

Arctic Adaptation Research Considerations and Challenges

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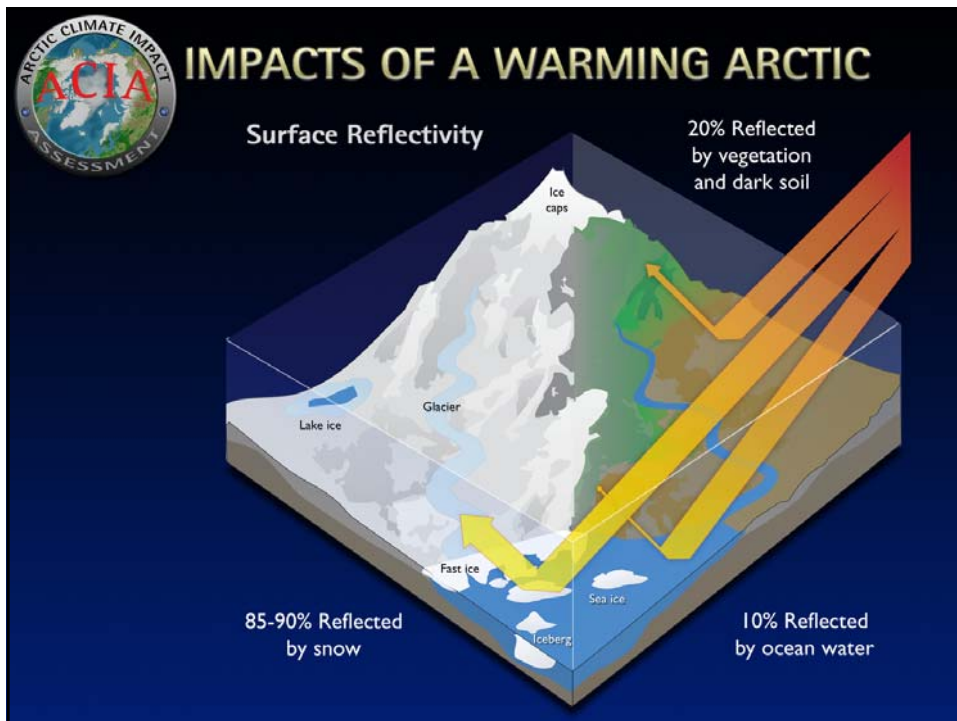
Background and Motivation for Current Arctic Adaptation and Vulnerability Research

- Arctic Climate Impact Assessment ACIA
- Rapid environmental and societal change
- Community focus important
- Community involvement in the research and management processes
- Arctic communities highly adaptable but more vulnerable than before in the face of the recent and rapid changes

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3

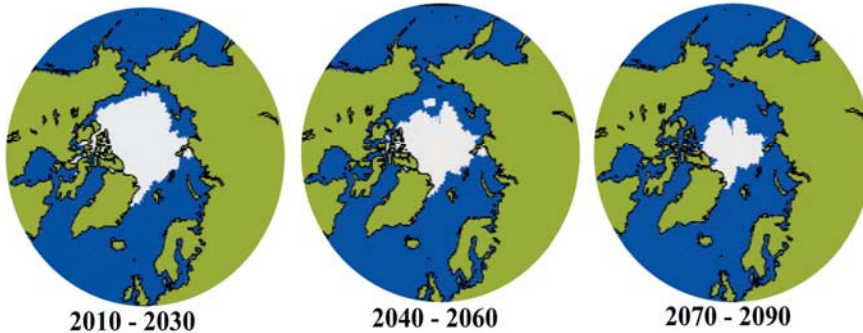


What is happening in the Arctic?

- Snow cover on land reduced with more than 10% the last 30 years
- The snow depth, season snow type and quality is changing
- The summer sea ice is retreating northwards
- The Greenland Ice Cap is melting
- Glaciers are melting
- The ice thickness reduced on rivers and lakes
- The sea level is rising
- The salinity in the ocean is changing

The sea ice has been reduced with
3-5% per 10 year the past 30 years

Projected Sea Ice Extent from Five IPCC Models for September



An example of glacial retreat in the Arctic.
Blomstrand glacier Svalbard 1928-2002



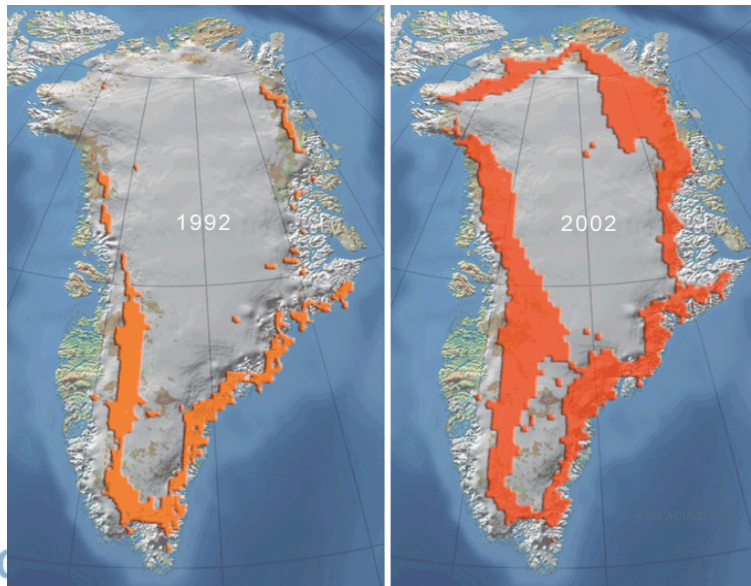
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Changes in maximum melting zone
Greenland 1992 -2002



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8

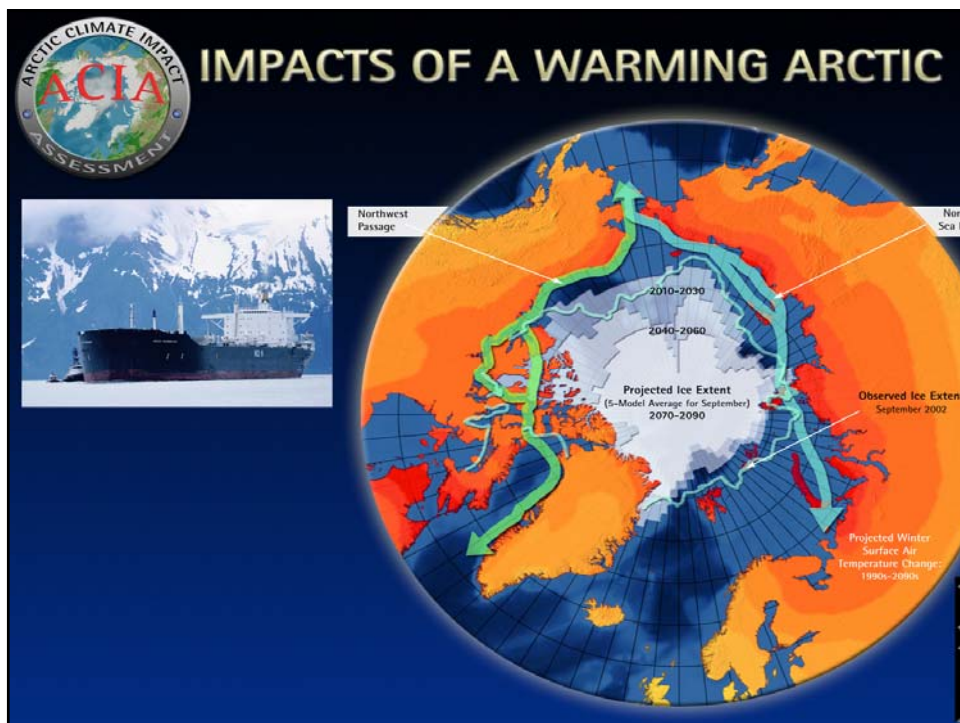
Increased temperatures – new opportunities

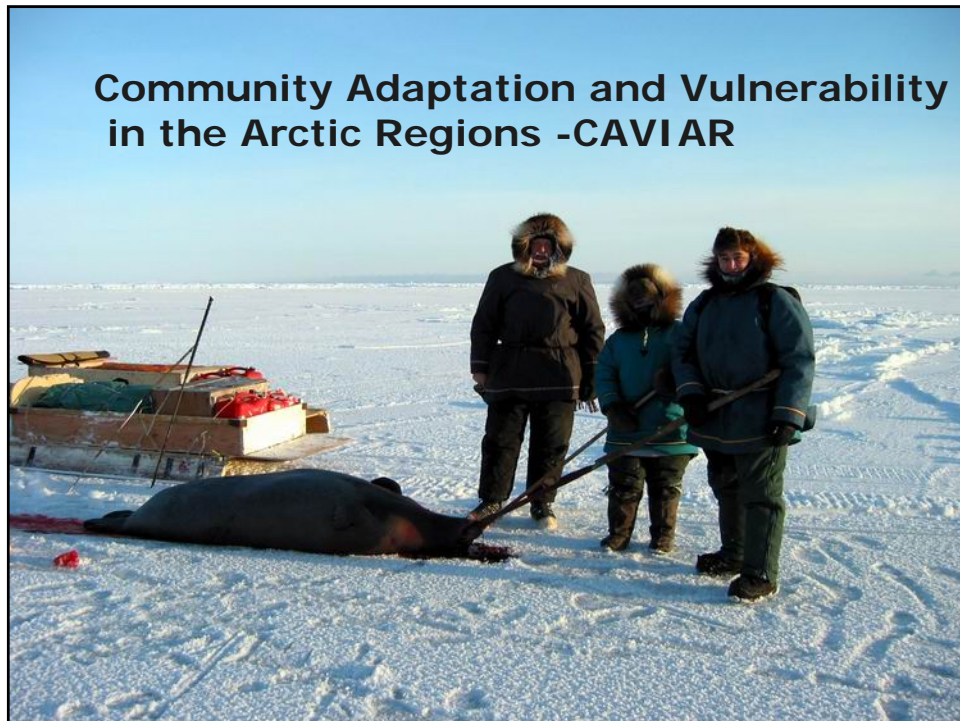
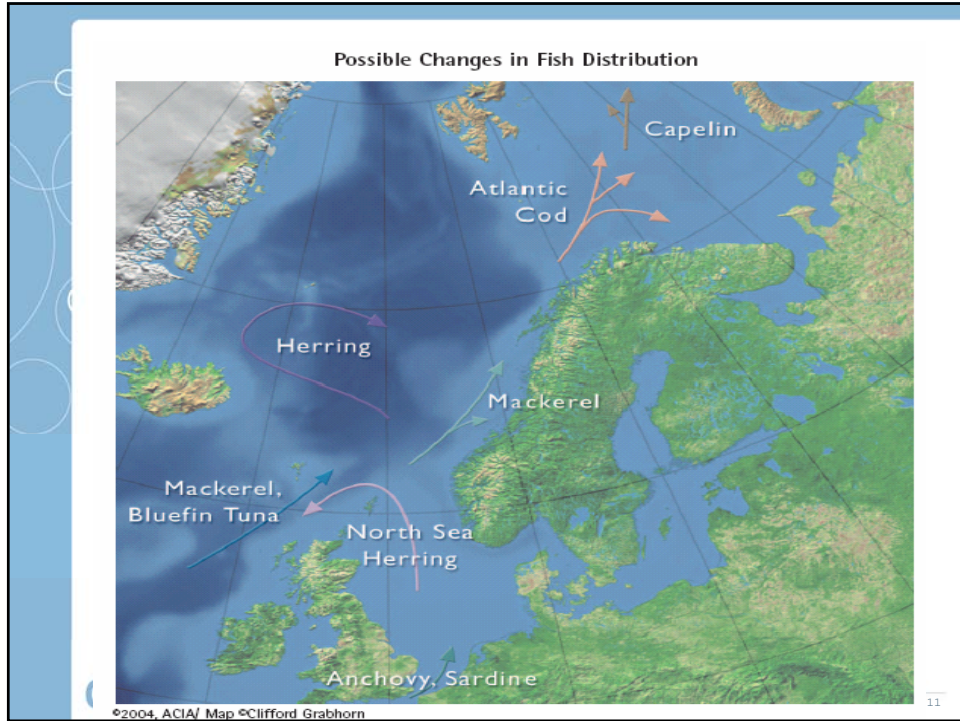
- More fish and new fish species
- Better access for transportation
- Possibilities for expanding agriculture
- Increased ship traffic in the Northwest passage and Northern Searoute
- Fisheries, oil and gass production opens up in new areas

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9





CAVIAR: some hard facts

- An International Polar Year (IPY) 2007-2008 cluster
- Led by Barry Smit, Univ of Guelph, Canada and Grete Hovelsrud, CICERO
- A Pan-Arctic Consortium – all eight Arctic countries involved
- 6 of the 8 partners funded to date – will ensure that locally based research will take place in Canada, Finland, Norway, Russia, Sweden, USA
- Fundamentally interdisciplinary

CAVIAR - is about people and the environment

Identify how projected changes in climate interact with changes in social and natural conditions

and how such interactions shape vulnerability and adaptation to climate change



CAVIAR – locally based

- Bottom-up approach
- Local communities define the focus of the study together with the researchers
- Local/traditional knowledge to be fully integrated in the study along with scientific knowledge



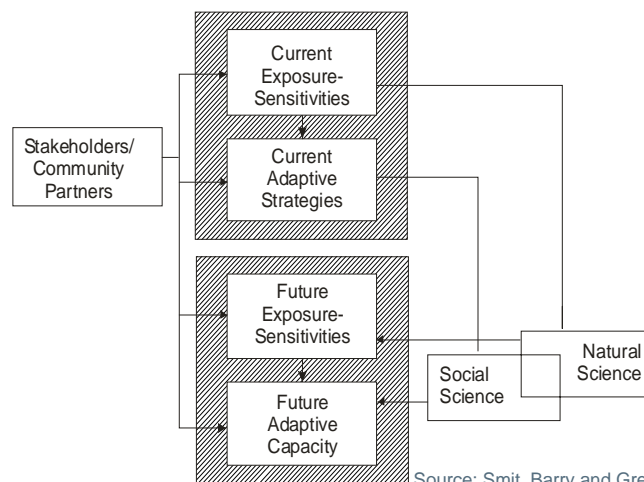
What do we want to understand?

- The processes that shape vulnerability and adaptation to changing social and environmental conditions
- The ability of communities to manage changing conditions
- The critical thresholds of adaptability and resilience
- The adaptive capacity of a community

And more...

- How social, cultural, economic and political processes operate at multiple scales to affect sensitivity to climate change and adaptive capacity
- How to enhance communities' adaptive capacity
- What economic sectors are most vulnerable to climate change and at what scale

Key Elements in Vulnerability Assessment



Source: Smit, Barry and Grete K. Hovelsrud (2006)
Community Adaptation and Vulnerability in Arctic
Regions
(CAVIAR) Pan-Arctic Research Proposal February
2006

CAVIAR Research Considerations

- The historical context of change
- Local involvement in research design
- Local/traditional knowledge
- Scale (local, regional, national)
- Policy relevance
- Interdisciplinary approach
- Case studies

CAVIAR Research Challenges

- Identification of relevant indicators for vulnerability
- Development of socio-economic scenarios
- Understanding how multiple stressors interact
- Understanding the links between scales and regions
- Local community involvement: how to best facilitate
- Comparison of local studies to increase our understanding about vulnerability and adaptation

Current Research Steps for the Norwegian-Russian CAVIAR

- Identification of communities, local partners and social and environmental conditions relevant for vulnerability assessments
- Identification of past (~1965) current (2006/7) and future (~2045) exposure-sensitivities and adaptation strategies
- Assessment and analyses of vulnerability and adaptation in northern Norway and northern Russia
- Integration of research across scale and case studies

Currently: Climate conditions important for vulnerability assessment in Hammerfest has been identified

- Determine the extent to which available meteorological data series can provide a meaningful description of the *local conditions that influence the exposure-sensitivity and adaptation strategies at the selected sites.*
- **Data** on local climate at selected sites for which long term records are available. Data from RCM covering Svalbard, Norwegian and Barents Seas, Northern parts of Fennoscandia and the Kola Peninsula. Spatial resolution of 24 km and is run for a 40 year period representing present day climate. The RCM provides daily values of a wide range of climate elements, incl. temperature, precipitation, snow, air pressure, wind direction and speed, wave heights and storm surges.

Identification of climate conditions important for vulnerability assessment

Method

- Apply statistical methods to deduce climatic based indices important for *exposure sensitivity and adaptation strategies at the selected sites.*

Local climate projections for assessing future vulnerability

- Downscaled climate projections for the 21st century with sufficient spatial resolution for vulnerability assessment at the selected sites. Assess uncertainty by downscaling from several AOGCM and at least 2 emission scenarios (probably IPCC SRES scenarios A2 and B2).
- Existing data available from meteorological stations in Northern Norway, Svalbard-region and Kola Peninsula. Large-scale climate scenarios from several AOGCMs. Regional climate scenarios 2071-2100 from the RCM (spatial resolution 24 km).
Relevant climate indicators defined by the collaboration between community members and climatologists.

Local climate projections for assessing future vulnerability **Methods**

- *Statistical (empirical) downscaling* applied to AOGCM output, producing micro-scale climate projections, i.e., at the level of the individual weather station. Results from the RCM runs will be interpolated and tailored to **represent the local climate at the selected communities.**

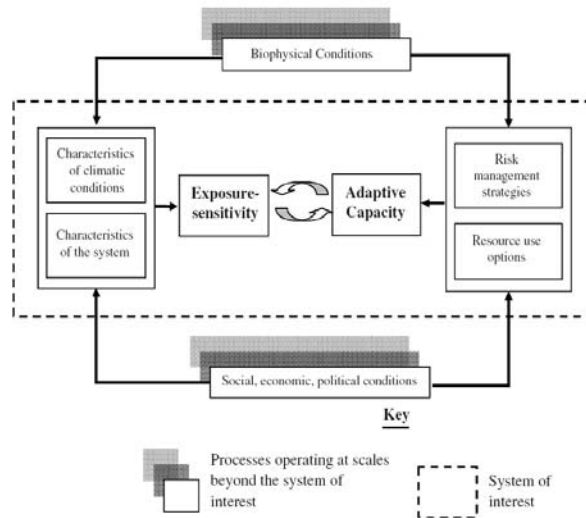


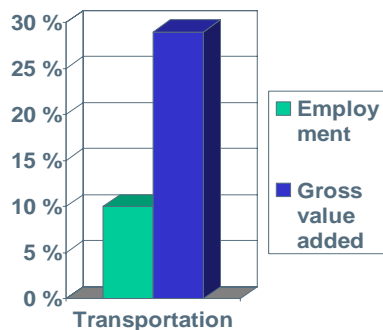
Fig. 1. A conceptual model of vulnerability. Components of vulnerability identified and linked to factors beyond the system of study and operating at various scales.

Source: Ford, J.D., Smit, B. and Wandel, J. (2006) *Global Environmental Change* 16:145-160

One simple illustration: Indicators

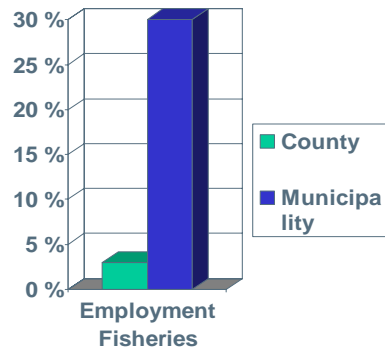
- Choice of indicators for determining vulnerability and adaptive capacity critical
- Different indicators tell different stories: who do you ask?
- Indicators vary with scale: local, regional, national:
- Identification requires local involvement

Choice of indicators for vulnerability matters: What do we want to measure?



- Transportation is economically important at the county level - 29%
- Less so in terms of employment - 10%
- Are there indirect economic risks or benefits to one or the other?

Are people involved in the fisheries sector in Norway vulnerable to climate change?



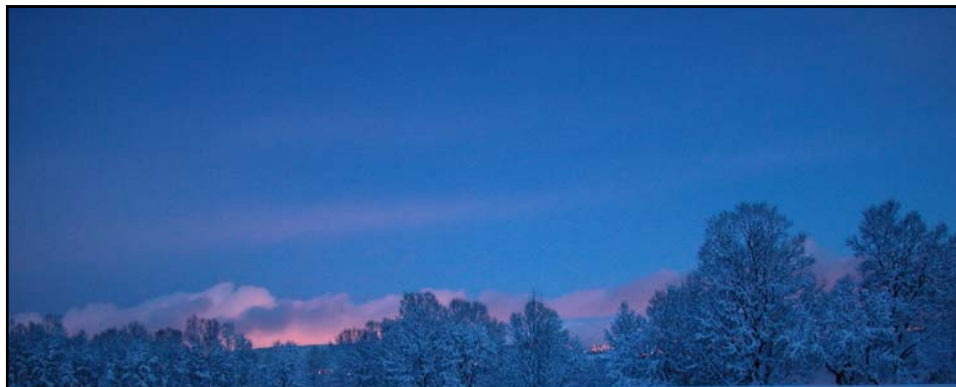
- 3 % at the county level
- Upwards of 30 % at the municipal level
- Perhaps even greater share in smaller communities
- What are the alternatives employment opportunities to fisheries?
- Are there other factors to consider?

Summary



- Climate change is happening
- It is felt more severely at the local level
- Adaptation happens at the local level
- It is happening in the context of other social, economic, political and environmental changes
- Policy relevant interdisciplinary research necessary
- Focus on both adaptation and mitigation
- Consider opportunities as well as challenges

It is about people, their livelihoods and well-being



**It is also about the unique beauty of the north,
and how we are connected to our neighbours
in the south....**



*Thank you for your
attention!*

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33