Critical tipping points of reindeer management in Finland

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Photos: Mia Landauer

Background and aim of the study

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- **Social-ecological systems (SES)** are linked systems that are constantly changing and affected by human interference (Milkoreit et al. 2018)
    - Some of these **changes are rapid** and non-linear, and their consequences are uncertain
- We study **why and how SESs are approaching tipping points**, how this leads to irreversible, qualitative system changes, and what the consequences of these changes are
- We mainly focus on **social tipping phanomena which is linked to ecological system change**
    - Our example of SES is **reindeer husbandry**

Photo: Mia Landauer

Material and methods

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- **Interview data** on herders' experiences and perceptions on climate change, land use change, and reindeer management issues
- **Scientific peer-reviewed literature** published between 2000-2018
- **Content analysis** to identify social and ecological tipping points and drivers of transition

Photo: Mia Landauer

Literature review

- Based on the content analysis, we found 58 publications where transitions/transformation/tipping points were discussed (N=84)

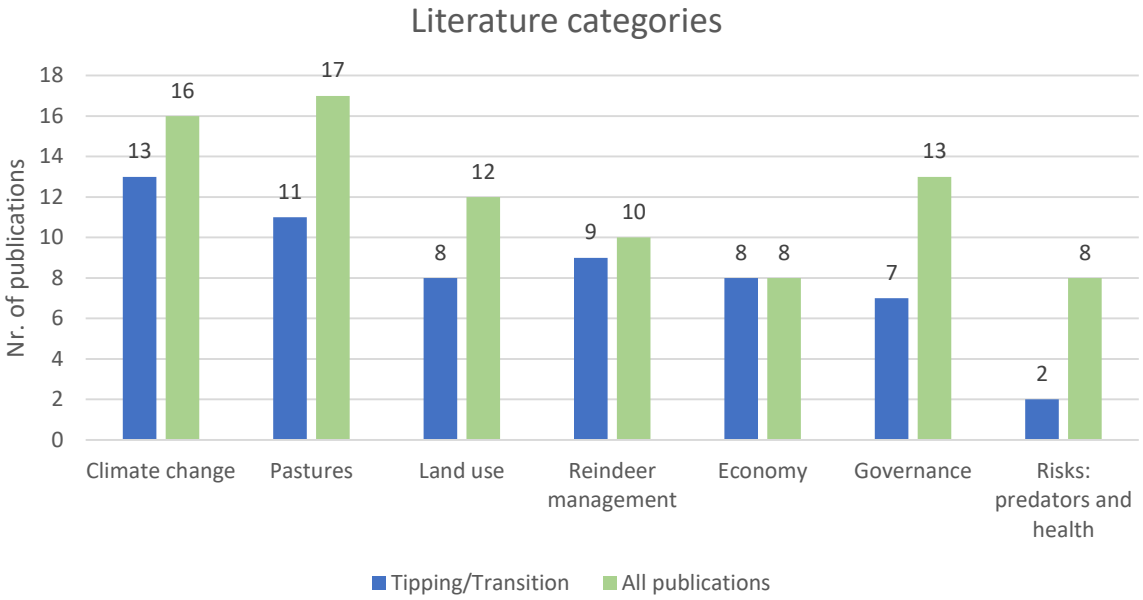


Photo: Mia Landauer

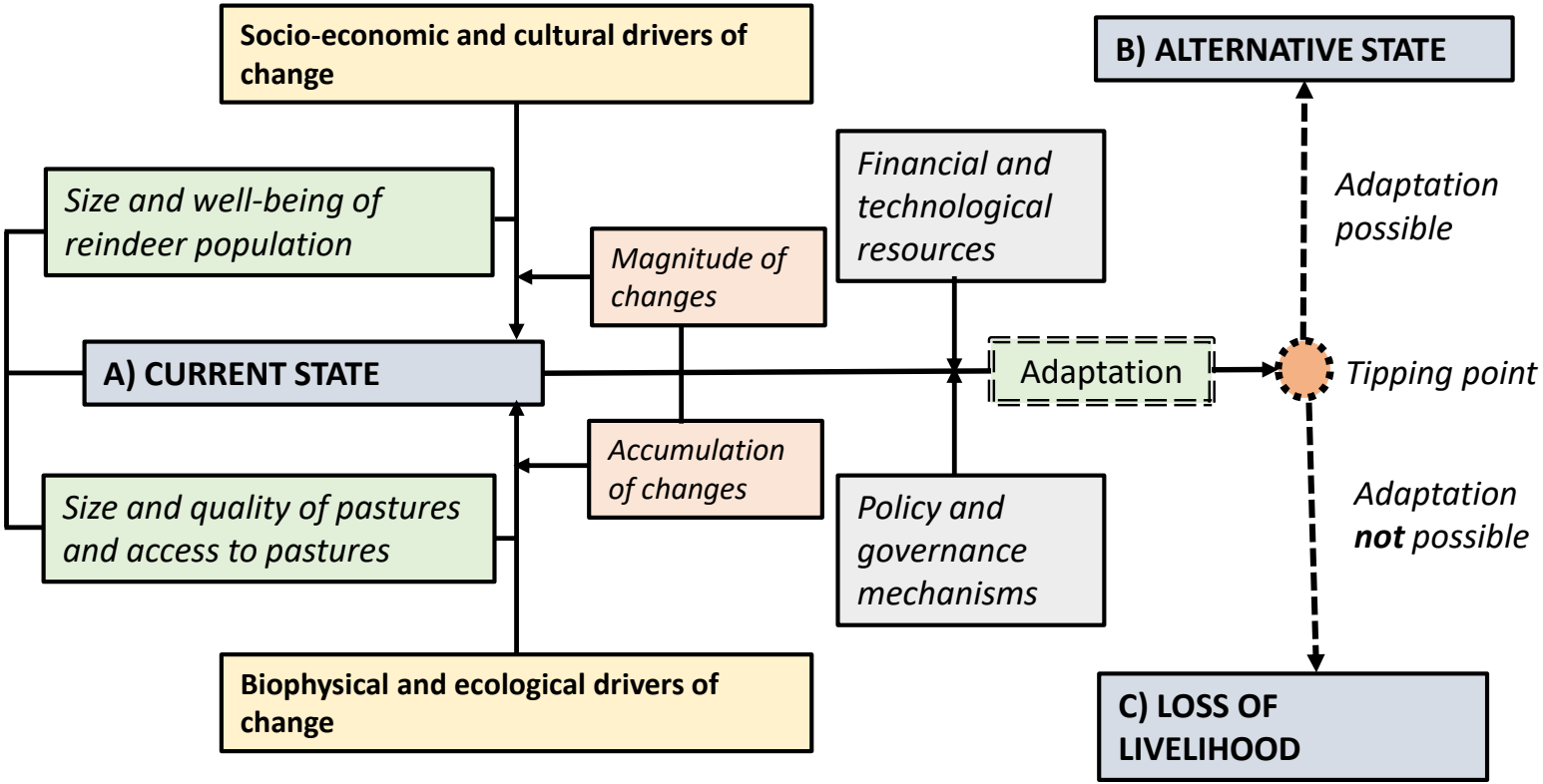
Terms found in the literature

- *Tipping; tipping point* (e.g. rapid increase in parasite populations)
- *Point of exceedance* (e.g. severe degradation of an entire ecosystem)
- *Collapse; sudden collapse, crash* (e.g. reindeer population decline)
- *Carrying capacity* (e.g. economic, ecological)
- *Threshold; critical threshold* (e.g. overgrazing)

- *Loss* of something (e.g. young generation quits herding)
- *Threat* to something (e.g. entire livelihood, culture)

Photo: Mia Landauer

Example of a system change

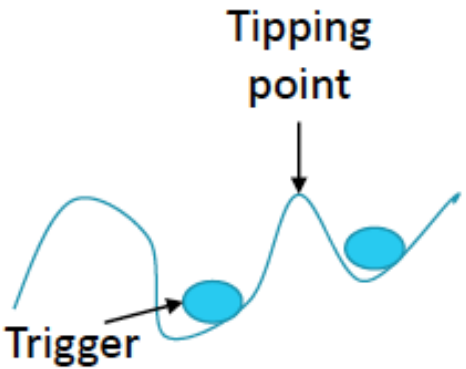


Landauer et al. *in preparation*

How does change happen?

- Pace of change
  - Gradual shift
  - Rapid change

- Type of change
  - Autonomous
  - Intentional
  - Irreversible



What happens when a tipping point has been reached?

- Loss of system
- Loss of sub-systems
- New system state (entire system)
- New system state of part(s) of the system

Figure modified from Scheffer et al. 2012

Main drivers and consequences of change

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Drivers

- Land use and land use change
- Governance
- Climate change
- Economic change

Consequences

- Impacts on reindeer management
- Impacts on pastures
- Economic impacts
- Socio-cultural impacts
- Reindeer health impacts

Photo: Mia Landauer

Transition from intensive herding management…

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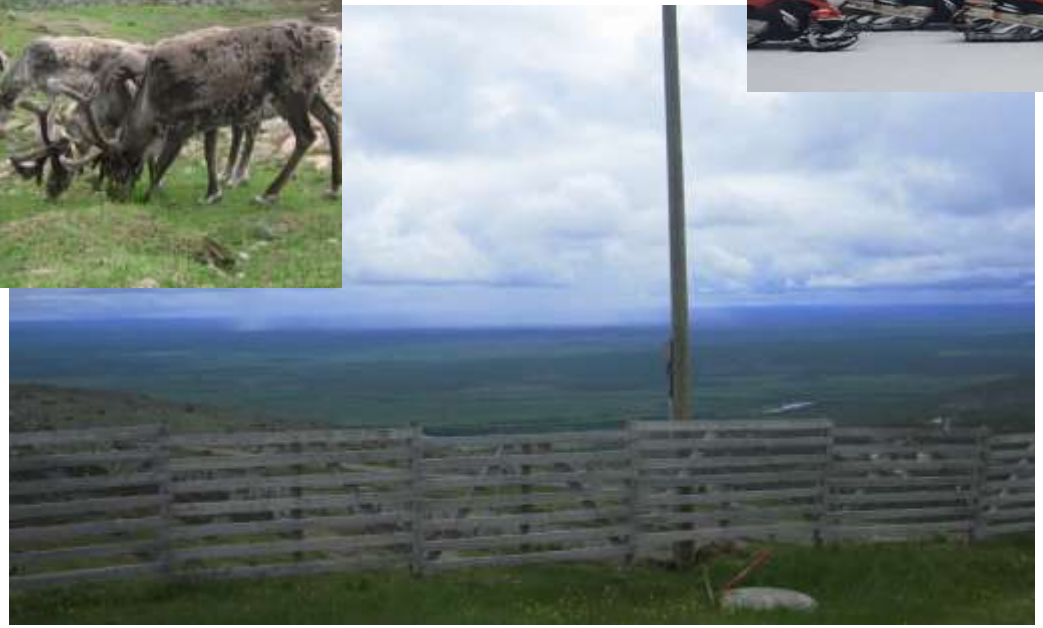
Photo: Mia Landauer

…to extensive herding management



Photos: Mia Landauer

Examples of drivers: Governance and policy

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- **Actors across scales**:
    - Intergovernmental: EU (agriculture policy)
    - National: Ministry of Agriculture and Forestry
    - Regional governmental authorities
    - Local: Herders' Association, herding cooperatives, *Siida*s

- **Formal policy instruments and steering mechanisms**
    - Steering by rules, norms, and regulations:
        - E.g., Reindeer Husbandry Act (848/1990)
    - Financial steering instruments
        - Market-based steering, EU and government subsidies, compensation

- **Informal policy instruments and steering mechanisms**
    - Information- and negotiation based steering

- **Problems:**
    - Top-down governance, lack of self-determination of herders
    - Relevance of herding not well-known on a national level

Photo credit: kiinko.fi

Examples of drivers: Changes in climatic and environmental conditions

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- **Climate change**
  - Basal ice, tundra shrubification, increasing precipitation,windiness, mould damage of lichen

- **Land use change**
  - Land use conflicts
  - Risks of industrial development

- **Predators**
  - Number of predators has increased

- **Diseases**
  - CWD – Chronic wasting disease
  - *Cronartium flaccidum+Peridermium pini* in monoculture forests increases demand for logging

Photo: Mia Landauer

Example of drivers: Predators

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Predator losses have increased
→ More work load and high costs
→ Reindeer have dispersed across winter pastures; problems for round-up
→ Management change from herding to monitoring predator losses

*"The number of predators has risen to a level that **threatens the entire livelihood** in parts of the reindeer herding regions."*
*"This could be the first time in the history of Sámi reindeer husbandry that the younger generation **does not see any future** in their livelihood."*

(Vuojala-Magga, 2012)

*"Previously we could find few footprints of predators. We never picked up the carcasses because there were not so many that it would have made sense. Nowadays if you see a wolverine, for example, you have to take your snowmobile and follow the footprints because **you will find dozens of them**!*

-Kuivasalmi herding cooperative

Wolverine (*Gulo gulo*)
Photo: suurpedot.fi

Herders' perceptions on governance

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"Our summer pastures are very good, so calve weights could be high and we could get high number of calves in autumn … ***If we could decide on the number of reindeer*** *it would mean financial income for us. If market prices go down there is a risk that* ***herding in this area could be lost****."*

-Oraniemi herding cooperative

Photo credit: Leonid Kolpashchikov

Herders' perceptions on climate change

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"*The occurrence of **diseases** has increased. I have the feeling that there is an **expansion of deer population** in this area. It is said that they carry parasites... If these **parasites** become more common, reindeer might have miscarriages; they lose their calves.*"

-Kuivasalmi herding cooperative

*" I do not know why but nowadays **summers have become very rainy and humid**… We have noticed that calves have **eye infections and other infections**."*

-Syväjärvi herding cooperative

Photos: Mia Landauer

Herders' perceptions on land-use change

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"…in this area we have 900 km of snowmobile trails, a mine, wind farms, husky safaris, and all kinds of other land use. And at the same time Metsähallitus is logging so damn much! There are ***no protected spruce forests available for us anymore****."*

-Kuivasalmi herding cooperative

"Forestry has massive impacts. It has reduced the quality of pastures. Now they will build very large bioenergy plants, but where are they going to get that wood? If from old forests which are the last arboreal lichen resources for reindeer, then ***we have to give up on herding****!"*

-Kemin-Sompion herding cooperative

"They have logged everywhere. There is no lichen anymore! It is gone. We could only keep about 500 reindeer if they were left on their own. ***They would starve*** *in January without supplementary feeding."*

-Oraniemi herding cooperative

Photo: Greenpeace

“Buffering” the change by adaptation actions

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Herders’ actions

- Changing composition of herd (e.g. calf slaughtering, population size changes, selective breeding)
- Supplemental feeding
- Moving reindeer to alternative pastures and new pasture rotation methods
- Technology, innovations and mechanization of herding
- Diseases and parasite treatments
- Flexibility and willingness to be able to change strategy if needed
- Cooperation and collaboration
- Economic diversification

Photo: Tapio Alajoki 2016

Governmental actions

- State subsidies and compensation schemes
- Policies for increased profitability and diversification of the livelihood
- Participatory governance

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Herder's perceptions on limits to adapt

*"It would be **extremely costly** to feed our 8,000-9,000 reindeer in this area, and it would also require **additional work force**. But if there were no arboreal lichen pastures we would have to feed our reindeer. Reindeer have **difficulties to dig** in very harsh conditions when there is basal ice and ice on snow. Arboreal lichen is the only natural fodder in winter. If it disappears, **we will reach a critical point** in reindeer husbandry in this area."*

-Kemin-Sompion herding cooperative

Photo: Jouko Kumpula

Conclusions

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- Empirical evidence reveals several **political, social, economic and environmental factors** that are bringing the herding system closer to tipping points
- Whether, when and how the system will reach its tipping point depends on **intensity, time and location of impacts and available adaptation mechanisms**
- There are large **regional but also perceptual differences** how tipping points can be understood
- Top-down **governance** and lack of self-determination limit herders' possibilities to adapt
- **Assessing and monitoring** changes are needed, in particular on cumulative impacts and drivers of change

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Thank you for your interest!

Photo: Mia Landauer