

# Comparisons between social-ecological resilience in Nenets and Yamal-Nenets Autonomous Okrugs, Russia

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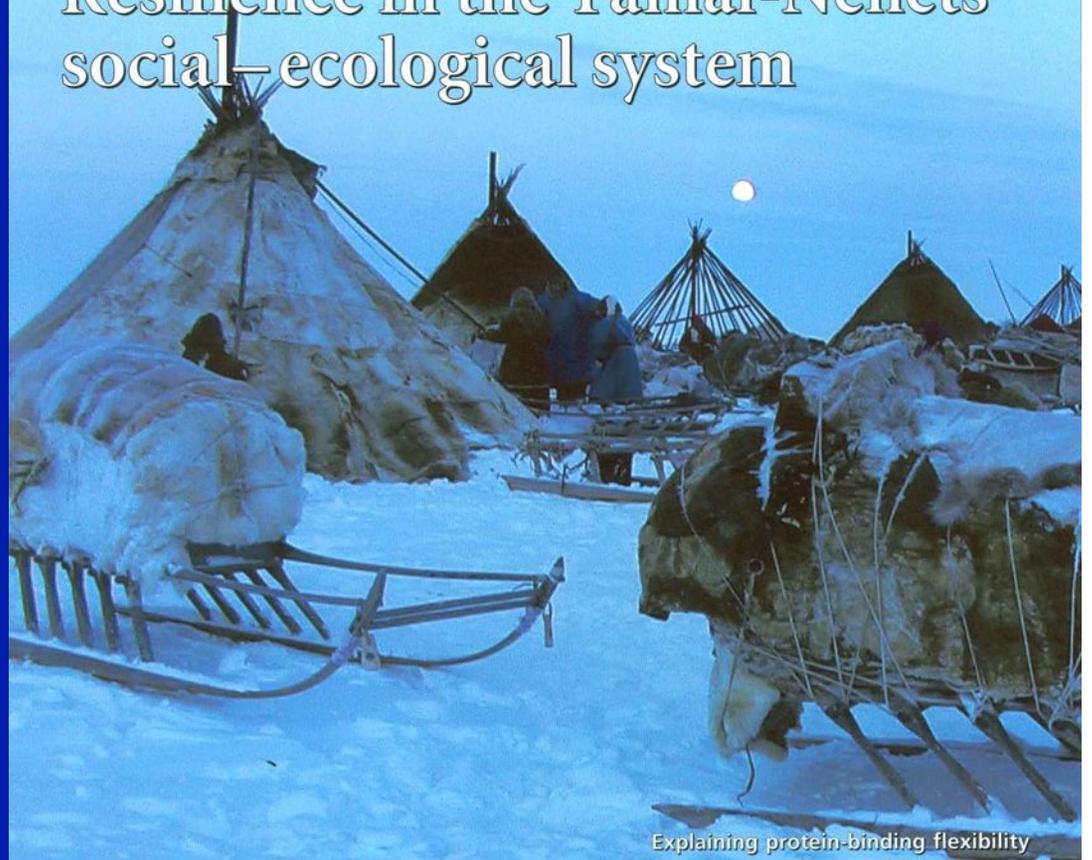
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## Resilience in the Yamal-Nenets social–ecological system



Explaining protein-binding flexibility

Canadian oil sands and pollution

Ethics and experiments

Attention influences worldview

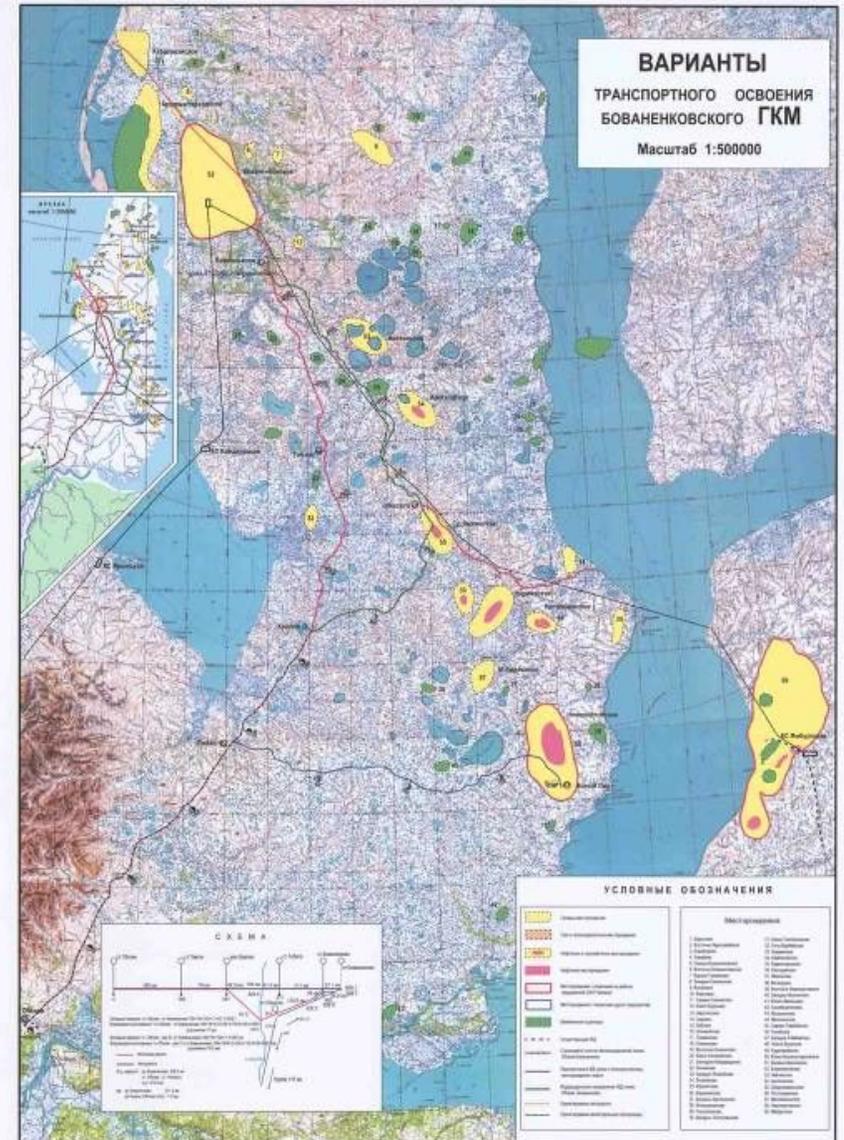
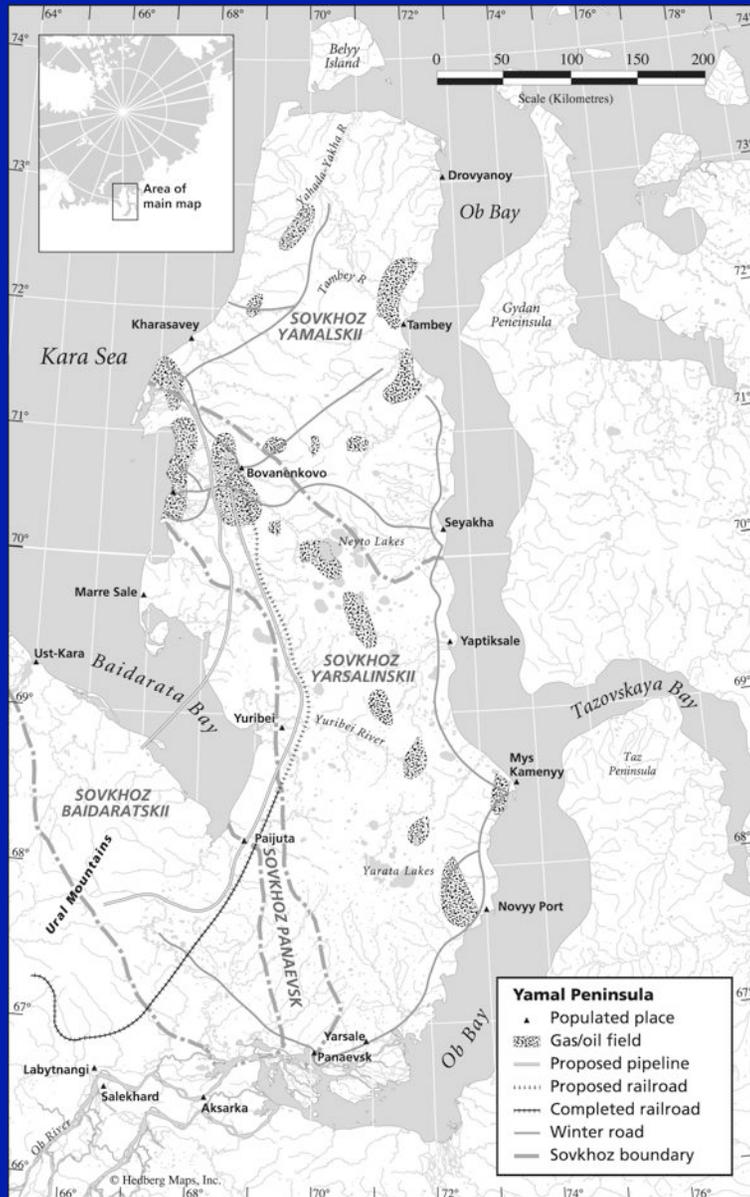
# Primary Russian oil & gas pipelines supplying Europe

The new Baltic 'Nord Stream' gas pipeline will be supplied in large part with gas from the Yamal Peninsula, West Siberia.

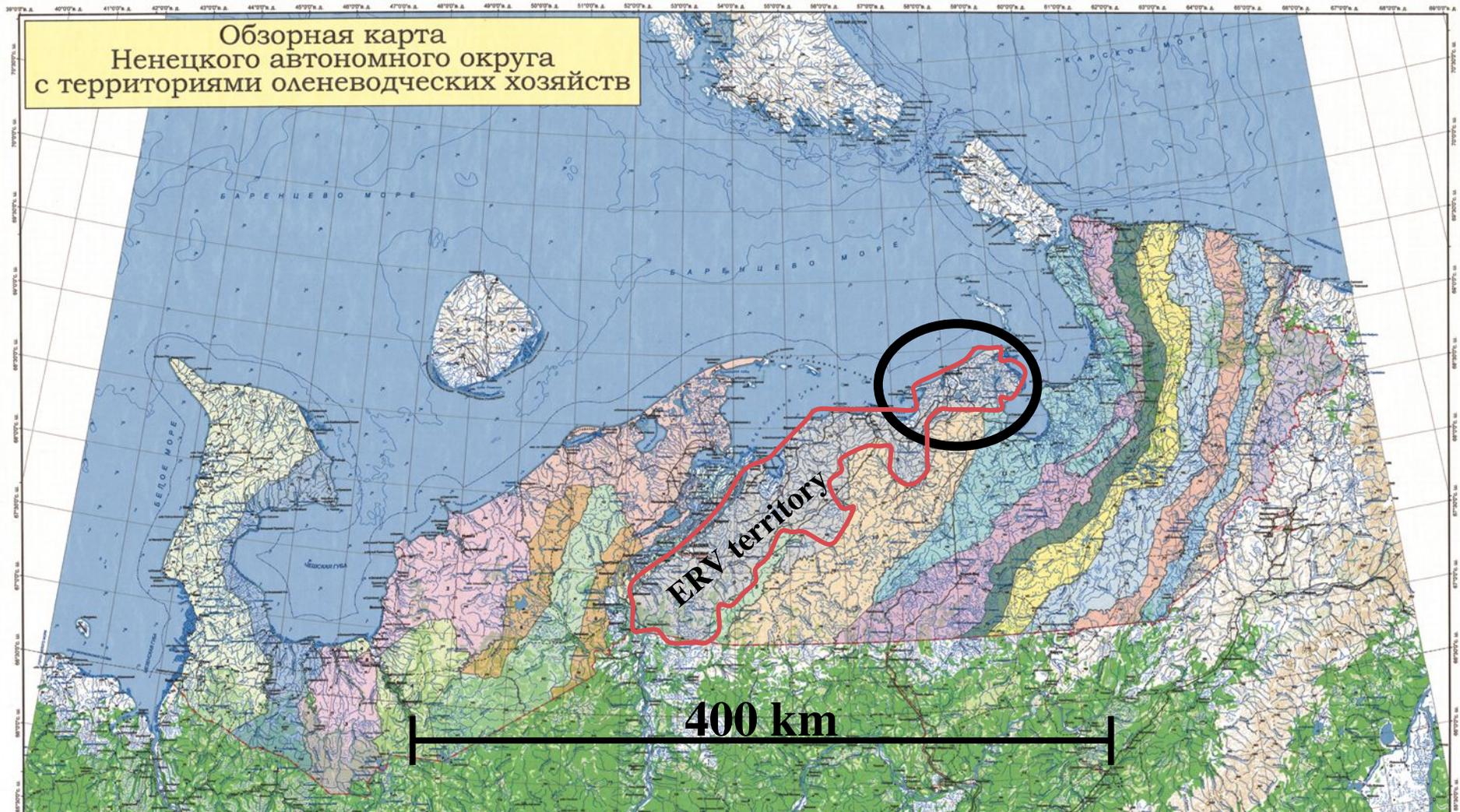
Besides extensive oil & gas development, NAO and YNAO have experienced profound pressures in the past 20-30 years from the Soviet Union's collapse and extreme weather scientists attribute to climate warming.



Yamal Peninsula, West Siberia: Gas & oil deposits overlap with the territories of nomadic Nenets reindeer herders. Therefore our research directly involved herders to understand resilience at the level of the entire social-ecological system.

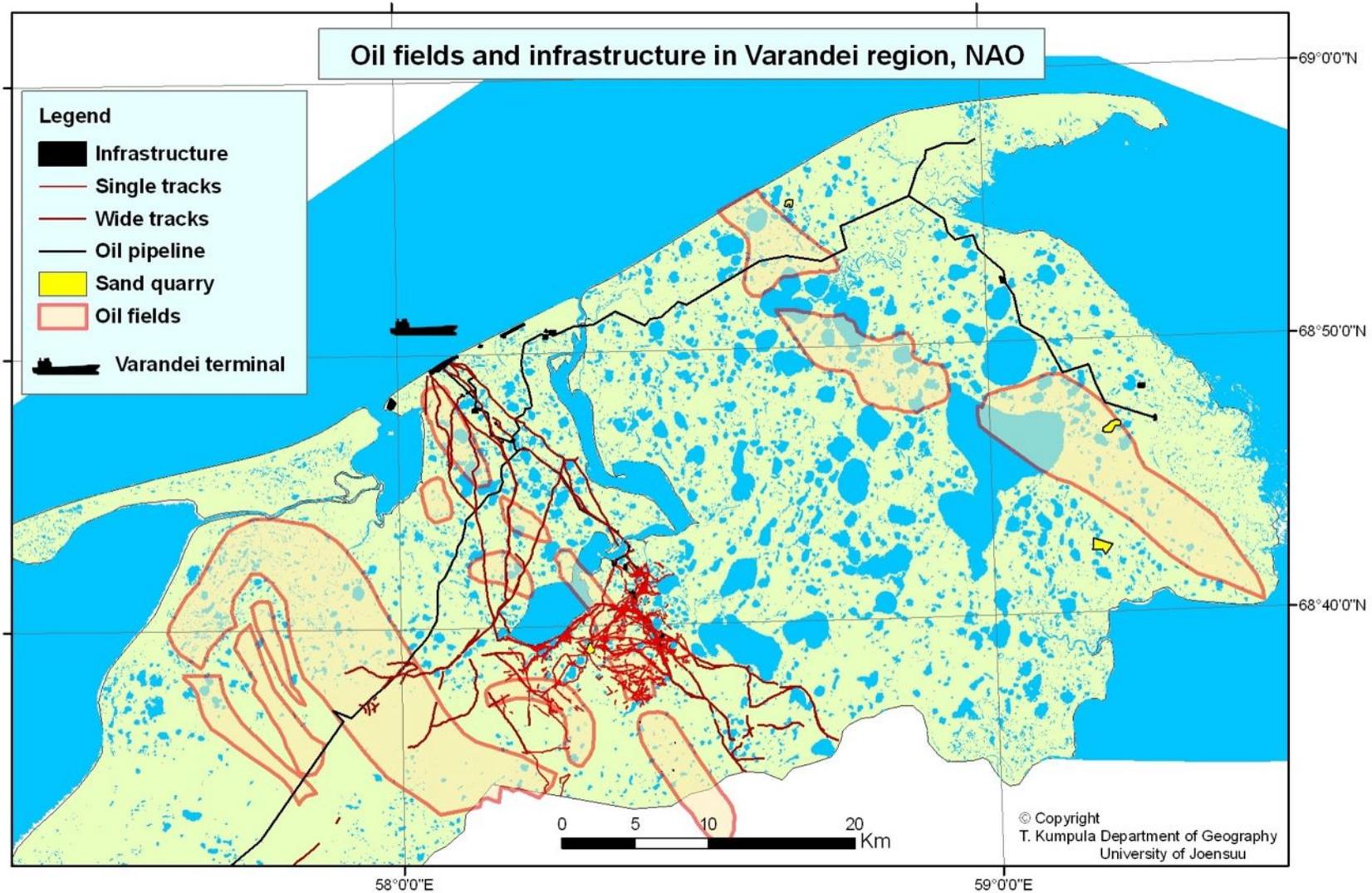


# Reindeer herding management units (sovkhozi, etc.) of the Nenets Autonomous Okrug



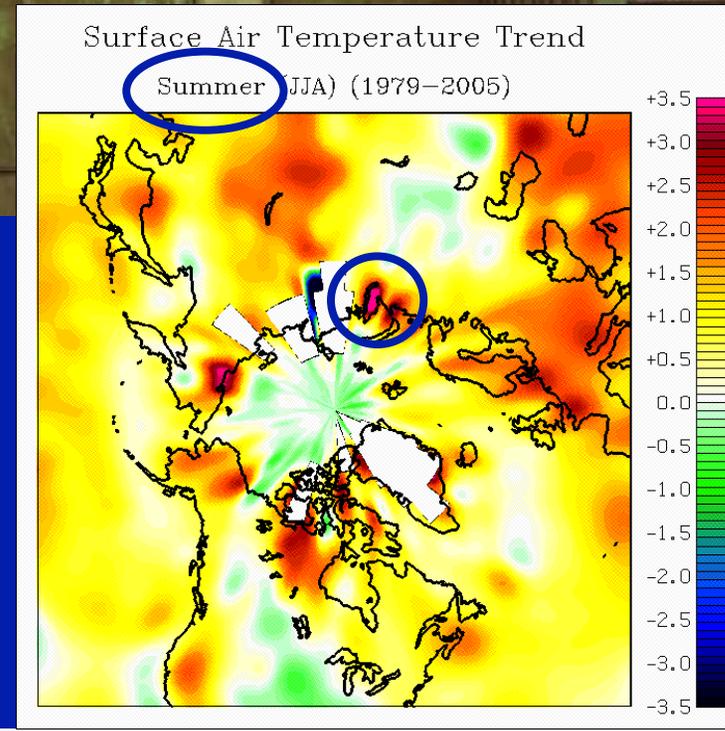
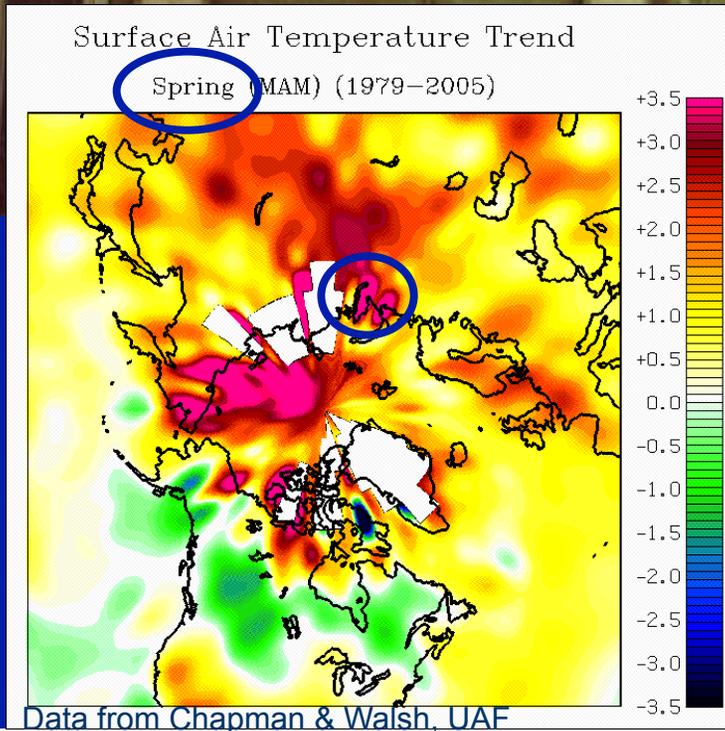
## Rapid changes in land use in Nenets regions

In both NAO and YNAO gas and oil fields and infrastructure are increasing. The developed lands overlap directly with territories used extensively by reindeer herders for centuries.





Our recent projects were designed to consider primarily oil & gas activities because these were what herders themselves cited as the most important factors affecting them. However, spring and summer air temperatures in YNAO (and NAO) have warmed over the past 25 to 30 years some 2 to 3°C. This has major implications for both oil & gas infrastructure and the future of reindeer herding since it means that people and reindeer are potentially exposed to multiple stressors.



A modern gas field has many direct and indirect impacts on the ground that have implications for both ecological and social aspects of the system. Herders are forced to adapt to these.



Some impacts accumulate in space & time, e.g. vehicle tracks, road dust & hydrological changes.



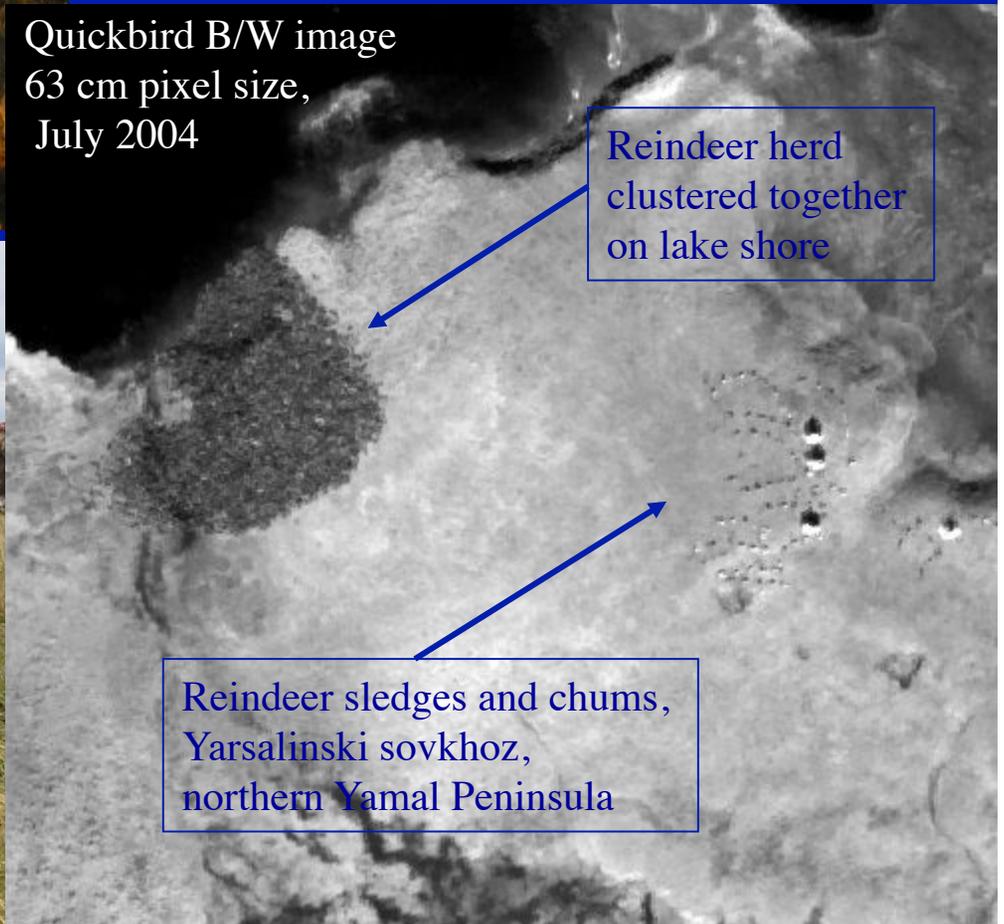
Nenets brigade near Bovanenkovo, Yamal Peninsula



Certainly the mires and riparian habitats of the region can handle heavy pasturing loads. However, some Russian scientists have argued that the sustained pressure of combined grazing and trampling is capable of turning dwarf-shrub heath to graminoid-dominated steppe tundra over extensive areas.

The various trends and drivers have to be well understood if we are to properly interpret the growing amount of remotely sensed data telling us that the Arctic is 'greening'.

Quickbird B/W image  
63 cm pixel size,  
July 2004



Reindeer herd clustered together on lake shore

Reindeer sledges and chums, Yarsalinski sovkhos, northern Yamal Peninsula

Another factor is warmer winters. An increase in the frequency/severity of 'rain-on-snow' events reported by herders and detected by QuikScat satellite radar imagery (Bartsch et al. *Ecological Applications*, in press)



The relatively free use of space according to herders' own needs is a critical factor at present. However, if too much oil & gas infrastructure encroaches on their migration routes, this adaptive capacity will be greatly reduced. Responses so far appear dynamic and non-linear. Mid-winter events used to be extremely rare.

# Conclusions

- The Nenets SESs have recently been subject to anthropogenic fragmentation and transformation of a significant proportion of the environment, socio-economic upheaval, and pronounced warming
- The systems have successfully reorganized in response to these shocks and pressures
- Institutional constraints, drivers and cultural factors are clearly as important as the documented ecological changes for resilience
- Particularly crucial to success is the unfettered movement of people and animals in space and time
- In the final phase of this *Rangifer* synthesis project, we need to interpret cultural drivers with local adaptations of land/climate change
- We take an integrated view of people situated in specific tundra landscapes that face significantly different prospects for adaptation depending on the spatial and temporal trajectories of industrial development

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**Thank  
you!**

