male	Norovlin
2	50-60	college/university	male	Bayandun
3	40-50	high school	male	Dadal
4	40-50	college/university	male	Dadal
5	40-50	secondary school	male	Norovlin
6	40-50	college/university	female	Bayandun
7	60-70	college/university	male	Bayandun
8	50-60	college/university	male	Bayandun
9	70<	elementary school	male	Bayandun
10	60-70	college/university	male	Norovlin
11	60-70	secondary school	male	Dadal
12	40-50	secondary school	male	Bayandun
13	60-70	college/university	male	Norovlin
14	20-30	high school	male	Bayandun
15	50-60	secondary school	male	Norovlin

Methods: Case study

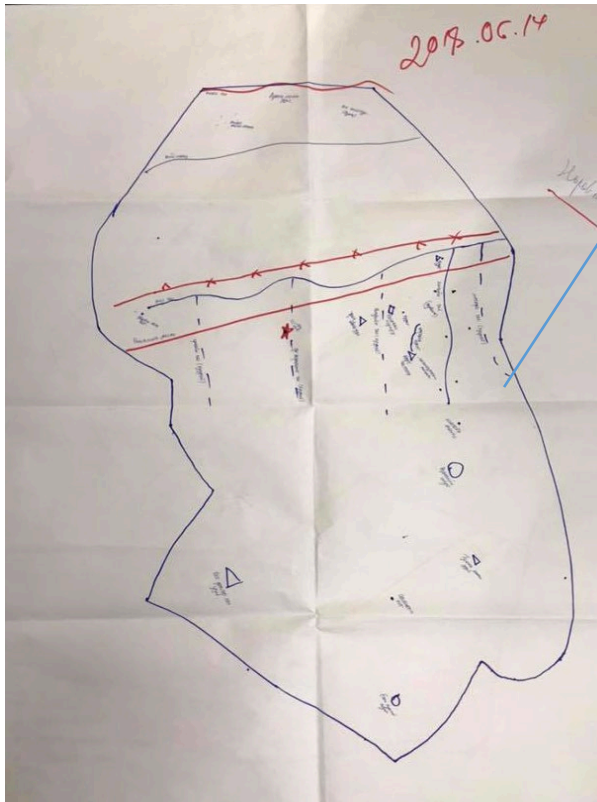
Focus group discussion- 3 FGDs



Climate change impacts on nomadic livelihood and ecosystem services



Results: “Khot ail” (a network of households) to “Neg goliinkhon” (one river area)



Mogoit riverside area, Norovlin soum, Khentii aimag, Mongolia.

8 herder families settle here during the summer time.

“Our livelihood depends on water. So, along with this small stream, around 10000 heads of livestock grazing. More than local livestock, the migrants’ livestock is contributed to the pastureland degradation.” P., 69

“To choose the settling place: water source and sufficient grass for grazing are so important and open space what can look after animals while grazing.” B.33

Results: Talks around the changes: climate and natural environment

<p>Climate change:</p> <ul style="list-style-type: none">- less and late rainfall,- fewer hot summer days,- cold and windy spring	<p><i>“Because of Climate change, our surrounding environment has changed a lot, like strong winds, rain storming or sometimes no precipitation at all. Surface water is shrinking” (N,53).</i></p> <p><i>“We have a less rain since 2013. Almost every summer is dry, so it is problematic to harvest grass and prepare good hay. Rain doesn’t fall in the season, comes late. Last winter, it was black at all, no snow, until March. Because of the black dzud, herders lost a number of animals” (KI).</i></p>
<p>Seasonal shift</p>	<p><i>“Seasons are changed. How nice rainy was the summer. Haven’t had continual warm rainy days last years. Now it is so dry and windy. Autumn was nicely warm. Now it is getting windier just like spring. Winter is shortening and not so cold. Spring is getting longer and windier” (P,63).</i></p>
<p>Weather prediction:</p> <ul style="list-style-type: none">- unstable and unpredictable weather	<p><i>Nowadays it is getting harder to see the morning star. We used to predict the coming season’ weather patterns. I heard that most of the rain comes due to cloud seeding. So, I suspect that influence to predict seasonal changes, since it is not natural raining. I would say that the weather becomes unpredictable (B,63).</i></p>
<p>Cloud seeding:</p>	<p><i>Because of cloud seeding, traditional weather prediction methods don’t work anymore. We can predict weather if cloud appears naturally (N, 53).</i></p>

Results: *Pasture land degradation and movement*

Being nomadic means moving to search better pasture and water for livestock

Water shortage	<i>“Ulz is only one bigger river in our soum area. Most of the big lakes dried. Surface water is worsening, year by year. If the year is dry, most of the herder families have moved around the source streams of the Ulz River” (Klls).</i>
Pasture land degradation	<i>Structure of pasture grasses has changed. The number of plants that had grown in the mountain and riverside area had disappeared. The grass “Ulun”, which used to grow up to horse saddle stirrup, hadn’t appeared last years (B, 63).</i>
Movement	<i>“Most of the herders prefer to stay close to the Ulz River. Also, some of them have needs to live close to the soum center. If it is far from the center, there is no mobile network.” (Klls)</i>

Grass grows up to horse saddle stirrup- Mongolian expression of how that grassland is plant-rich

Results: *Trend of ecosystem services benefit*

In 1990	2000	The current situation
<p>Harvesting: Distance: Enough grasses had grown around the winter place to harvest</p> <p>Quantity: Used to prepare 80 haycocks from 1 hectare</p>	<p>It was getting harder to harvest near the winter place. So, we had traveled 10 km far from the winter place.</p> <p>60 haycocks from 1-hectare area</p>	<p>Need to travel more far to find harvesting place. App. 30-40 km.</p> <p>40 haycocks from 1-hectare area</p>
<p>Color of landscape: Because of enough grasses, mountains were green</p> <p>Because of grass cover, land surface was not much hot</p>	<p>Because of intensive and repetitive forest and steppe fire, mountains were grey dark</p>	<p>Land is getting drier. Less grasses. So, mountains are reddish now.</p>

Results: *Trend of ecosystem services benefit*

In 1990	2000	The current situation
<p>Water:</p> <ul style="list-style-type: none"> ✓ Balj river was so deep. Average depth was until the waist. We couldn't go to other side by motorcycle ✓ Many small rivers and streams were run into Balj river ✓ There were many types of fishes. 	<p>Started getting dry out small rivers and streams</p> <p>Getting fewer fishes</p>	<p>Balj river is not so deep now. Average depth is up to knees. So, we can go to other side by motorcycles.</p> <p>Hard to fishing. Most of species of fishes disappeared.</p>
<p>Forest:</p> <ul style="list-style-type: none"> - It was easy to collect plenty of birch sap - There was forest fire. But not many evidences registered. - Less forest diseases and insects 	<ul style="list-style-type: none"> • Lot of evidences of the forest fire • Spreading vaguely forest disease 	<ul style="list-style-type: none"> • It is so hard to collect the birch sap. Birch is drying • Larches are getting dryer and smaller • Trees are disappearing by the bunches • Disease of trees and insects spreading are intensively

Results: *Spiritual value of land*



The nomadic herders believe themselves as being constantly **“under the sky power (tengeryn khuch)” with the support of “land master” (gazariin ezen);**

Respecting and honoring sacred mountains have been integral to both shamanic and Buddhist practice in Mongolia.

“There are sacred mountains in our soum. Every spring we have worshipped the sacred mountain and after that rain falls in most cases” (B, 53). “We did worship 3 mountains this year. And after that rain fell quite well” (J, 32).

70 years gap: religion both Buddhism and shamanism has been recovered or reintroduced in Mongolia.

Results: *Horse culture*

“My eldest son is 10 years old. He doesn't ride the horse. I heard animals myself. My kids are raised by my mother and she doesn't allow them to learn horse ride (B, 33).

“Year by year, it is getting hard to find the skilled kids. When we were little, kids started riding the horse from 4-5 years old. Now, that prohibition law states that horse riding kids must be above 6 years old. Another thing is herders' kids don't learn horse riding like our young ages. Maybe because of those issues cause more accidents during the horse riding. My 4 kids all ride horses. Now all of them grown up. So I am training my nephew to horse ride. The problem is he lives in the city and forgets what learned during the winter (horse trainer, 50).



Discussions: Scale: *from “Khot ail” to “Neg goliinkhon”*



“Khot ail”- herder family (2-3 generations of families live together in a nomadic camp). Basic unit of the nomadic society. Generally, sons create and establish own household in a common camp with father. Except of sharing the herding task, the unit has valuable social and ritual functions.



“Saakhalt ail”- neighborhood. Distance between the neighbors are different in the different natural zones. In the forest steppe area, distance is closer than steppe area. In the Gobi Desert, distance between the 2 khot ail can be “place to ride by horse a day”. They share the pasture land and water resources and help each other for some labor requesting works.



“Neg goliinkhon”- our riverside area

A larger neighborhood group called “neg goliinkhon” (families live along the one river side area). Generally, consists of four to fifteen khot ails, depending on the size of the river value, or open steppe (availability of the open pasture land and water sources).

Discussions

Climate change:

- **temporal and spatial distribution of precipitation** in North Eastern Mongolia.
- **seasonal shift.** It's timing and intensity as the most important changes affecting their livelihoods and natural ecosystem (Marin, 2010).
- **growing season.** Because of the late rain, the growing season is delayed. Pasture land plant growth and composition are most affected by precipitation change in Mongolia.



Water shortage: Water shortage is the main problem, everywhere. Because of dryness and less precipitation, small rivers, streams, and lakes are dried. Rivers discharge and flow reduced.

Moving radius and cycles are reduced. Traditional nomadic herders used to move at least 4 times annually. At the present, herders move 2-3 times, annually. In north-eastern Mongolia, “herders moving radius was less than 25 km up to 50 km from the certain camp. The distance was measured by the distance a horse could run in a day” (Bazargur, 1998). Nowadays, it is limited up to 10 km (access to water & mobile phone coverage etc.)

Traditional livelihood changes: less usage of horses for herding. Herders' kids do not ride horses. Changes in horse riding culture. Traditional nomadic livelihood is based on the horse riding.

A landscape photograph featuring a vibrant rainbow arching across a dark, stormy sky. Below the rainbow, the sky is filled with heavy, grey clouds. The foreground and middle ground consist of rolling golden hills and fields, illuminated by warm, low-angle light, likely from the setting or rising sun. The overall mood is dramatic and serene.

Thank you for attention!

Question & Comments?