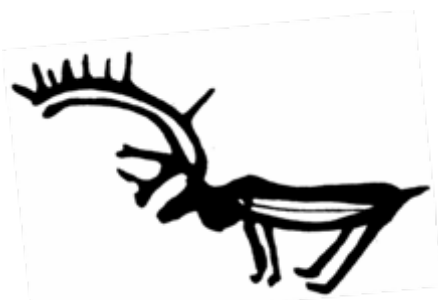


# Climate adaptation related to reindeer herding

Svein D Mathiesen, Saami University College, International Centre for Reindeer Husbandry, and The Norwegian School of Veterinary Science, Norway.



NASA LCLUC Science Team Meeting May 1st 2008



Ассоциация «Оленеводы Мира»  
Association of World Reindeer Herders



**Sámi allaskuvla**

Samisk høgskole - Saamelainen korkeakoulu  
Саамская Высшая Школа - Sámi University College



International Centre for Reindeer Husbandry  
Международный Центр Оленеводства  
Riikkaidgaskaš Boazodoalloguovddáš



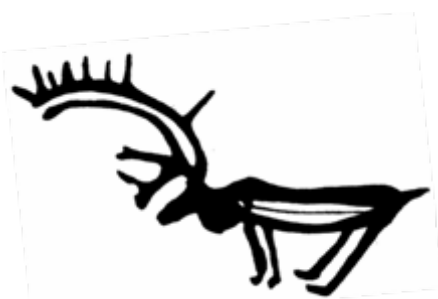
Reindeer herding and climate change  
Reindeer herders' vulnerability network study.

# EALÁT-Network Study

THE EALÁT CONSORTIUM, 2007-2010

[www.EALAT.org](http://www.EALAT.org)

Project leaders Prof. Ole Henrik Magga,  
Prof. Svein D Mathiesen, Director Anders Oskal

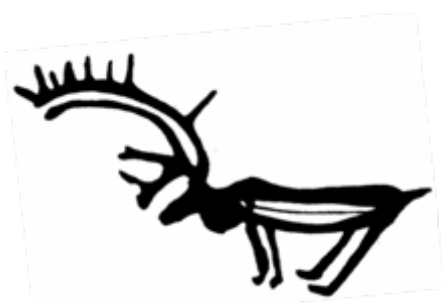


Ассоциация «Оленеводы Мира»  
Association of World Reindeer Herders



ARCTIC COUNCIL  
NORWEGIAN CHAIRMANSHIP  
2006-2008

Ole Henrik Magga, Inger Marie G Eira, Anders Oskal,  
Philip Burgess, Mikkel Nils Sara, Johan Mathis Turi,  
Nils Isak Eira, Erik Reinert, Nicholas Tyler, Bruce Forbes,  
Ellen Inga Turi, Ole Isak Eira, Inger Hanssen Bauer,  
Dagrun Vikhamar, Schuler, Mathis Bongo,  
Monica A Sundset, Eli Ristin Negård,  
Vladimir Etylen, Dmitry Khorolia, Robert Corell,  
Nancy.G.Maynard.



Ассоциация «Оленеводы Мира»  
Association of World Reindeer Herders



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Riikkaidgaskaš Boazodoalloguovddáš

**Sami University College / Nordic Sami Institute  
Association of World Reindeer Herders  
International Centre for Reindeer Husbandry**

## **Saami Council**

**Abisko Scientific Research Station  
[Royal Swedish Academy of Sciences.](#)**

**CICERO**

**GRID-Arendal**

**Norske Reindriftsamers Landsforbund (NRL)**

**Norwegian School of Veterinary Science**

**Norwegian Meteorological Institute**

**Norwegian Research Council**

**Reindriftsforvaltningen**

**Suoma Boazosámit**

**NORISS - Other Canon Foundation**

**University of Oslo**

**University of Tromsø**

**NASA, NORUT, KSA, ESA**

**Heintz Sentre, USA**



# The IPY EALÁT Consortium

---

- EALÁT-Research
  - Multi-disciplinary research on climate change, adaptation and traditional knowledge – Competence building
- EALÁT-Outreach
  - Communication of results from IPY EALÁT and other research projects and activities under the International Polar Year
- EALÁT-Monitoring
  - A Future Circumpolar Monitoring Network for World Reindeer Husbandry
  - CAFF endorsement (CBMP)
- EALÁT-Information
  - An information project about climate change and traditional knowledge
  - Reindeer herders' voice on climate change to the Arctic Council



INTERNATIONAL 2007 2008  
**POLAR YEAR**



ARCTIC COUNCIL  
NORWEGIAN CHAIRMANSHIP  
2006-2008

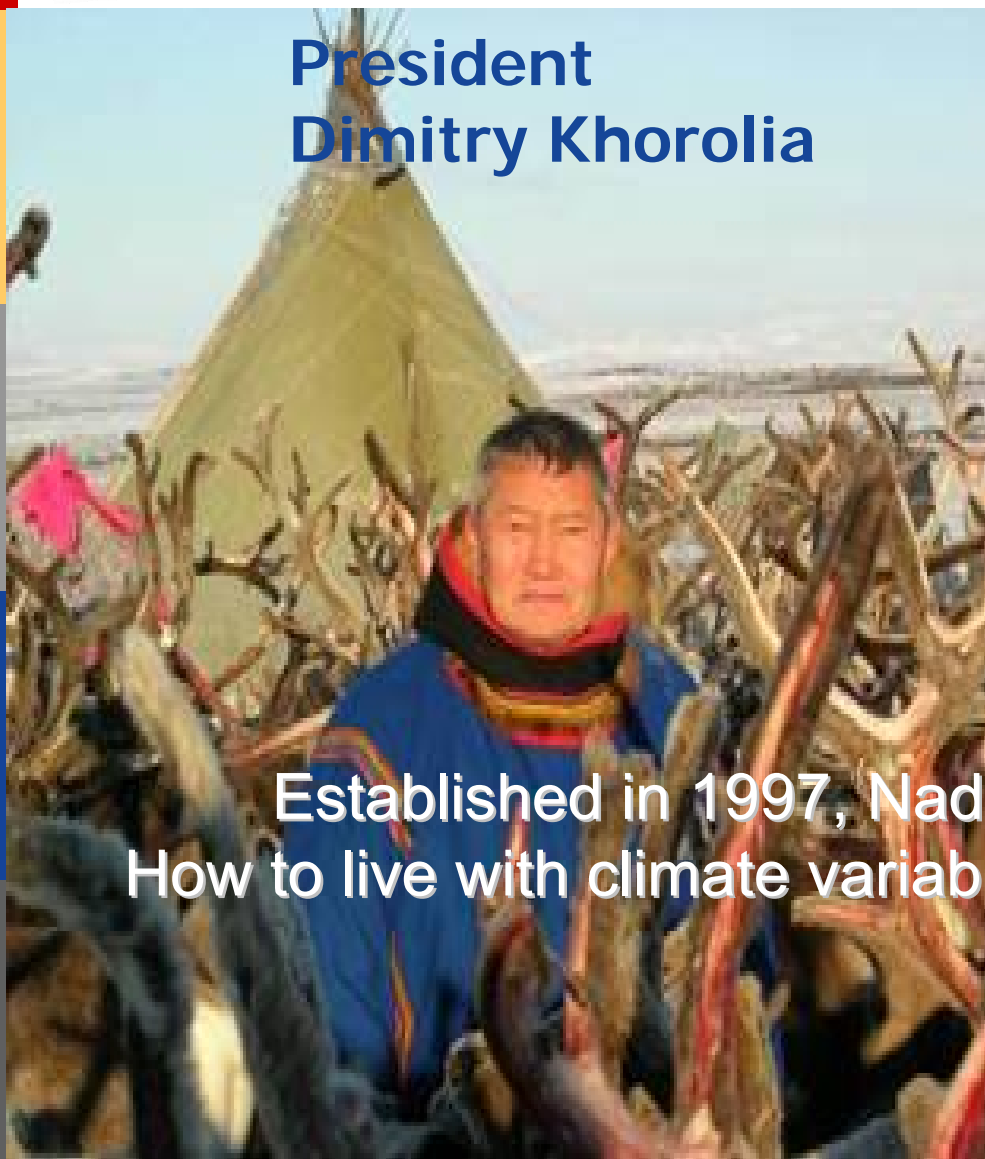




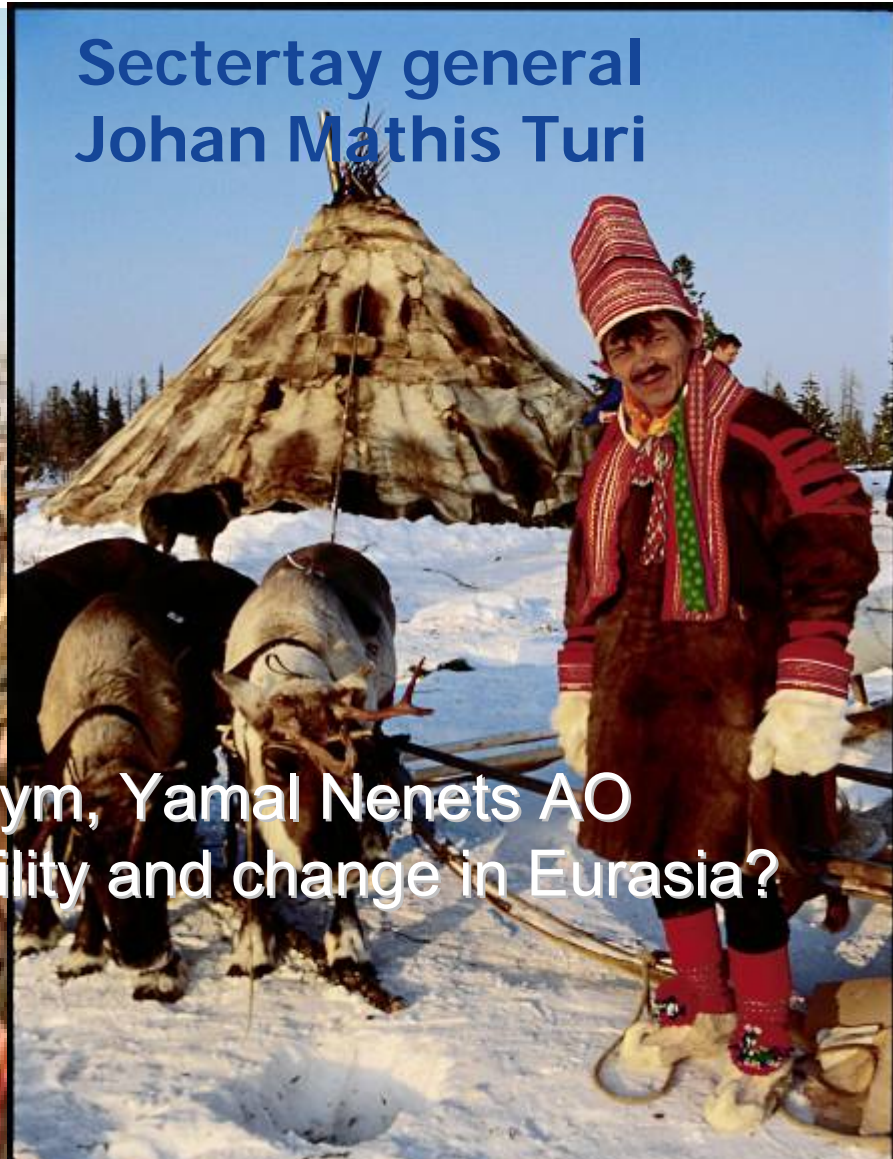
Ассоциация «Оленеводы Мира»

Association of World Reindeer Herders

President  
Dimitry Khorolia



Sectertay general  
Johan Mathis Turi



Established in 1997, Nadym, Yamal Nenets AO  
How to live with climate variability and change in Eurasia?



EALÁT

EALÁT- Good pasture

EALLU – Herd

EALLIN - Life

# Ealát adopt a novel methodological approach.

We recognize that reindeer herders ability to adapt to change is based on traditional knowledge embodied in the their language, in the institutions of herding and in the action of individual herders.





**Reindeer (*Rangifer tarandus*)**

*As species about 15 mill years old.*

*Intermediate highly adaptable ruminant anatomically and physiologically.*



# Pastures used by domestic reindeer in the circumpolar north

---



# Reindeer husbandry is a human coupled ecosystem



# Reindeer husbandry:

**“Reindeer herding practices, ancient in origin, represent models in the sustainable exploitation and management of northern terrestrial ecosystems that is based on generations of experience accumulated , conserved, developed and adapted to the climatic and administrative systems of the north.”**





Stonecarvings from North  
Norway about 11.0000 years old



The LASSO RING is Arctic indigenous people's most important invention. With it the human arm is extended by 15 meters, which represents the difference between life and death in the North.





# Reindeer peoples of the world



- About 2 mill. domesticated reindeers
- Below 100 000 reindeer herders
- About 4 mill. square km, across 9 national states
- More than 20 different indigenous peoples



# IPY EALÁT – Reindeer herding and adaptation to climate change and variability A unique circumpolar place-based study



OPPAS

ČIEGAR

LEARNING BY HERDING

## □ Fokus:

- Samisk
- Nenets AO
- Yamal-Nenets AO
- Sakha (Yakutia) Rep.
- Chukotka AO
- Alaska

## Traditional knowledge

Climate research , biology, linguistic research, antropology, social science  
remotesensing and economy.

Multidisiplinary



# EALÁT Workshop Nadym, YNAO March 2, 2007





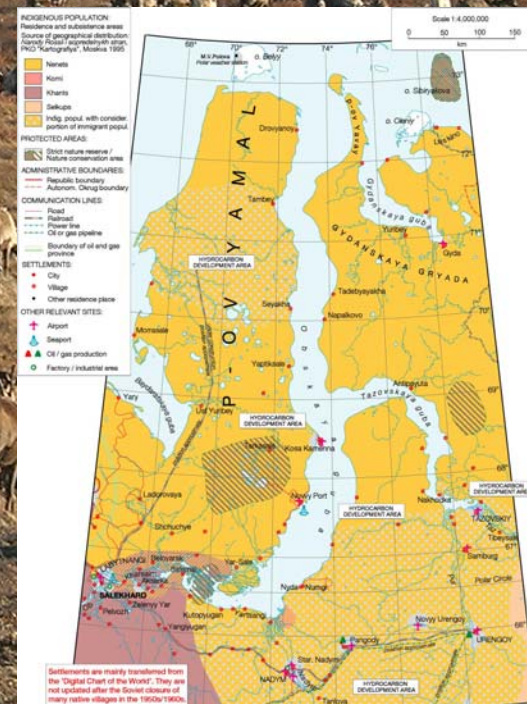
# EALÁT workshop on Yamal, Western Siberia, September 2007

Two parts:

- Brigade 17, Yarsalinsky Sovkhoz
- City of Yar Sale



Brigade 17, Yarsalinsky Sovkhoz  
Picture: Svein D Mathiesen



# EALAT Workshop Chuckotka March 2008

Vassily Vassilievich, senior reindeer herder of the brigade noted: *It is not us reindeer herders who have been the cause of climate change. The reindeer know which routes to take. Many people have lost their connection with nature, but the animals maintain this connection and that is why we follow the reindeer.*





EALAT workshop Topolini, Sahka-Jakutia April 8th, 2008

# One people in four countries

---



- ❑ The Sámi live in four national states
- ❑ Common language, culture and traditions
- ❑ Common Sámi flag, national day and national anthem
- ❑ About 600.000 reindeer





International Centre for Reindeer Husbandry

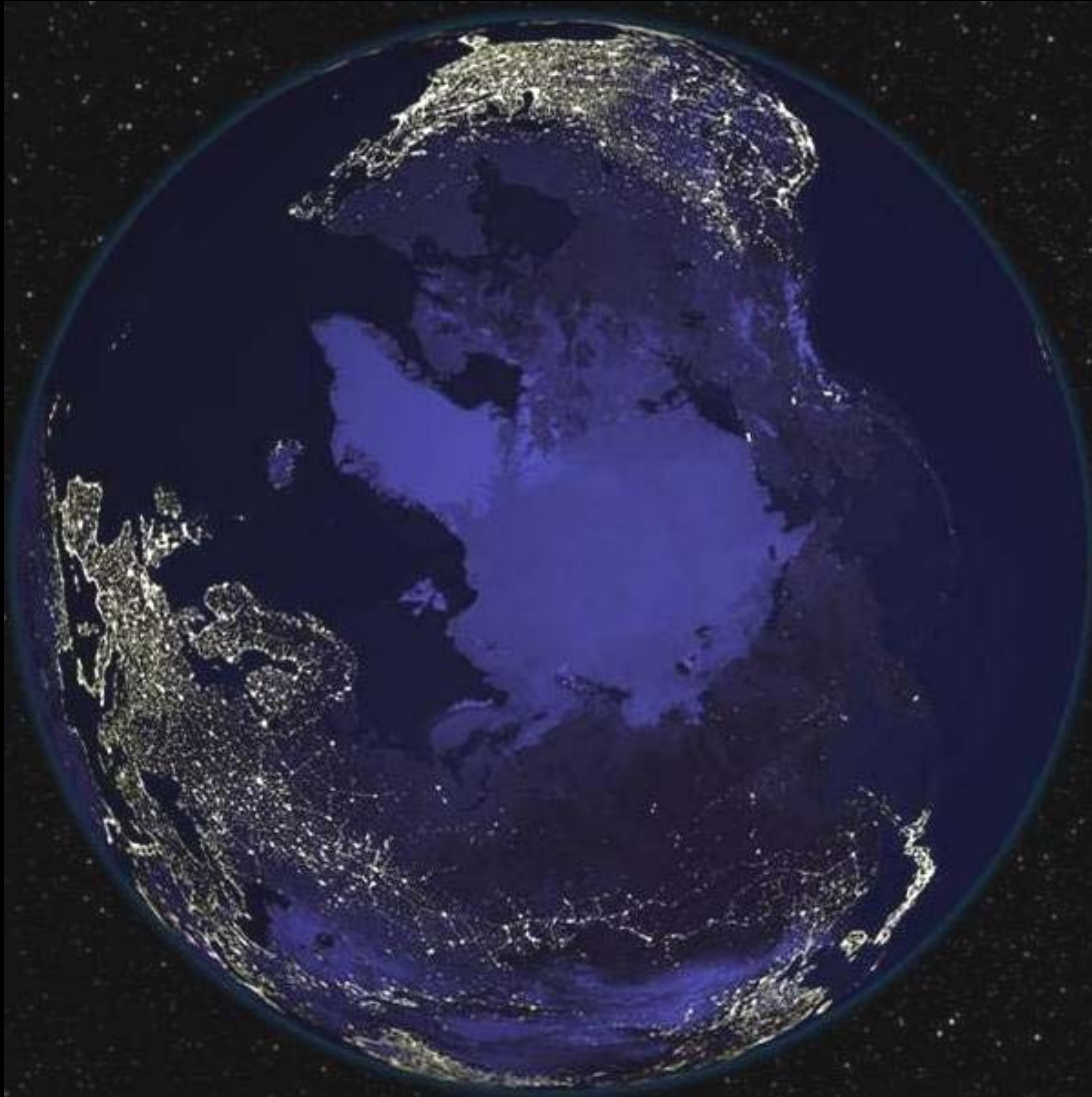
Международный Центр Оленеводства

Riikkaidgaskasaš Boazodoalloguovddáš

## MAJOR CHALLENGES:

- Loss of grazing land
- Climate change
- Predation
- Wild reindeer/caribou.

When the lights is turned on in the north.....



International Centre for Reindeer Husbandry  
Международный Центр Оленеводства  
Riikkaidgaskasaš Boazodoalloguovddáš

# Globalization of the Arctic



# The relation between climate change and loss of pastures

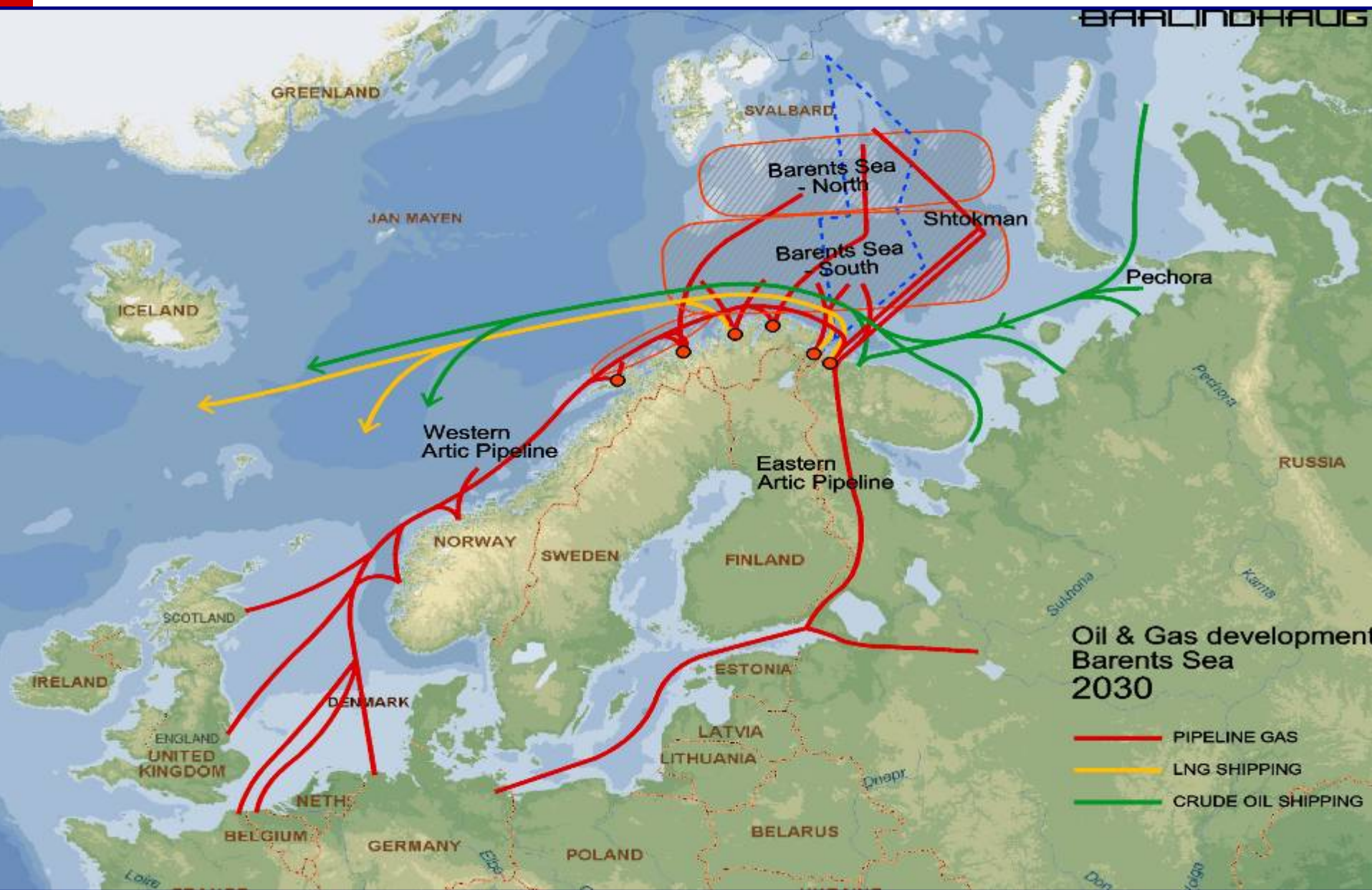
”...We parliamentarians strongly believe the impact of climate change to be a matter of urgency. The climate change already has a strong impact on the living conditions of the Arctic indigenous peoples. And if the ice disappears for large parts of the year, we will see an explosion in human activities in the Arctic. We need to find ways to regulate this activity and keep ahead of the development.”

*Hill Marta Solberg, Chair of the Arctic Parliamentarians, Arctic Council Ministerial Meeting, Yamal October 2006*





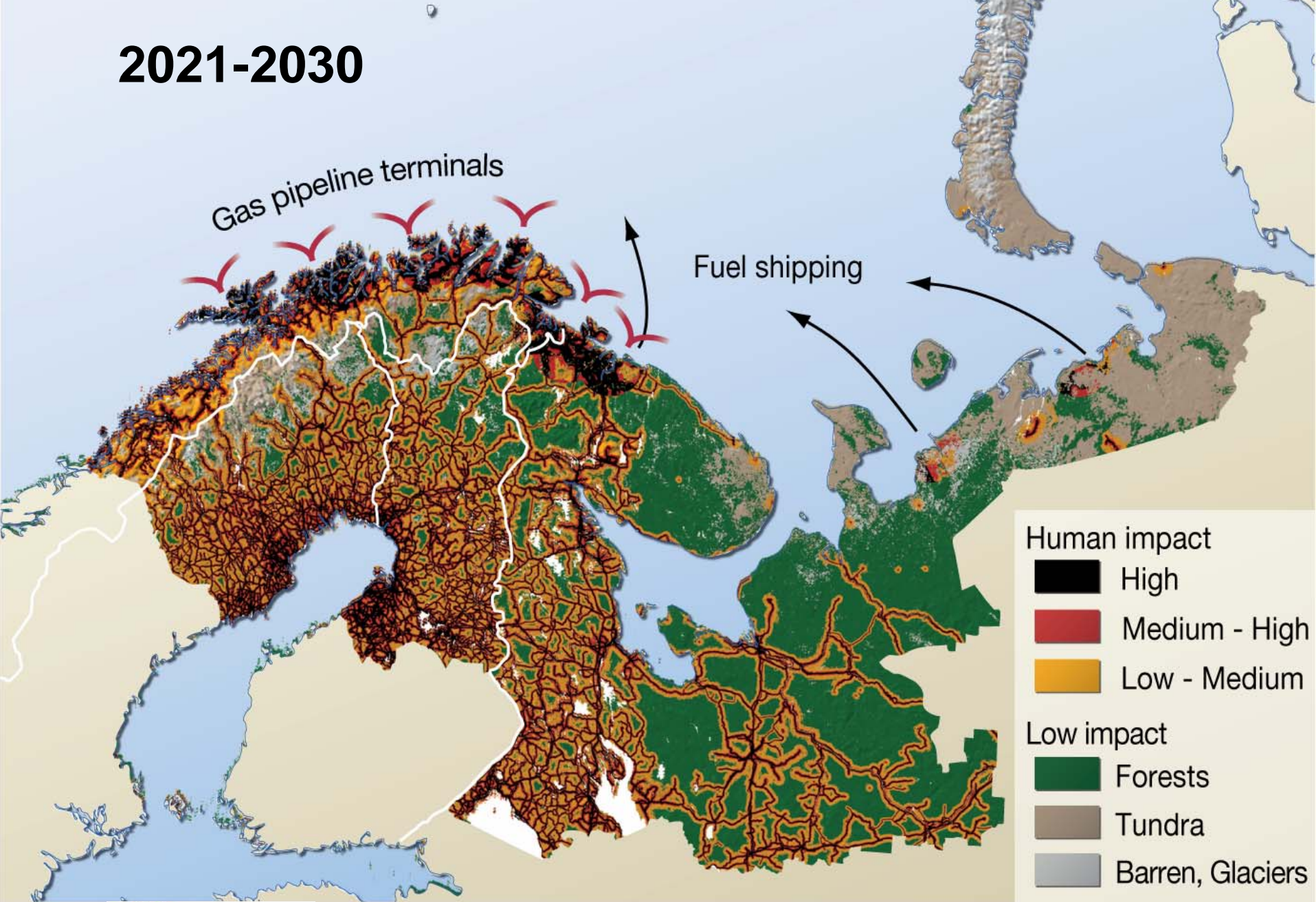
# LNG Hammerfest Norway

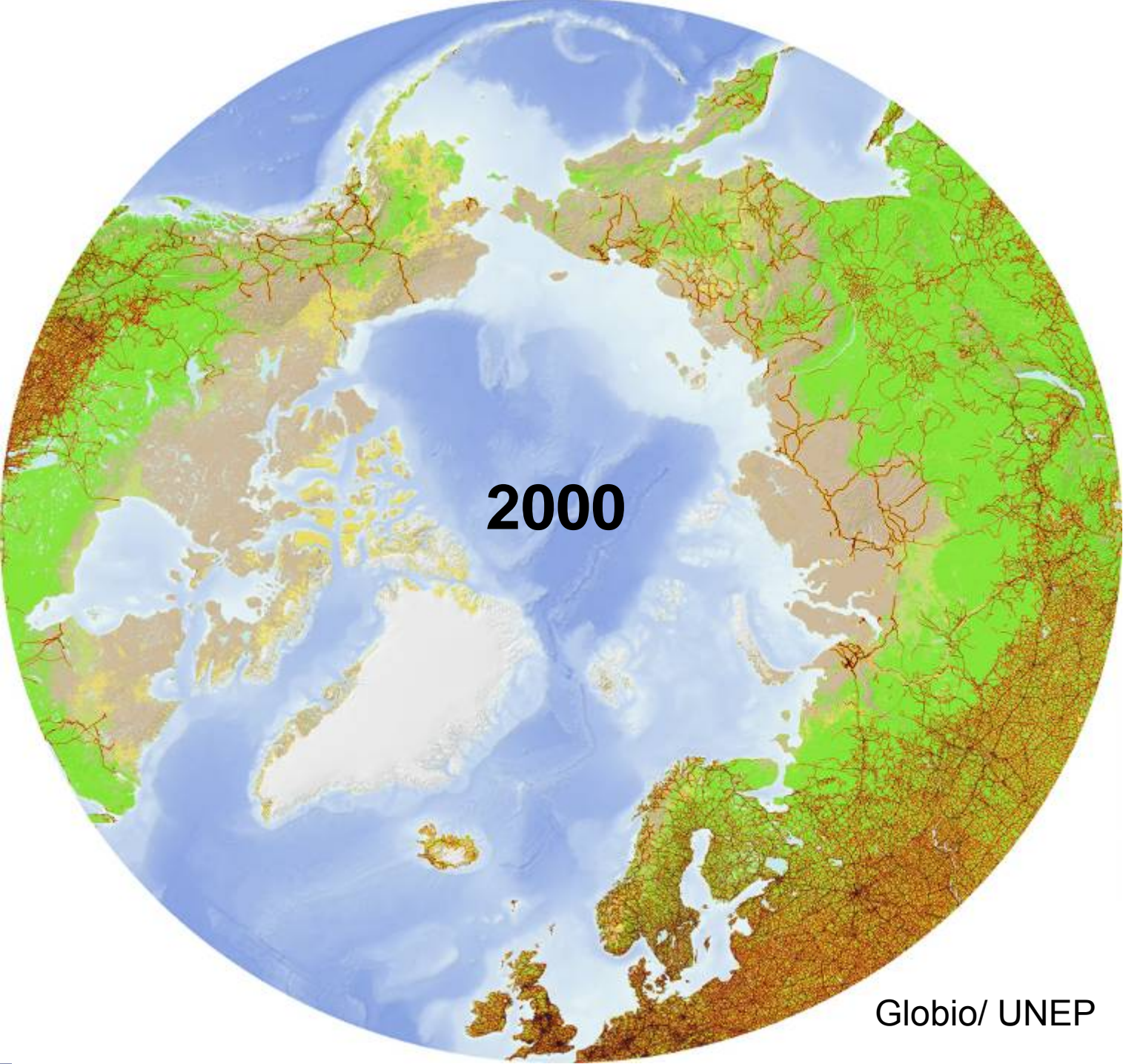


### Oil & Gas development Barents Sea 2030

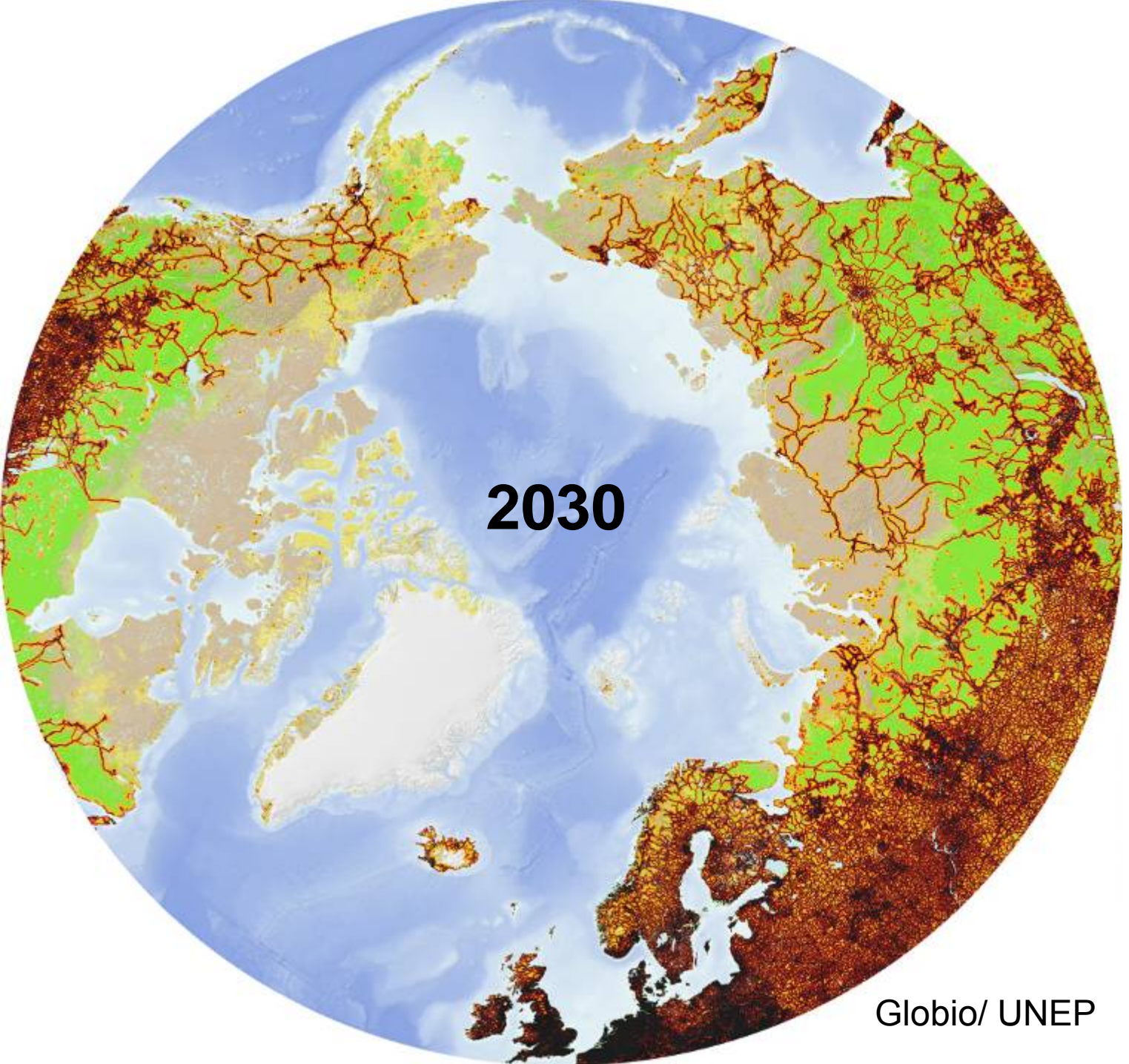
- PIPELINE GAS
- LNG SHIPPING
- CRUDE OIL SHIPPING

# 2021-2030





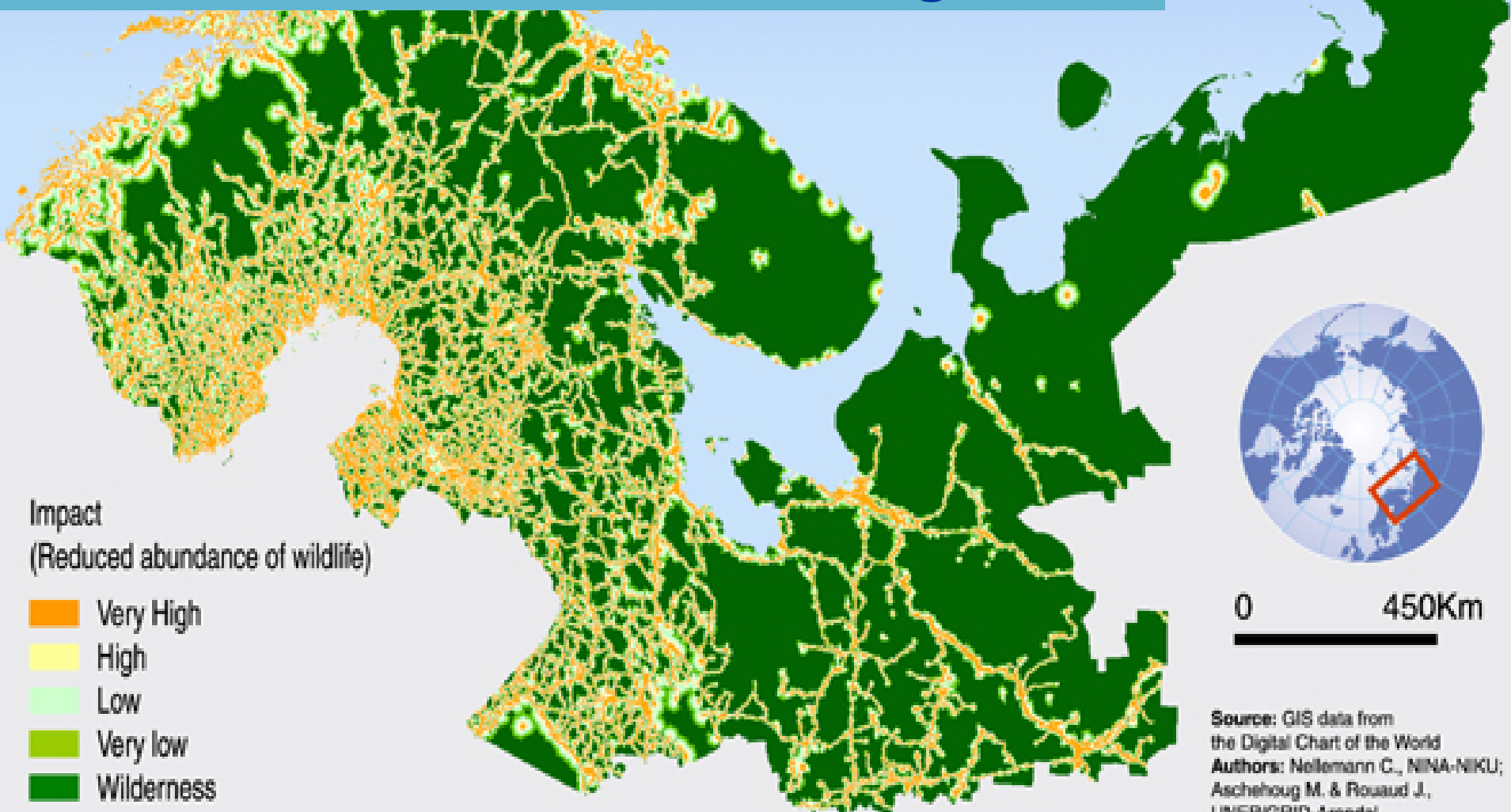
Globio/ UNEP



Globio/ UNEP

# Impact of human activities on wildlife in the Euro-Arctic Barents Region using the GLOBIO methodology

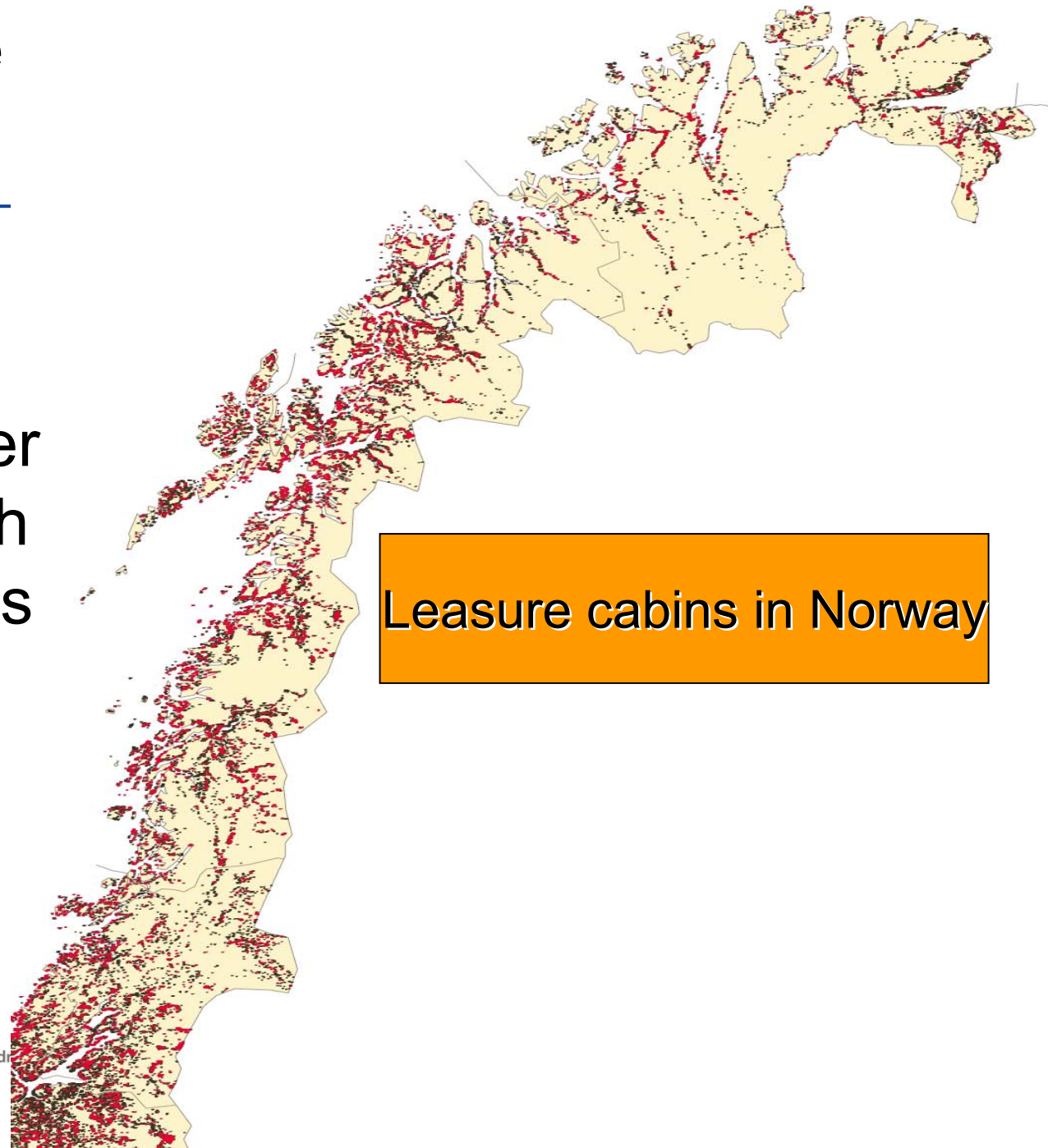
## 1/3 of the grazing land for domestic reindeer is lost in the Barentz region



There are more  
than >60,000

---

cabin build in  
Grazing land  
used by reindeer  
in Norway. Each  
year as much as  
500-1000 new  
cabins.



Leisure cabins in Norway



International Centre for Reindeer Husbandry  
Международный Центр Оленеводства  
Riikkaidgaskasaš Boazodoalloguovddáš

# In Norway:



- 1) About 25% of grazingland used by reindeer is lost due to industrial and infra structure development .**
- 2) About 35% of summer grazingland along the coast of North Norway is lost.**
- 3) About 78% of coastal calving ground will be lost the next 30-45 years if development continue.**



# A simple perspective on vulnerability to change.

**Vulnerability ( V ) = the difference between the Impacts ( I ) from multiple stressors and the ability of a system to Adapt (or its adaptive capacity AC ):**

$$V = I - AC$$

**Arctic reindeer herders formel for practical reindeer herding and survival strateg**

**Vulnerability decreases by increasing the value of adapting capacity (AC) by accepting and using indigenous peoples traditional knowledge and insights (McCarthy *et al* 2005)**

# Coproduction of knowledge, partnership between reindeer herders and scientist



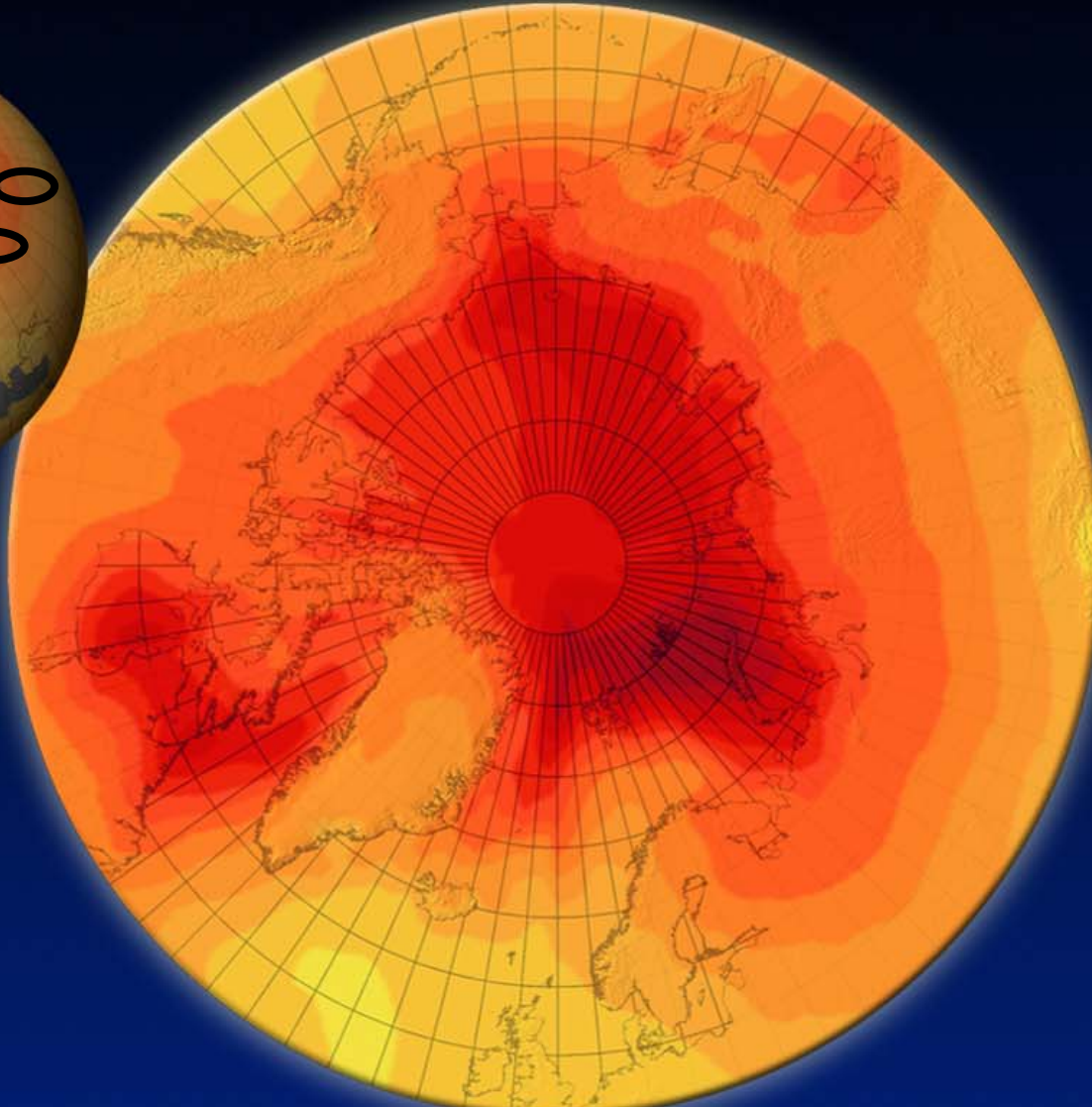
+





# EALÁT DUTKAN: GUOHTUNEATNAMIID LIEGGANEAPMI

Projected Surface Air Temperature Change:  
1990s–2090s (winter Dec–Feb)





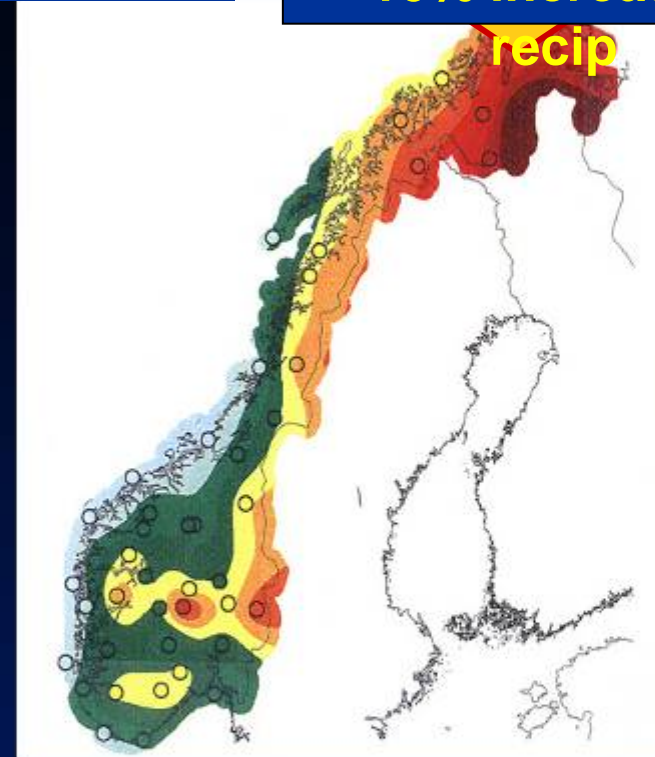
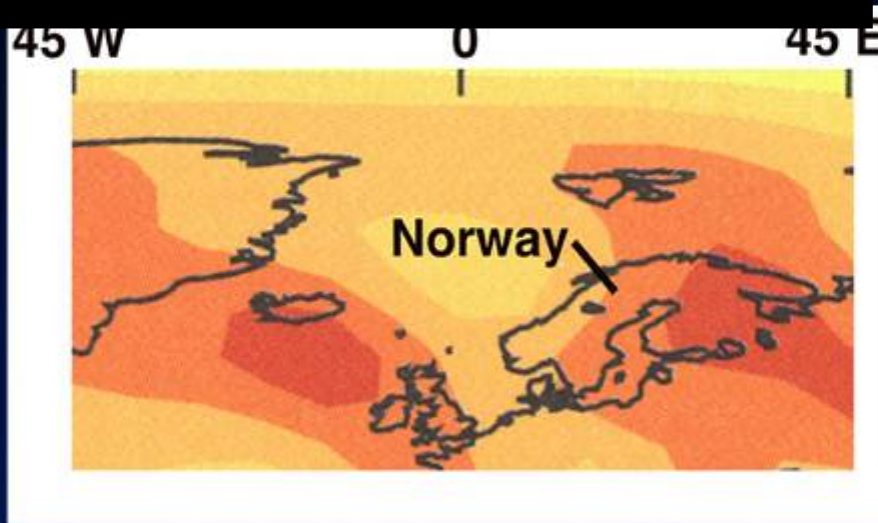
## Warming will effect reindeer pastures

Average warming  
in winter

0.7° C/10 år

10% increased

Arctic as an global window:  
10 years change in Arctic = 25 years change  
other places on earth

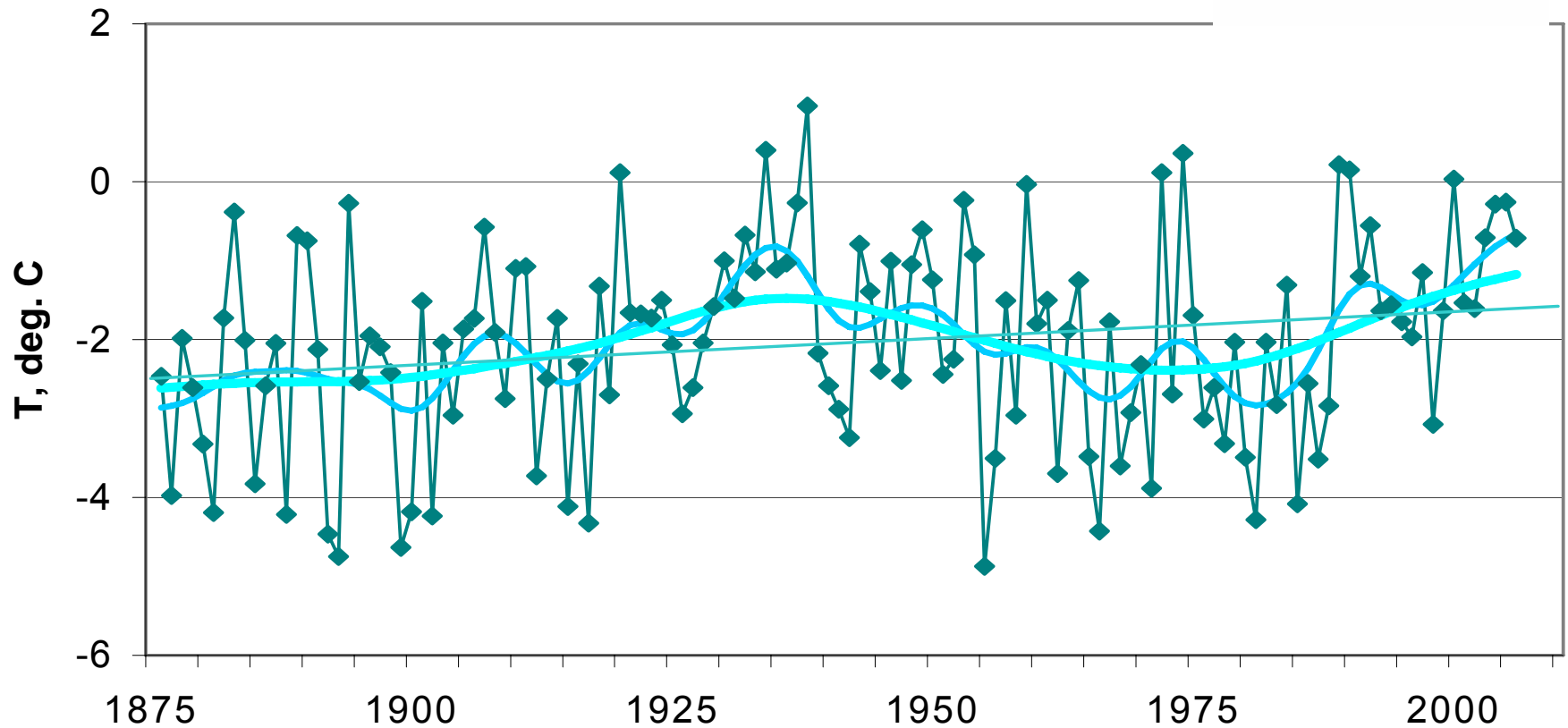


Globale estimates for temperature  
In Norway

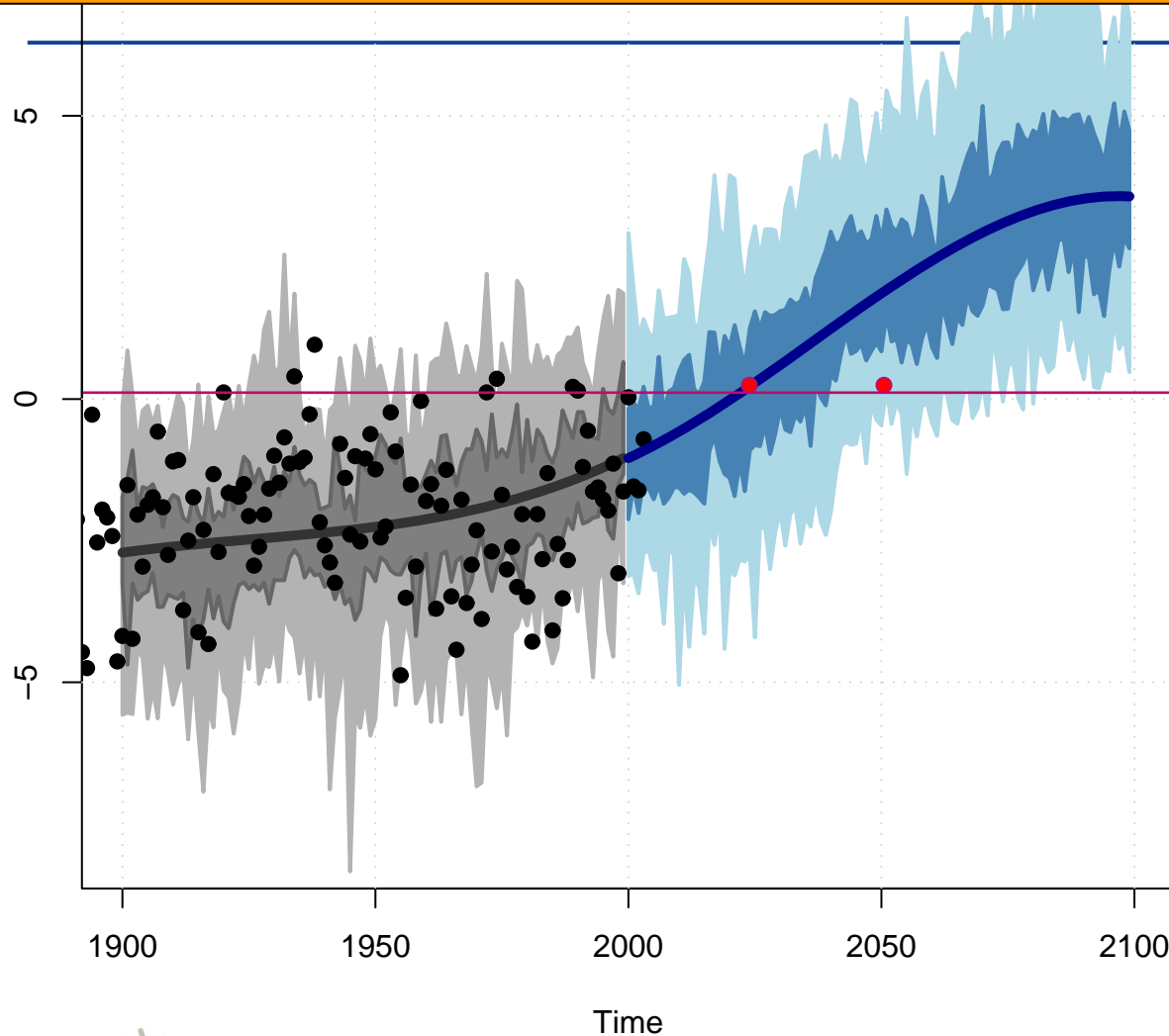
High resolution estimates  
for temperature change  
i Norge.



# *mean annual temperature in Finnmark, Norway*



# Past and future mean annually temperature in Finnmark Norway



Statistical downscaling of annual mean temperature in Finnmark based upon 11 global models under A1B.



GCMs from PCMDI database for IPCC 4AR (SRES A1b/20C)  
International Centre for Peat Research  
Международный Центр Оленеводства  
Norsk Polarisprogram - Polarisprogrammet



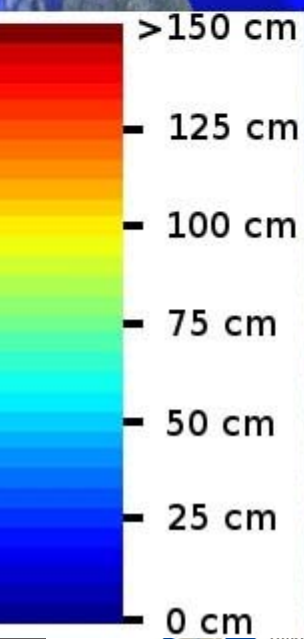


International Centre for Reindeer Husbandry  
Международный Центр Оленеводства  
Riikkaidgaskaš Boazodoalloguovddáš





Snow depth in reindeer grazing land, Nov 1st 2007

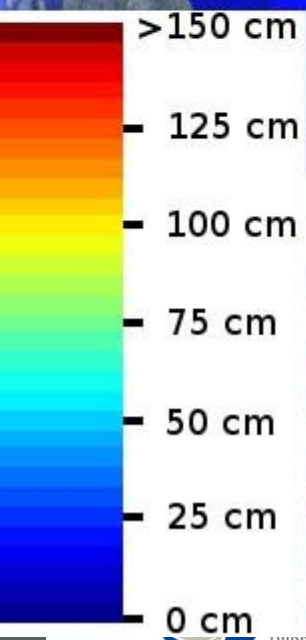


ESA POLARVIEW

Image NASA  
Image © 2008 TerraMetrics  
Image © 2008 DigitalGlobe

©2008 Google  
Eye alt 6774.40 km

# Snow depth in reindeer grazing land, Jan 1st 2008

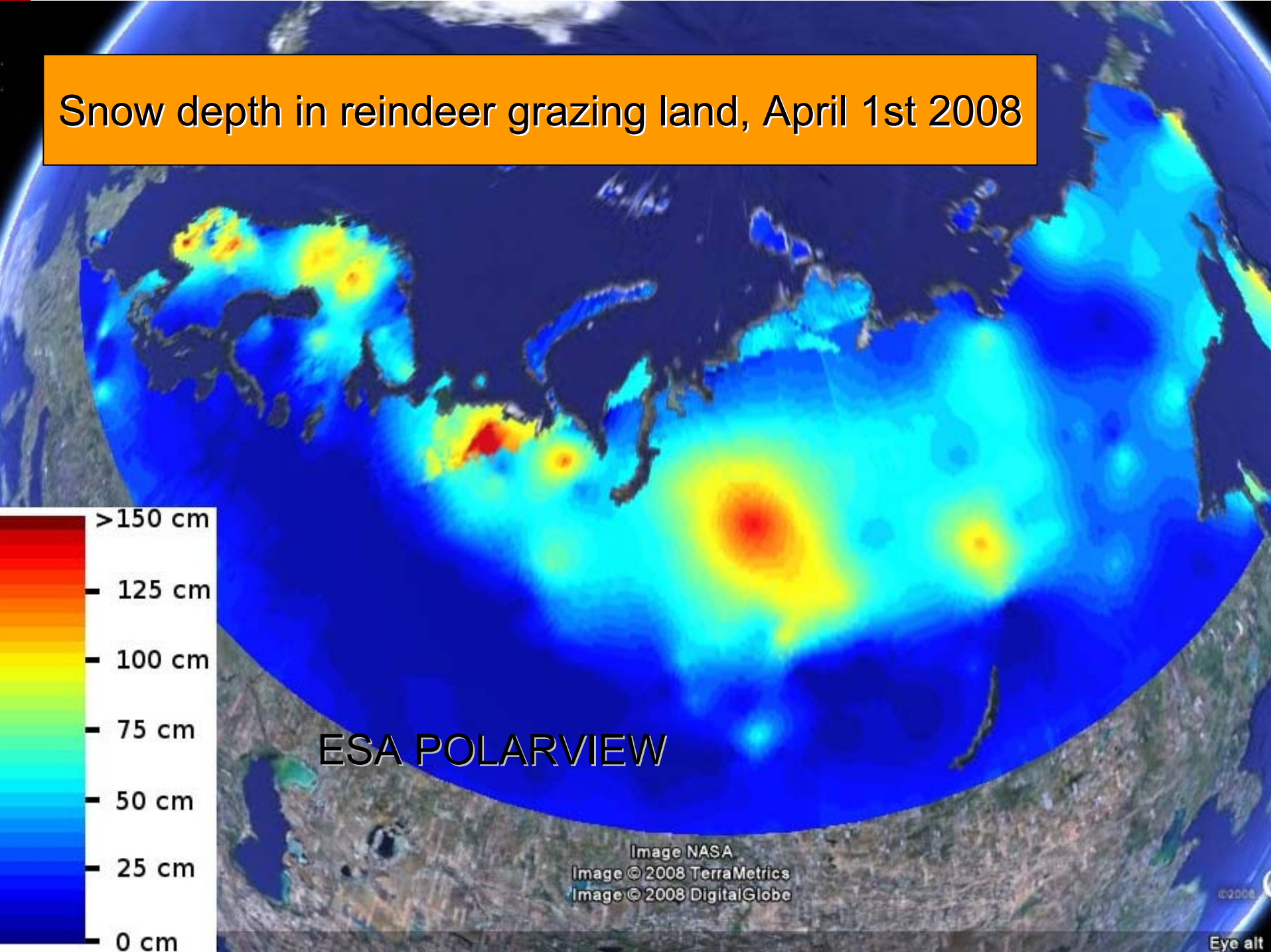


ESA POLARVIEW

Image NASA  
Image © 2008 TerraMetrics  
Image © 2008 DigitalGlobe

©2008 Google  
Eye alt 6774.40 km

# Snow depth in reindeer grazing land, April 1st 2008



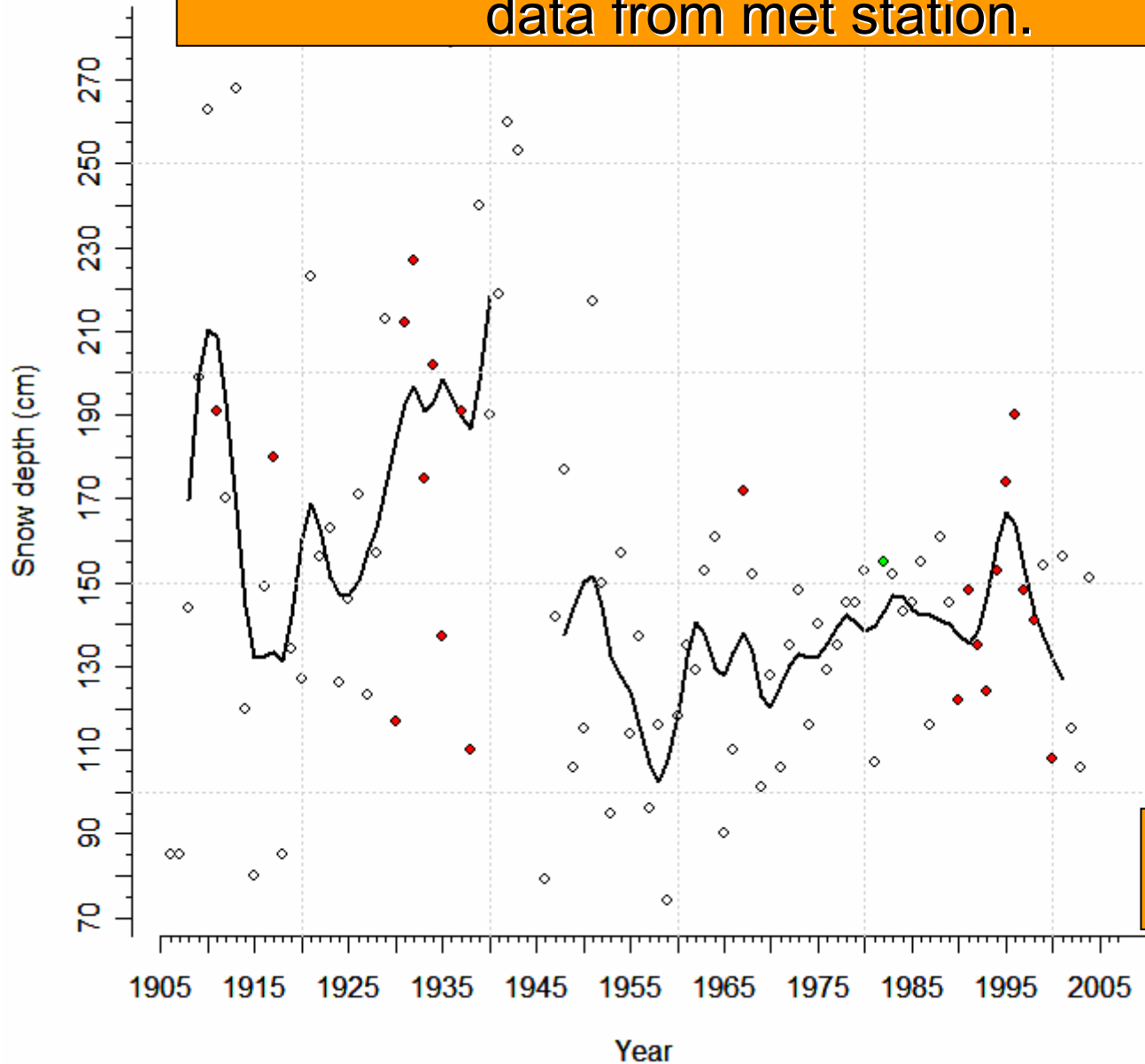
ESA POLARVIEW

Image NASA  
Image © 2008 TerraMetrics  
Image © 2008 DigitalGlobe

©2008

Eye alt

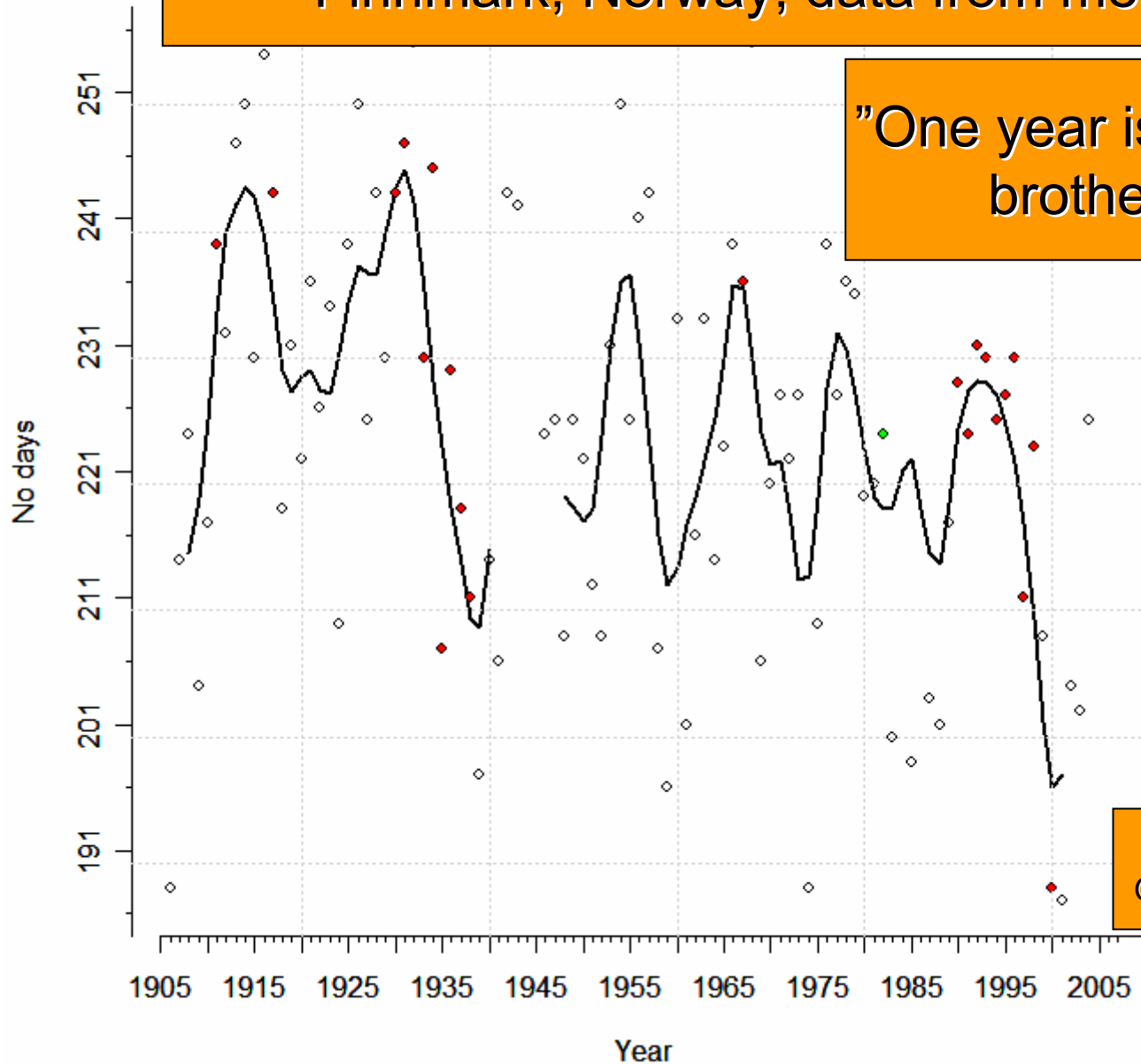
# Max snow depth in Finnmark in winter (cm) data from met station.



Red bad: grazing year  
Green: good grazing year



# Number of days with snow covering the pastures in Finnmark, Norway, data from met station

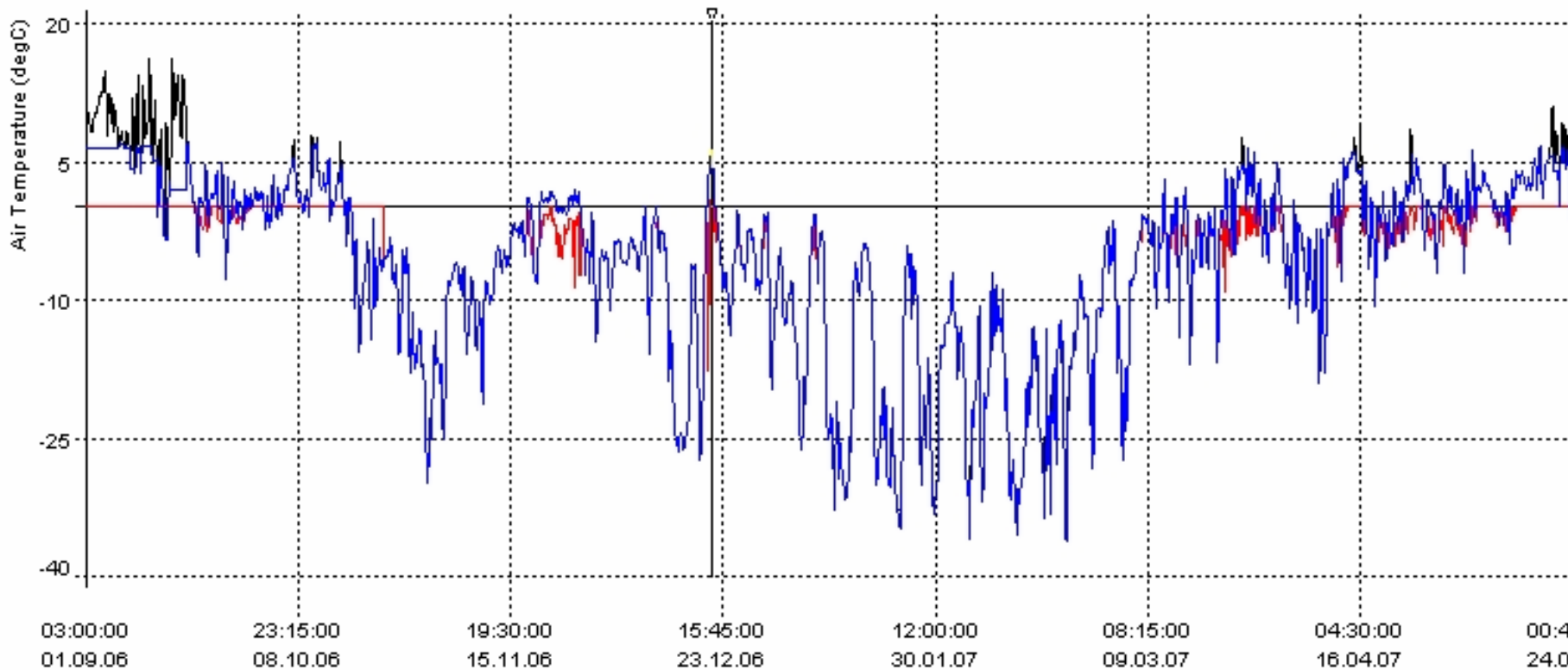


"One year is not another years brother – variability"

Red bad: grazing year  
Green: good grazing year



# Daily temperatures in Finnmark Norway 2006-2007



Slope = 0.00 deg  
Aspect = 0.00 deg

**Kautokeino20052007repgt, 300 m**

-- Tair      -- Tsurf mod      -- Tsurf meas

# Saami reindeer herders use more than 300 words on snow and snow change.

Reindeer herders traditional knowledge should be used to decrease vulnerability to change in futurer.

*joavggahat*

*sievlla*

*lavki*

*bohkolat*

Fieski

*čearga*

Skarti

*muovllahat*

*moarri*

*skoarádat*

OPPAS

*časttas*

ČIEGAR

*girrat*

*rodna*

*fáska*

*činus*

Sámi boazodoalus  
leat s. 300 iešguđege  
analyhtalaš muohtasáni.

Čierga

*gálja*



Yamal Oct 2006, photo: F.Stammler



	<i>skáva</i> “very thin layer of frozen snow”		
	<i>vahca</i> “loose snow (especially new snow on the top of a layer of older snow or on a road with snow on it)”		
	<i>geardni</i> “thin crust of snow”		
	<i>vahca</i> “loose snow”		
	<i>gaska-skárta</i> ‘hard layer of crust’		
	<i>ceavvi</i> ‘layer of hard snow’		
<i>seaŋaš</i> “granular snow at the bottom of the layer of snow”	<i>skoavdi</i> “empty space between snow and the ground”	<i>skárta</i> “thin (...) layer of snow frozen on to the ground”	

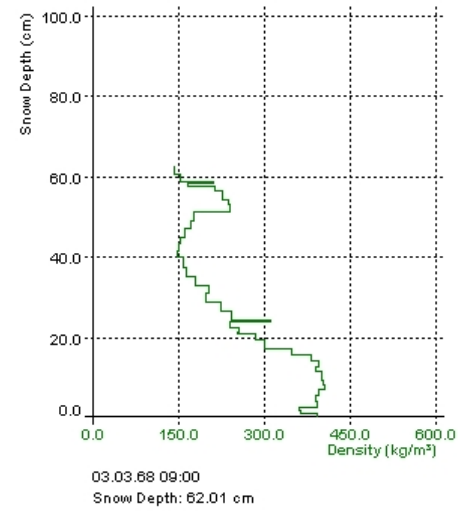
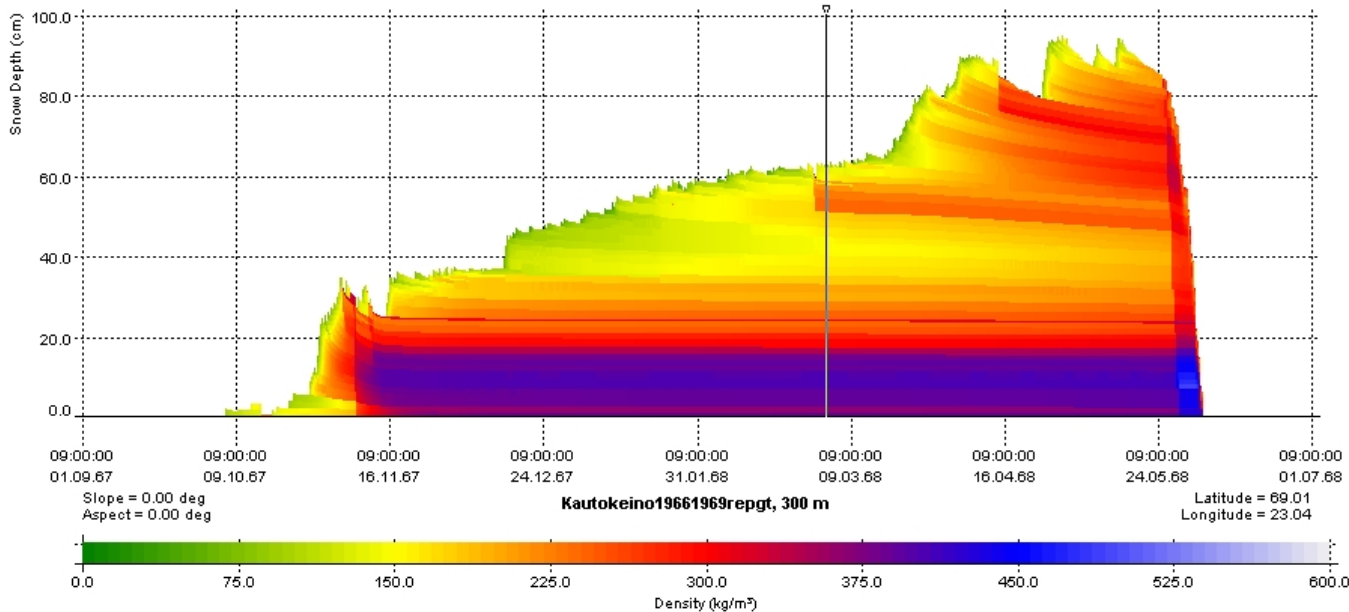
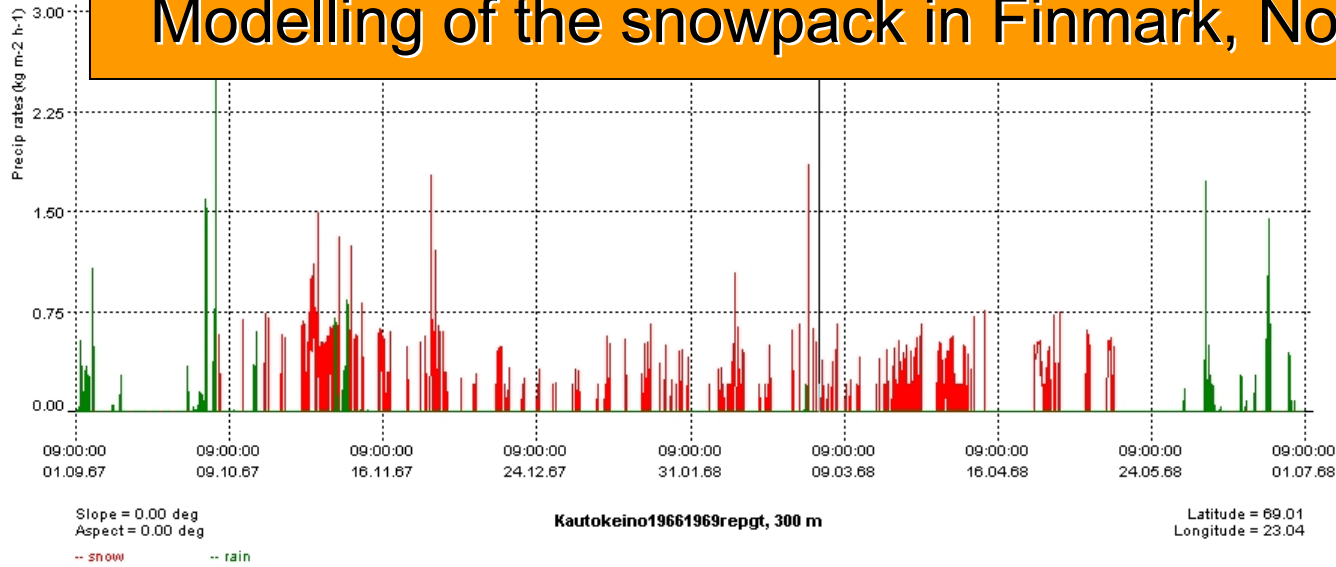




Internat  
Между  
Riikkaid



# Modelling of the snowpack in Finmark, Norway 1967/68

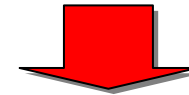
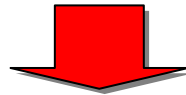
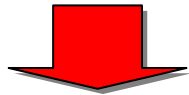


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**Place-Based  
(Regional/Local)**

**Place-Based  
(Regional/Local)**

**Place-Based  
(Regional/Local)**



Vulnerability = Impacts - Adaptive  
Capacity

**Clearly, coping/adaptation is at regional/local scales !**

# Example of adaptation knowledge: Castration

- Castration is a key element of traditional knowledge that persists in everyday usage in Nenets reindeer husbandry
- A tool for herd structure management
  - Nenets reindeer herders stated that a ban on castration would generate need of a lot more cash to buy and maintain machines for travelling
  - Male reindeer can more easily break through ice layers in the snow, and thus help females and calves getting *access to food* under difficult conditions

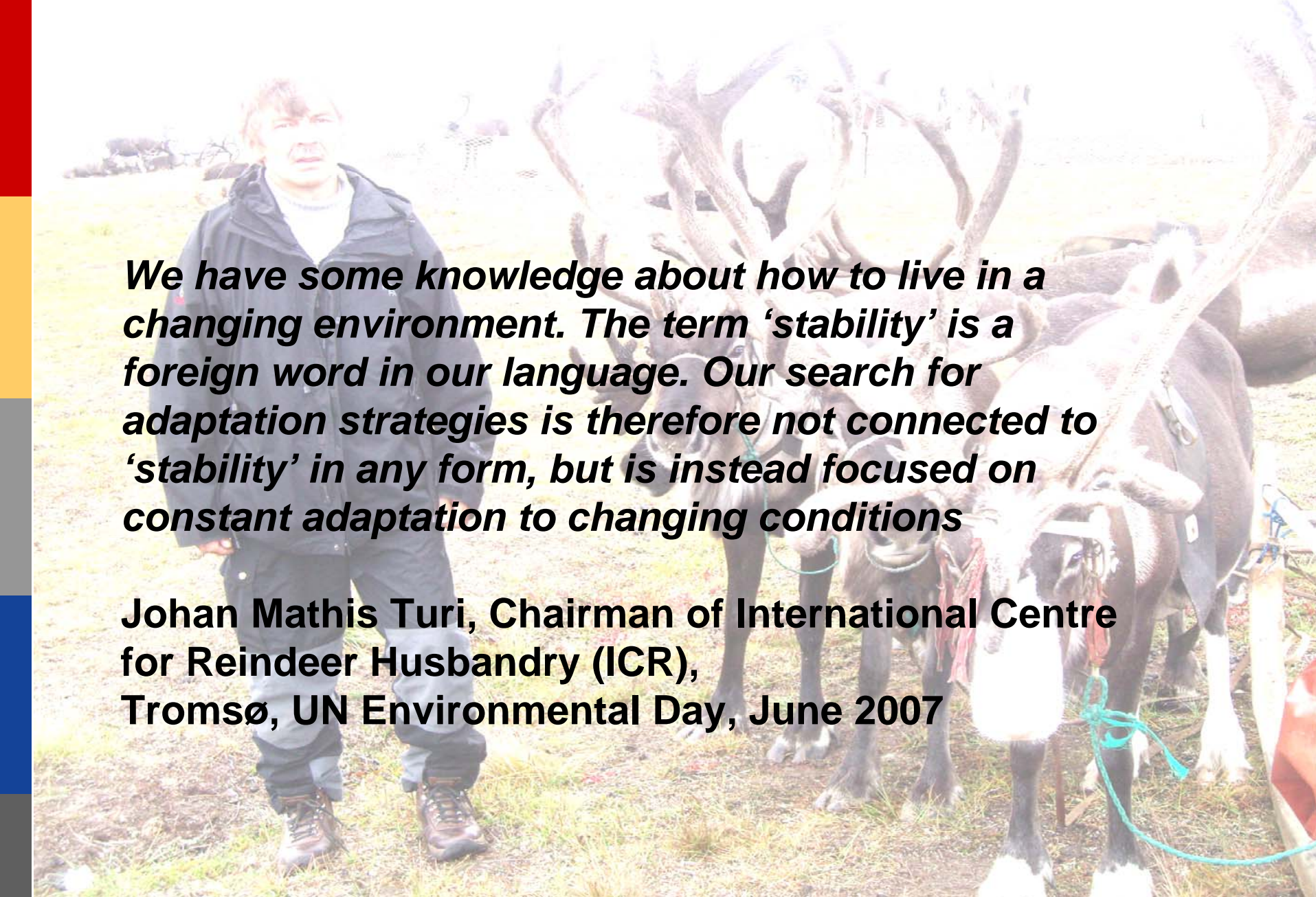


# Adaptation to climate change in reindeer husbandry in Eurasia:

---

- ❑ Limit the increasing permanent loss of ecological niches available to reindeer, due to loss of grazingland.
- ❑ Structuring herds to decrease vulnerability to climate change. Modify government incentives to improve understanding of biodiversity and traditional knowledge
- ❑ Making sure herders have a solid economic base, which enable them to absorb the costs associated with climatic change.





***We have some knowledge about how to live in a changing environment. The term 'stability' is a foreign word in our language. Our search for adaptation strategies is therefore not connected to 'stability' in any form, but is instead focused on constant adaptation to changing conditions***

**Johan Mathis Turi, Chairman of International Centre for Reindeer Husbandry (ICR), Tromsø, UN Environmental Day, June 2007**





> EALÁT MENU

- > About
- > Ealát News
- > Work Packages
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- > Presentations
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EALÁT: PASTURE | EALLU: HERD | EALLIN: LIFE

Welcome to the website for the EALÁT project: An International Polar Year (IPY) endorsed project (No. 399) and also endorsed by the Arctic Council.

EALÁT is a Reindeer Herders Vulnerability Network Study and is a project that examines reindeer pastoralism in the light of climate change. On this site you will find background information about the project, presentations by Ealát researchers, details of the various work packages, lots of news related to the project, a wide variety of photo galleries, web video pages and more. Ealát is Sámi word with a multi layered meaning. *Ealát* signifies 'Pasture', but related words *Eallu* means 'Herd' while *Eallin* means 'Life' in the Sámi language. The primary research institution in EALÁT is the Sámi University College-Nordic Sámi Institute (SUC-NSI). A wide number of other research institutions are involved in the project, along with the Association of World Reindeer Herders (WRH) and the International Centre for Reindeer Husbandry. All these bodies are located in the heart of the Sámi region, Guovdageaidnu-Kautokeino, Norway. [Learn more about IPY EALAT here.](#)



Sámi allaskuvla  
Samisk høgskole  
Sámi University College



Sámi Instituhtta  
Nordisk Samisk Institutt  
Nordic Sámi Institute



International Centre for Reindeer Husbandry  
Международный Центр Оленеводства



>> LOGIN

Username

Password

>> ICR

« February 2008 »

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17	18	19	20	21	22	23
24	25	26	27	28	29	

iCal

>> OUR PARTNERS



>> VISITOR LOCATION



>> EALÁT PHOTOGRAPHY

[www.ealat.org](http://www.ealat.org)

[www.reindeerblog.org](http://www.reindeerblog.org)

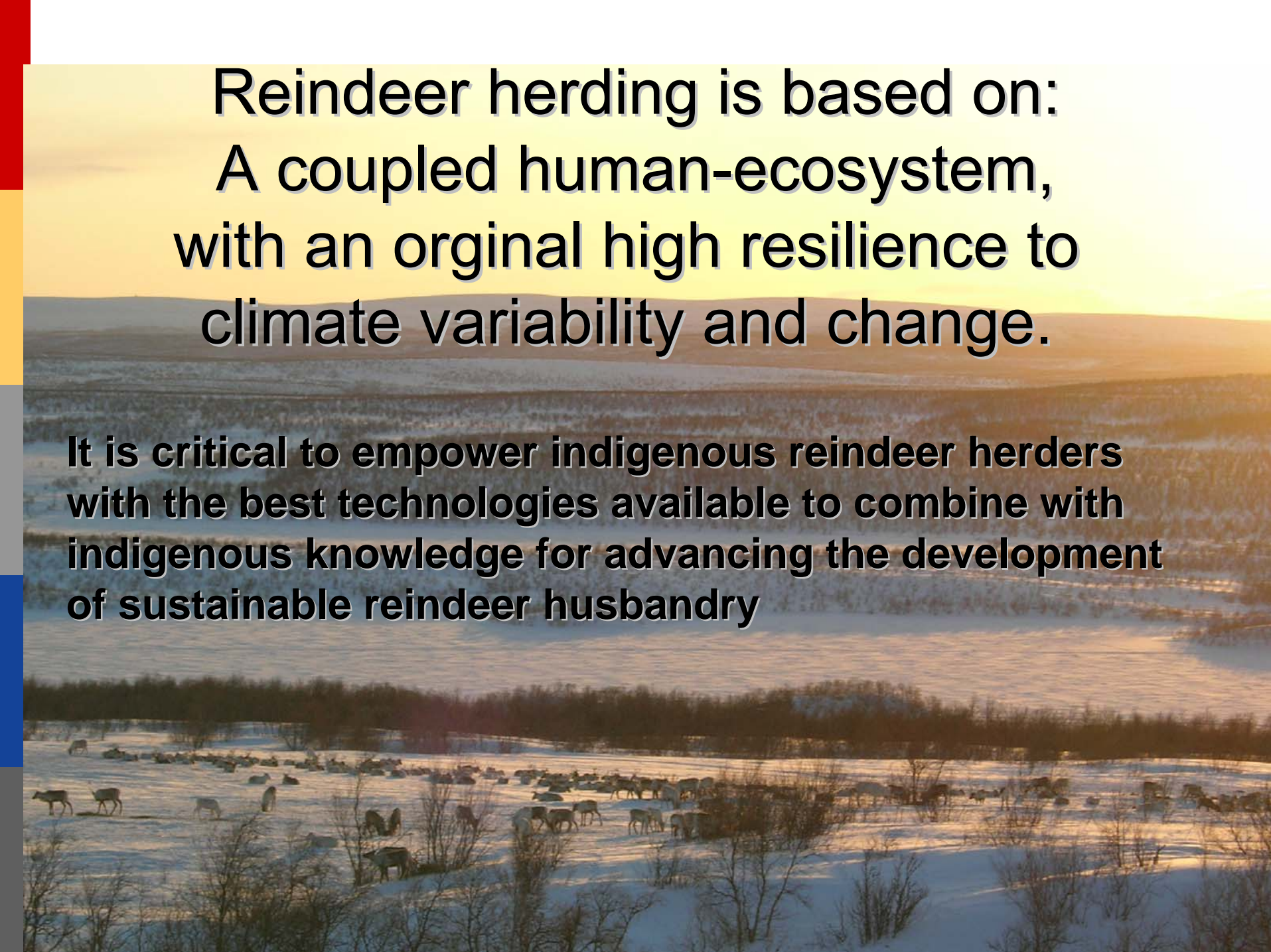
[www.reindeerportal.org](http://www.reindeerportal.org)

Fri, 15 Feb 2008  
EALAT Project Leader on NRK - Laerere k...

Fri, 15 Feb 2008  
February 2008: Unusually Warm? We Ask In...







**Reindeer herding is based on:  
A coupled human-ecosystem,  
with an original high resilience to  
climate variability and change.**

**It is critical to empower indigenous reindeer herders  
with the best technologies available to combine with  
indigenous knowledge for advancing the development  
of sustainable reindeer husbandry**





Information at  
[www.reindeerportal.org](http://www.reindeerportal.org)



International Centre for Reindeer Husbandry  
Международный Центр Оленеводства  
Riikkaidgaskaš Boazodoalloguovddáš

Picture by Øyvind Ravna