CES Nordic Project on Climate and Energy Systems

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The Climate and Energy Systems Project: Past, Present and Future

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Icelandic Meteorological Office, IMO, Iceland

Future Climate and Renewable Energy: Impacts, Risks and Adaptation 31 May - 2 June 2010 Oslo,

Outline of presentation

- Historical overview
- The CES project
- The Top Forsknings Initiative, TFI
- Global Framework for Climate Services (GFCS)

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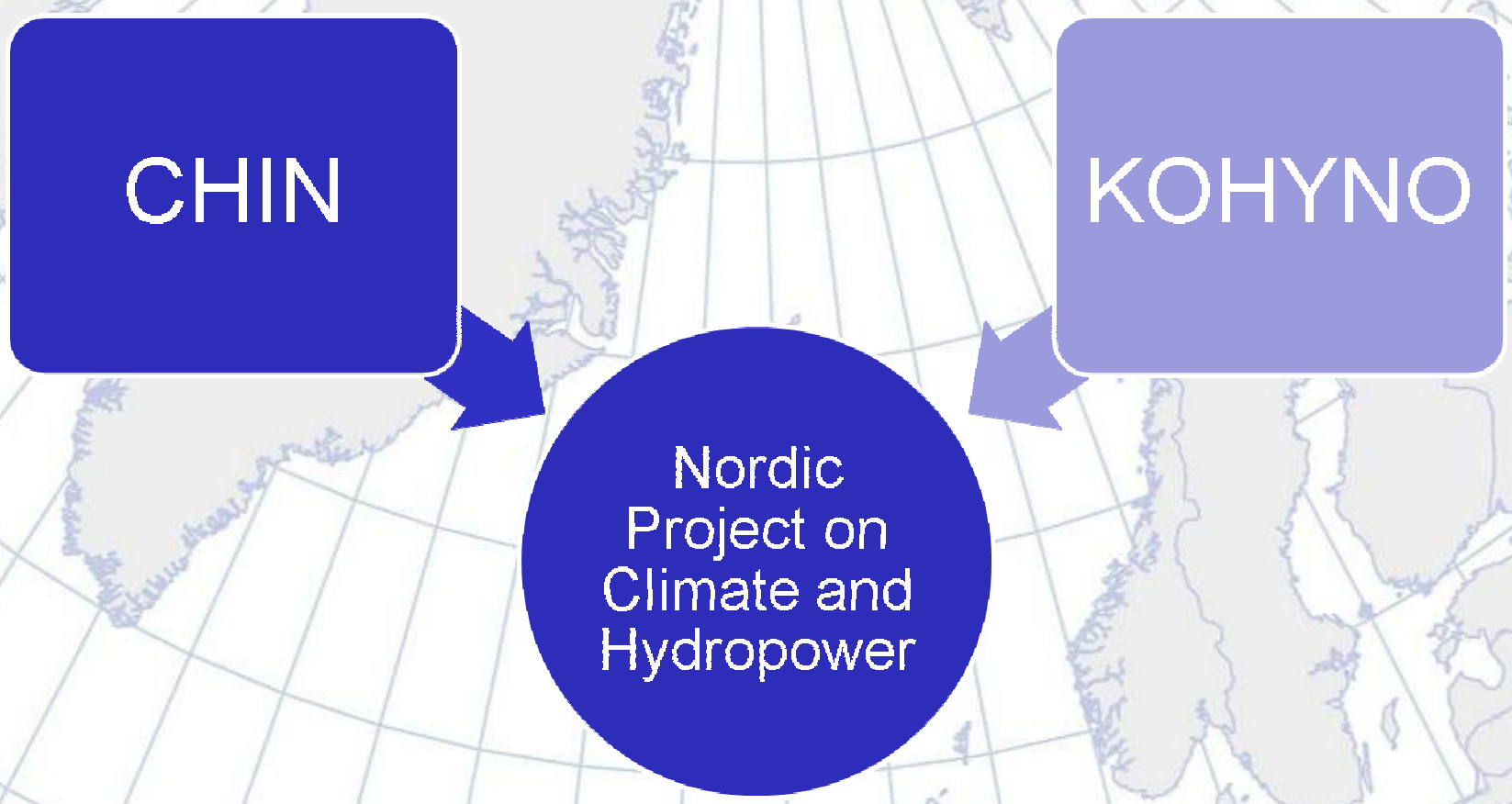
First Nordic project on Climate and Hydropower started in 1991 after the first IPCC report



Funded by the NMR

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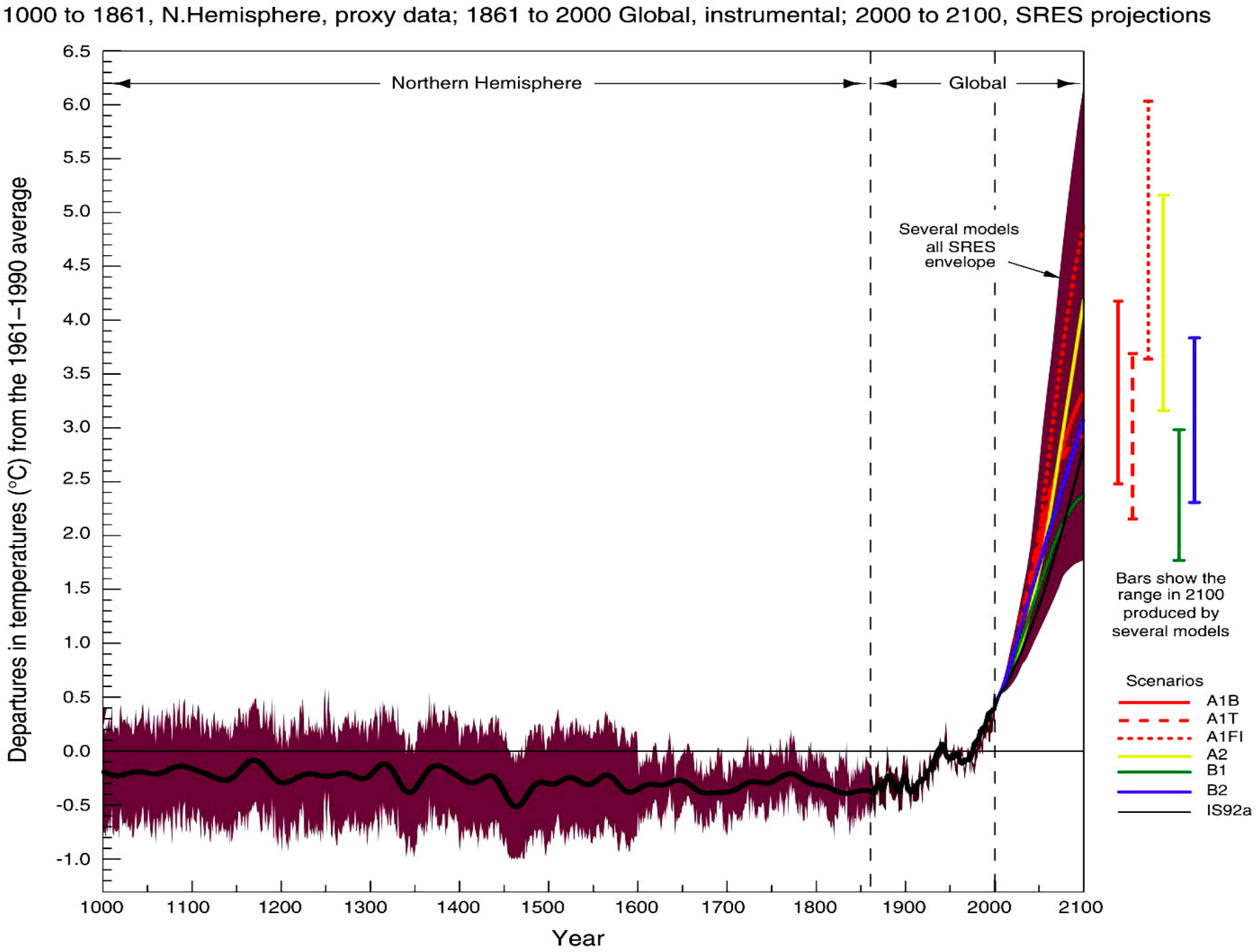
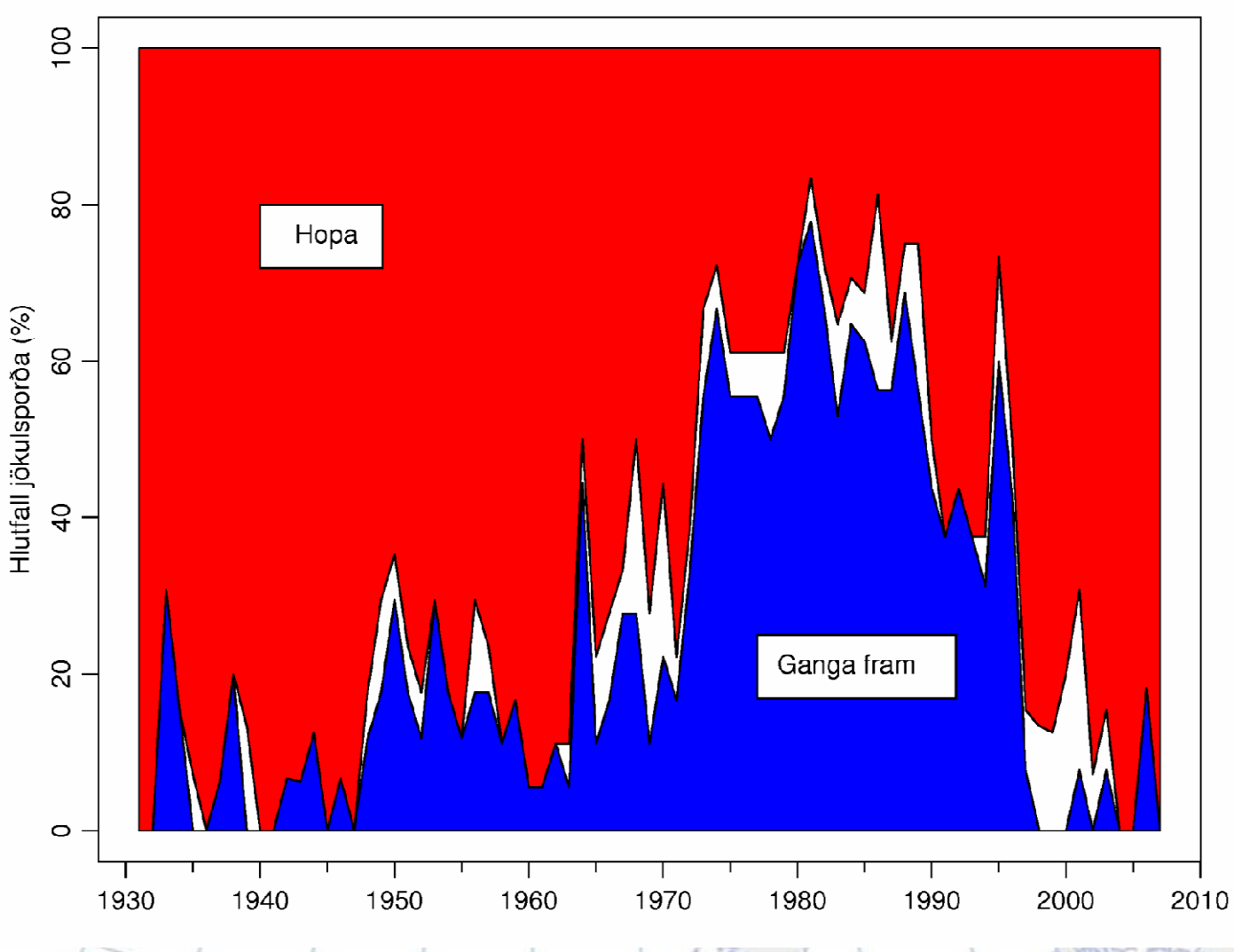

1000 to 1861, N.Hemisphere, proxy data; 1861 to 2000 Global, instrumental; 2000 to 2100, SRES projections
Northern Hemisphere
Global
Several models
all SRES
envelope
Departures in temperatures (°C) from the 1961–1990 average
Year
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
Bars show the
range in 2100
produced by
several models
Scenarios
A1B
A1T
A1FI
A2
B1
B2
IS92a

Retreat of Icelandic glaciers



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Nordic-Baltic projects on the impact of climate change on renewable energy following the third IPCC report

Climate Water and Energy 2001-2002

Climate and Energy 2003-2006

Funded by Nordic Energy Research and the partners

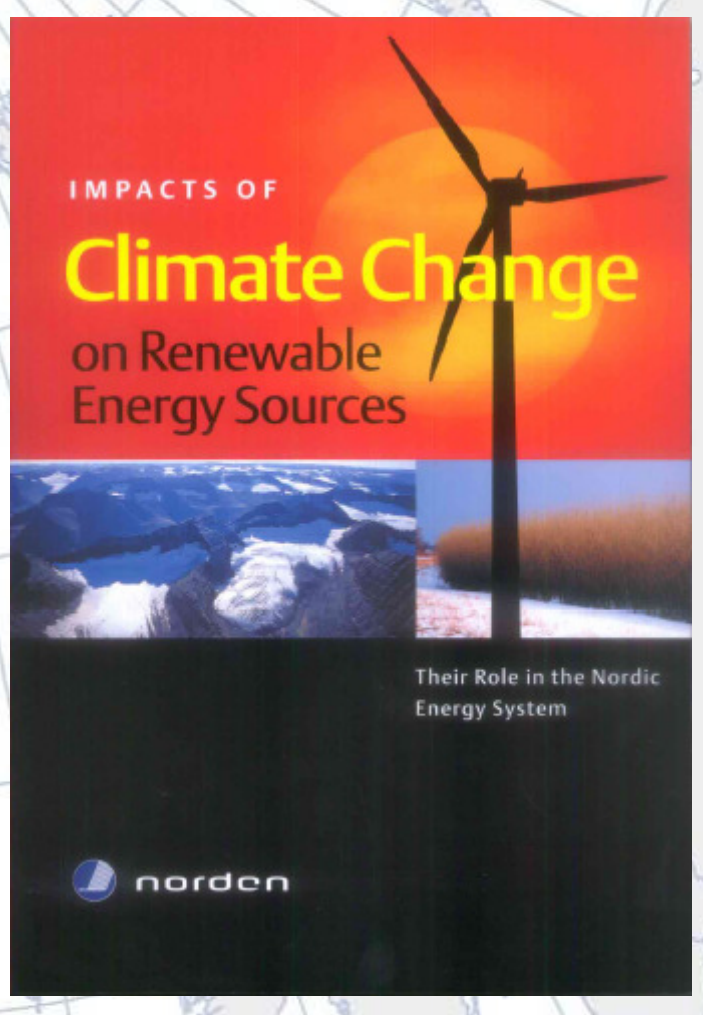
CES Nordic Project on Climate and Energy Systems

The main project results

Impact of Climate Change on Renewable Energy Sources

Edited by Jes Fenger

Contribution from 30+ specialists on energy and climate change



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Dam safety

Foto: C-O Brandesten, Vattenfall

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Dam safety

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Nordic-Baltic projects on the impact of climate change on renewable energy

Climate Water and Energy 2001-2002 (2MNOK)

Climate and Energy 2003-2006 (15MNOK)

Climate and Energy Systems 2007-2010 (18MNOK)

Funded by Nordic Energy Research and the partners

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Main objective of CES

To improve the decision framework of the energy sector in the face of imminent impacts of climate change on:

- renewable resources
- the energy system

with special emphasis on the near future relevant to the energy sector.

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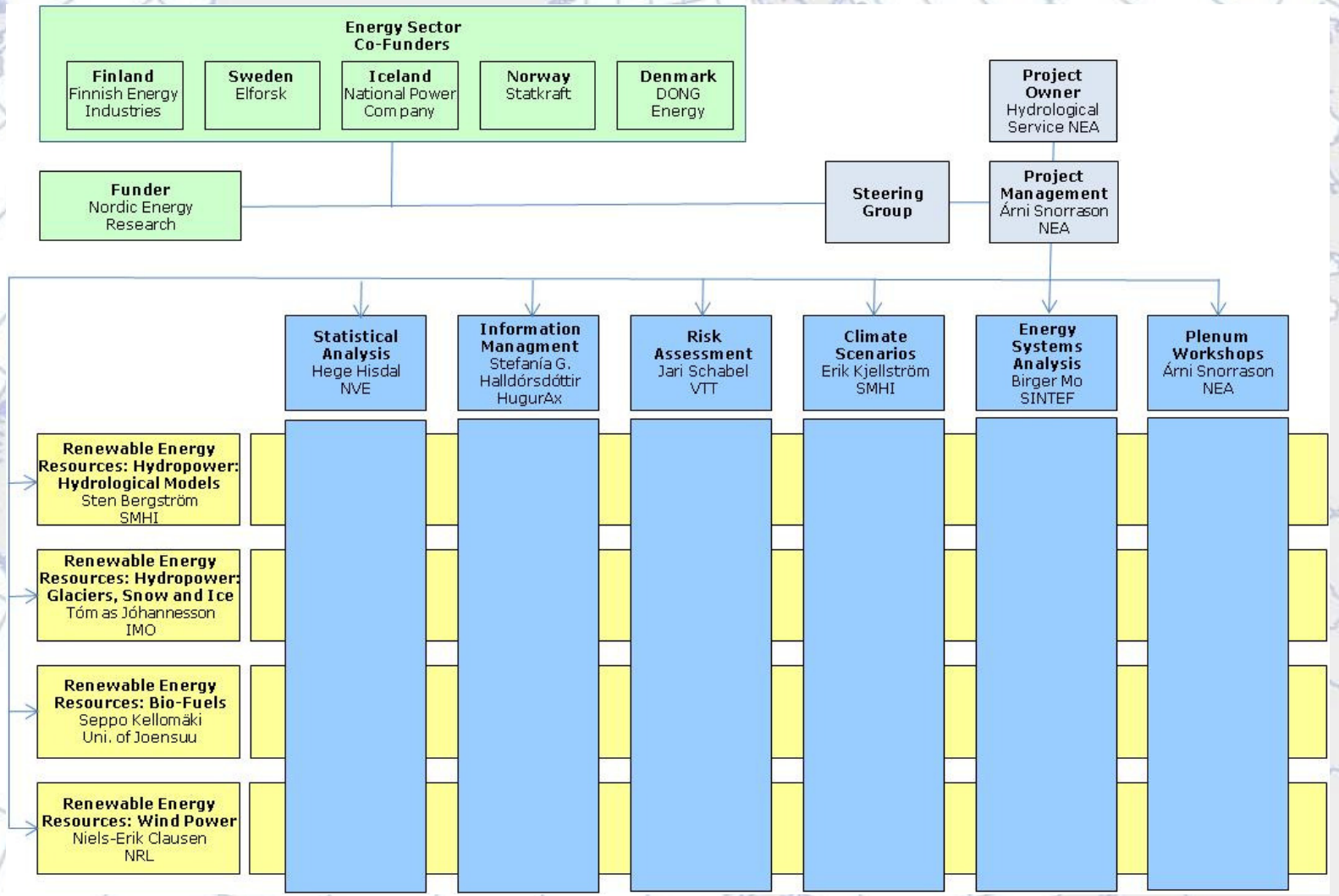
Objectives of the CES project

- Understanding of the natural variability and predictability of climate and renewable energy systems at different scales in space and time.
- Assessment of the risks due to changes in probabilities and nature of extreme events.
- Assessment of the risks and opportunities due to changes in production of renewable energy.
- Development of guiding principles for decisions under climate variability and change.
- Development of adaptation strategies.
- A structured dialog with stakeholders

Partners, organisation



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Main objectives of The CES Conference:

- Past and present changes in climate and hydrology.
- Climate and hydrological projections for the near future (2020-2050).
- Effects of a changing climate and hydrology on renewable energy.
- Risks and opportunities for renewable energy caused by climate change.
- Adaptation strategies.

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Toppforskningsinitiativet (TFI)

Budget: DKK 400 million over 5 years

Joint funding through: Nordic Council of Ministers
National Funding Bodies
NordForsk
Nordic Innovation Centre
Nordic Energy Research

Programme timeframe: 2009-2013

Calls for proposals will begin in 2009

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Toppforskningsinitiativet (TFI)

- Aims of the TFI Programme
  - Profile the Nordic region as a leader within certain areas of the energy and climate sectors
  - Strengthen national research and innovation systems
  - Create larger professional communities which extend across borders and pave the way for greater mobility of competencies
  - Ensure the highest quality in research and innovation by combining the strongest Nordic communities
  - Provide a platform for increased international cooperation both within the EU and beyond
  - Enhance Nordic participation in EU programmes
  - Strengthen Nordic competitiveness by using research and innovation to counter economic downturns.

Toppforskningsinitiativet (TFI)

- The initiative will consist of the following six sub-programmes:
  - Effect studies and adaptation to climate change
  - Climate change's interaction with the cryosphere
  - Integration of large-scale wind power
  - Sustainable biofuels
  - Nanotechnology and energy efficiency
  - Carbon capture and storage
- Within the framework of these six themes, the initiative will also include:
  - Advanced climate modelling
  - Social sciences and humanities
  - A focus on the Arctic area

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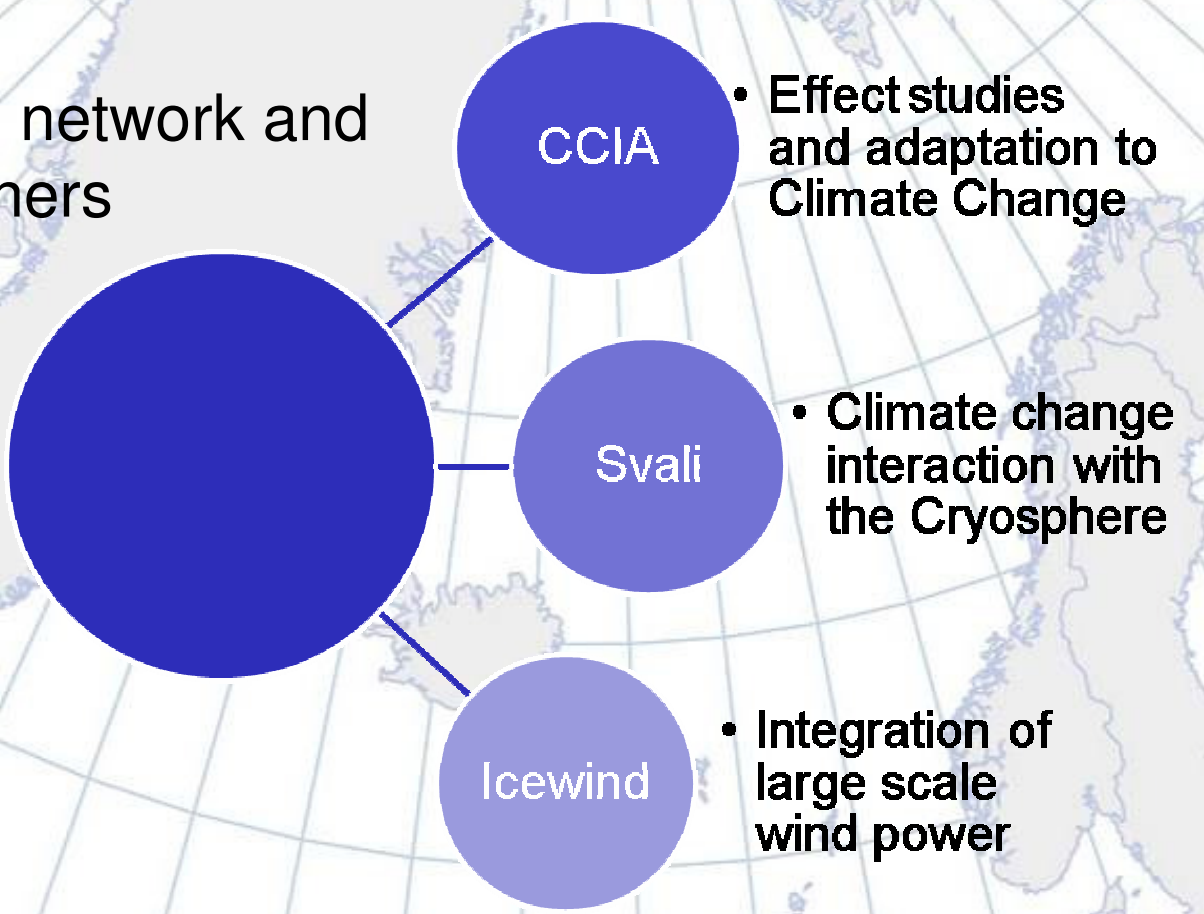
CES approach to TFI

CES network and Partners



- Effect studies and adaptation to Climate Change
- Climate change interaction with the Cryosphere
- Integration of large scale wind power

ICEWIND

- The climate of wind of the extreme Nordic
  - Regional wind fields
  - Regional statistics of wind
  - Temporal statistics of wind
- Isolated parts of the Nordic energy system
  - Systems simulations
  - Operations and maintenance
  - Energy market aspects
- Scale:
  - Total: 20.8 MNOK
  - TFI: 12.3 MNOK

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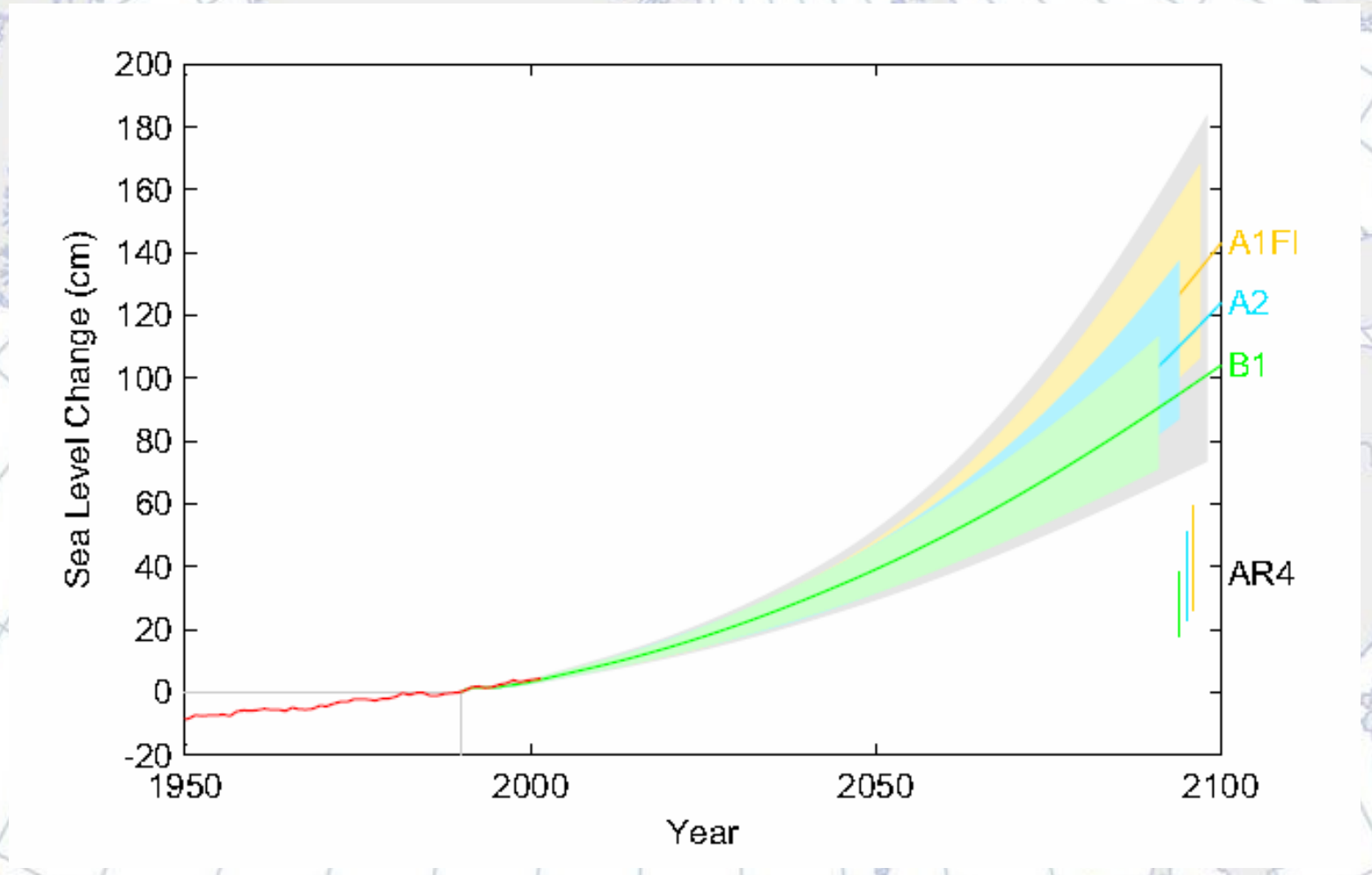
Estimated Global Sea level rise



Vermeer and Rahmstorf 2009

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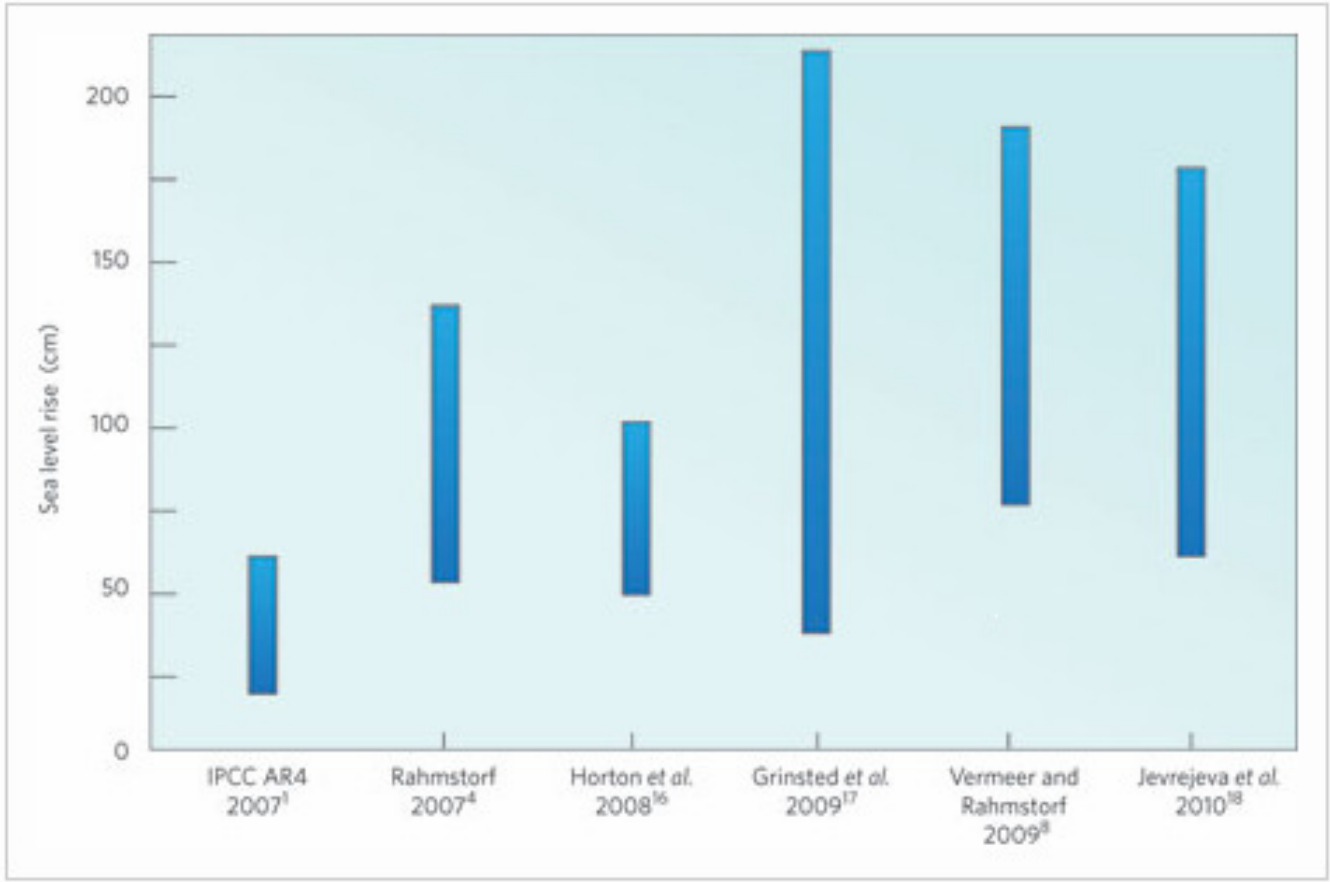
Estimated Global Sea level rise at 2100



Rahmstorf 2010

Deformation of Iceland due to mass loss from glaciers

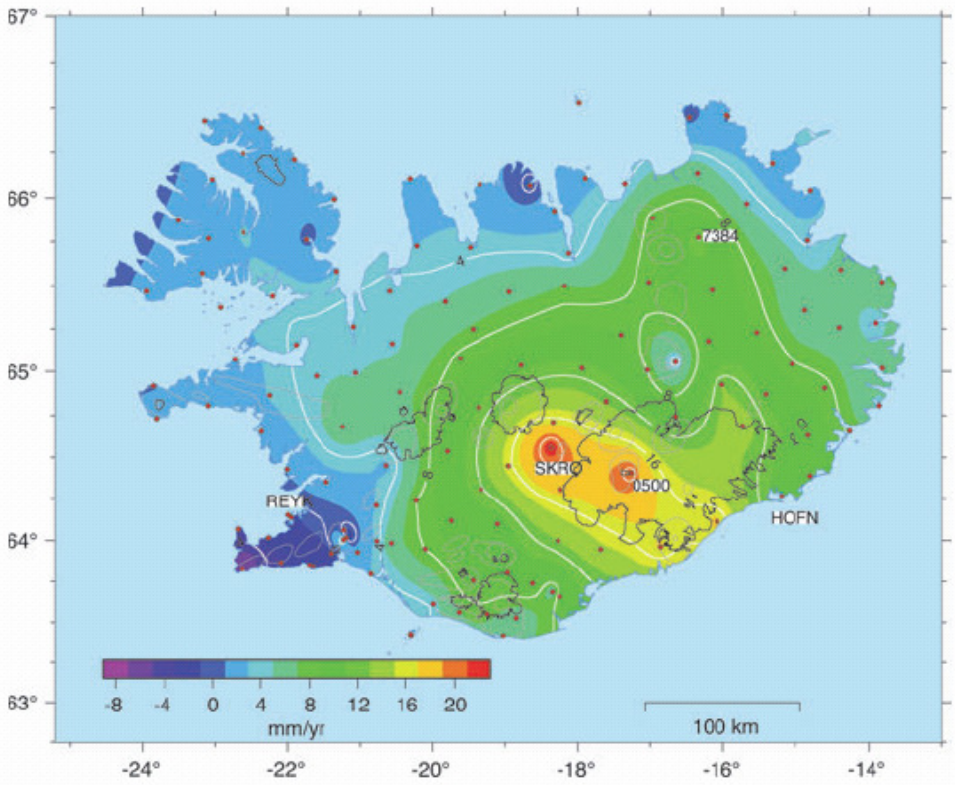


Figure 5. Vertical velocities in the ITRF2005 from ISNET (1993–2004) and the CGPS network in Iceland (1999–2004). Positive numbers indicate uplift and negative are subsidence. Contour lines are drawn every 4 mm yr^{-1}. The red dots show the GPS station locations.

Þ. Árnadóttir *et al.*, GJI, 177

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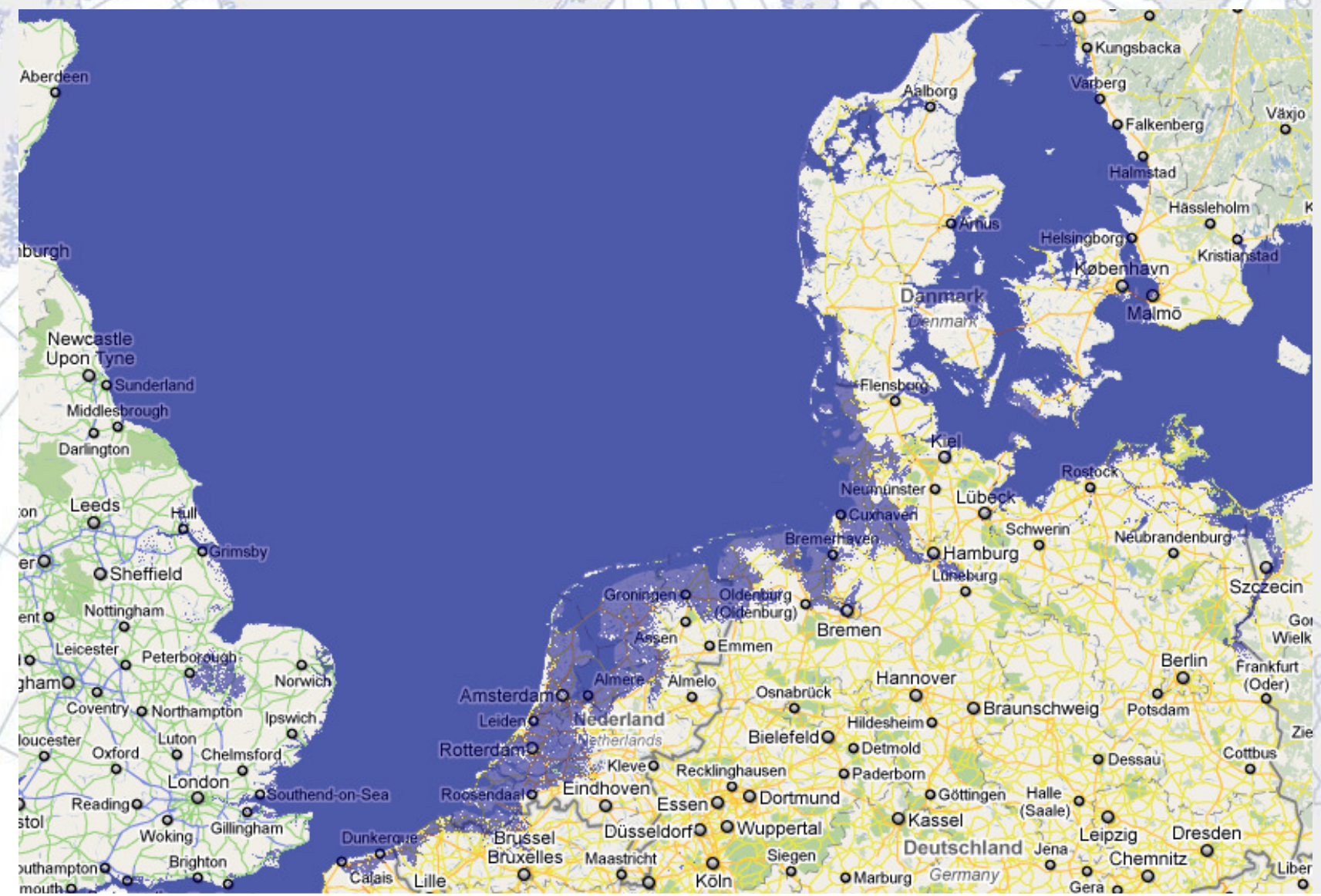
Area of inundation: 1m sea level rise



Stability of Arctic Land Ice: SVALI

- CES Snow and Ice Group
- Many partners from the Nordic Countries
- Led by University of Oslo, IMO, Geus, DMI and FMI
- Scale: 40 MNOK from TFI

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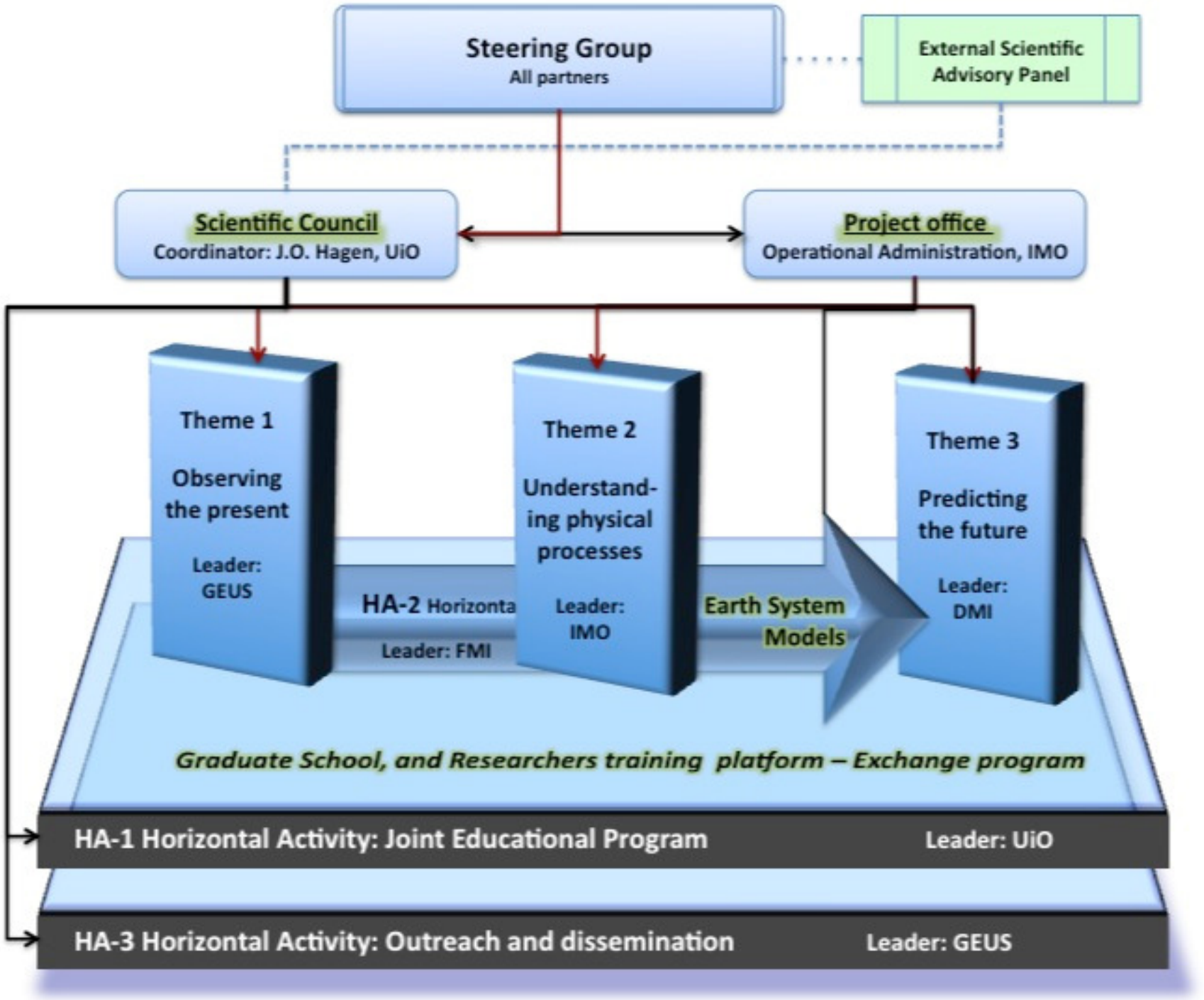
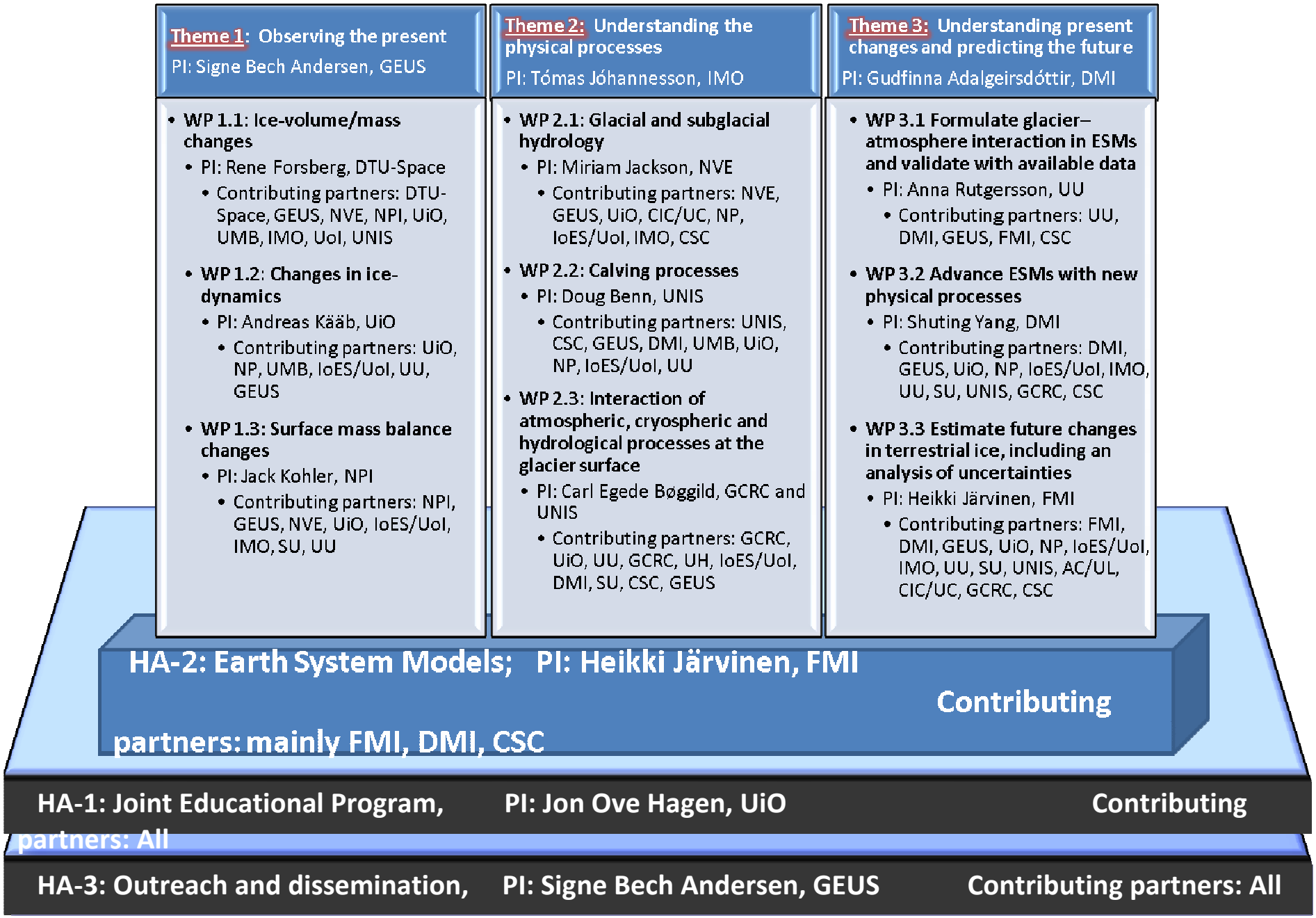
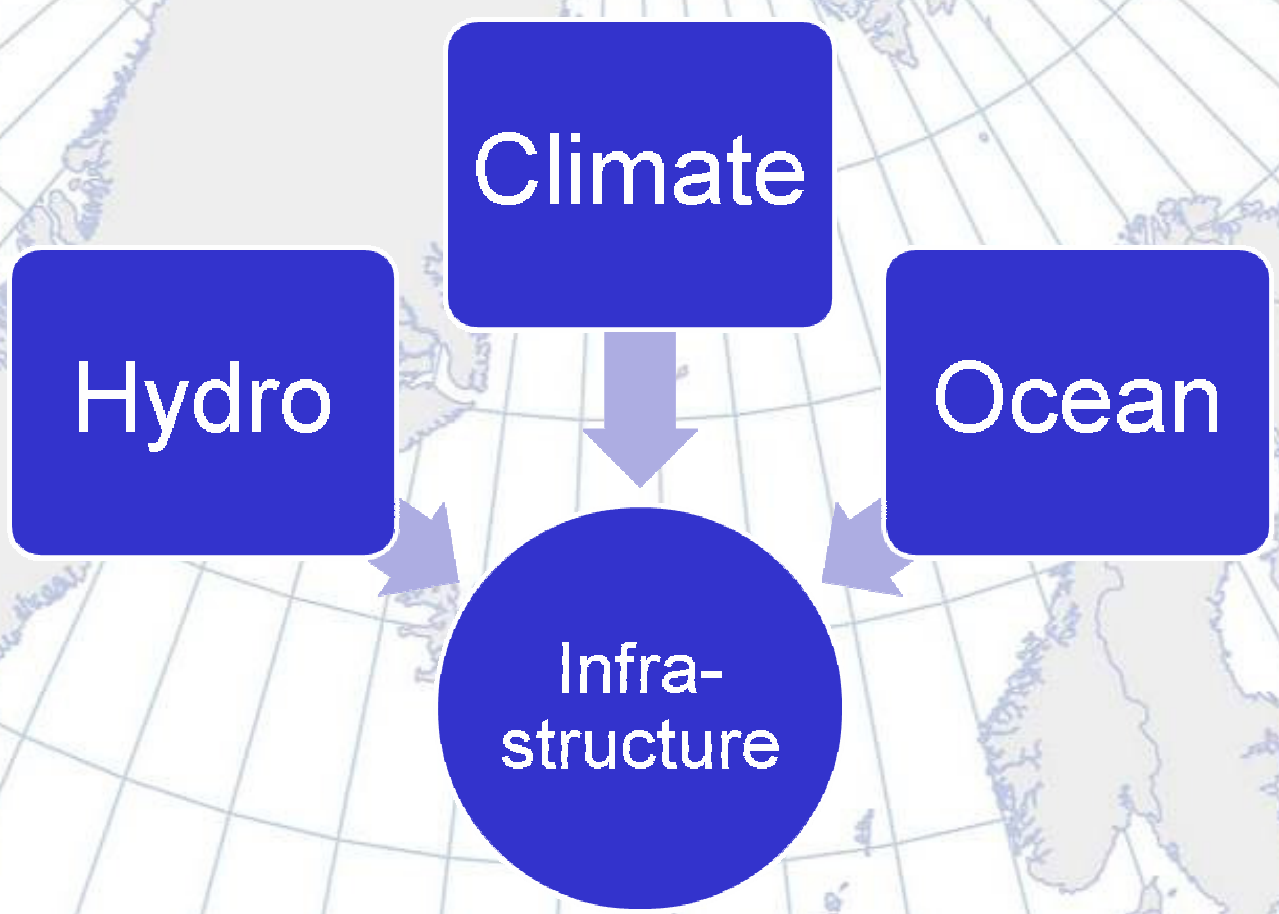

Steering Group
All partners
External Scientific Advisory Panel
Scientific Council
Coordinator: J.O. Hagen, UiO
Project office
Operational Administration, IMO
Theme 1
Observing the present
Leader: GEUS
Theme 2
Understand-ing physical processes
Leader: IMO
Theme 3
Predicting the future
Leader: DMI
HA-2 Horizonta
Leader: FMI
Earth System Models
Graduate School, and Researchers training platform – Exchange program
HA-1 Horizontal Activity: Joint Educational Program
Leader: UiO
HA-3 Horizontal Activity: Outreach and dissemination
Leader: GEUS

SVALI NCoE: Overview of themes, research work packages and horizontal activities



Climate Change Impacts and Adaptation, CCIA



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CCIA

- Climate impacts on infrastructure:
  - Renewable energy
  - Transport
  - Planning and land use
  - Water sector
  - Public safety
- Scale:
  - 33 MNOK from TFI
  - 9 MNOK from stakeholders and partners
- Total: 42 MNOK over five years

Networks participation of CCIA partners

- Network on adaptation lead by the CCIA team
- Network on adaptation lead by University of Copenhagen
- Network on Statistical climatology lead by Norway

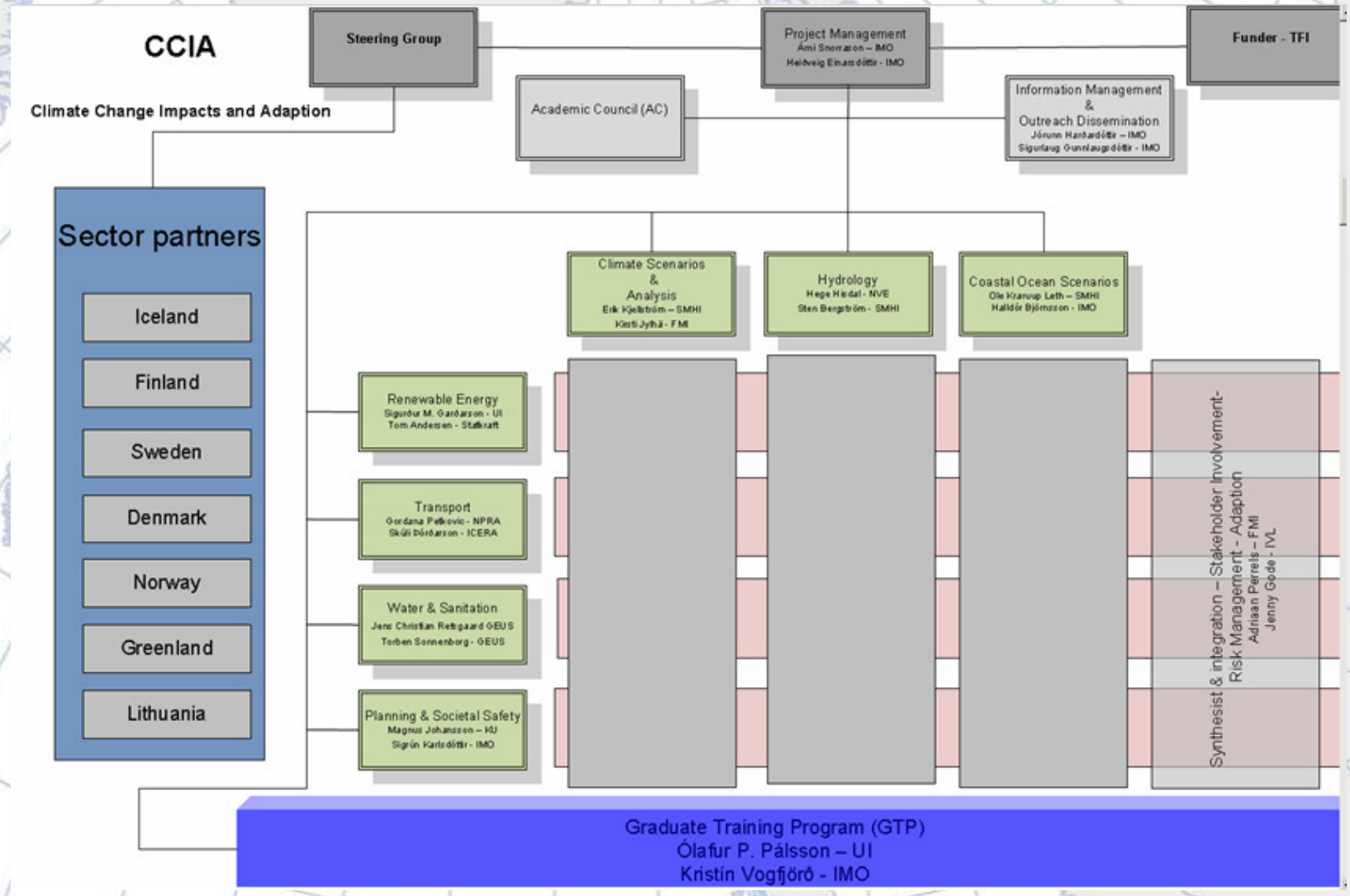
CCIA

- Physical impacts:
  - Climate
    - Climate models
    - Climate statistics
  - Hydrology
    - Hydrological models
    - Statistical hydrology
    - Hydraulic models of rivers and estuaries
  - Ocean
    - Scenarios of sea-level changes
    - Storm surges under future climate
      - Hydraulic models with wind and pressure fields
      - Statistical methods

CCIA

- Risk and adaptation
  - Risk analysis
  - Adaptation methodologies
  - Case studies
- Stakeholder involvement and participation
  - Stength of CES: Stakeholders and end users at the table
- Graduate Program

Organizational chart for CCIA



World Climate Conference, WCC-3

Global Framework for Climate Services (GFCS)

Goal:

"enable climate adaptation and climate risk management through the incorporation of science-based climate information and prediction into policy and practice at all levels."

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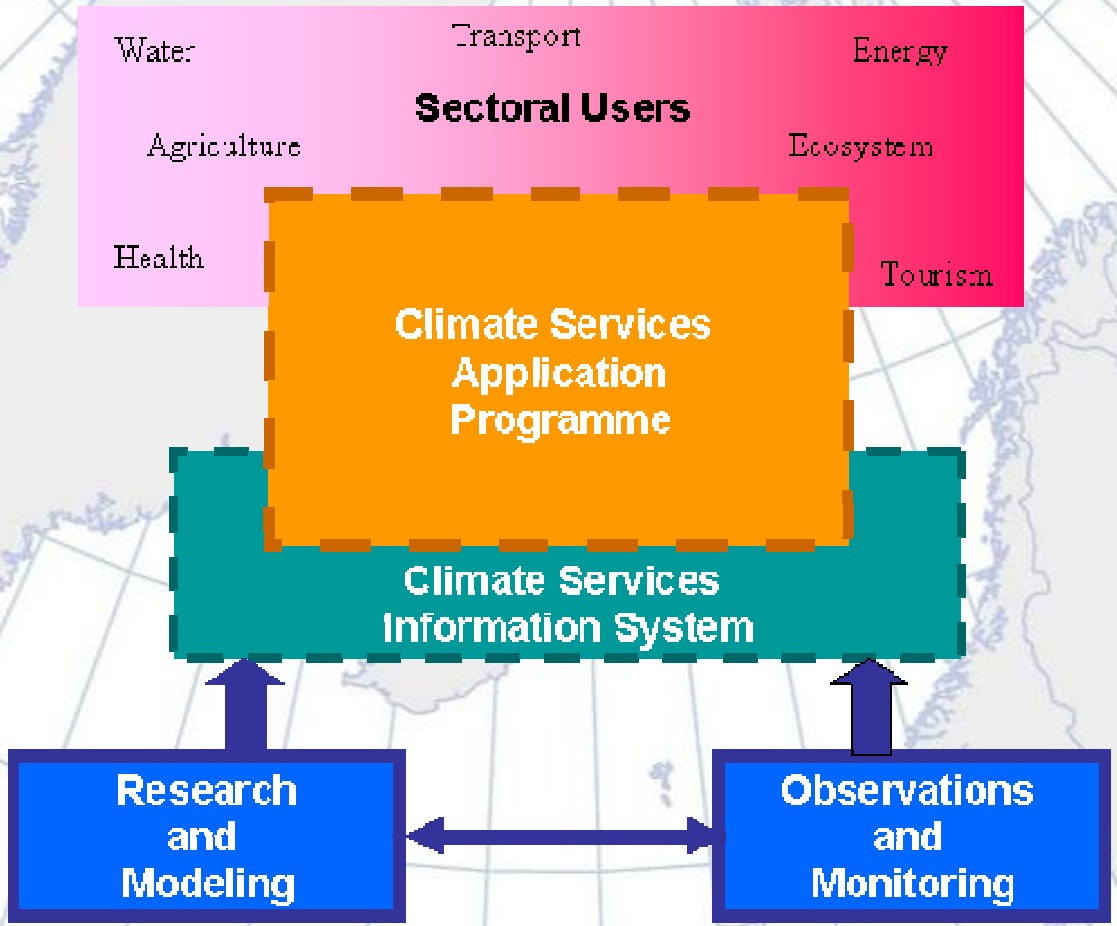
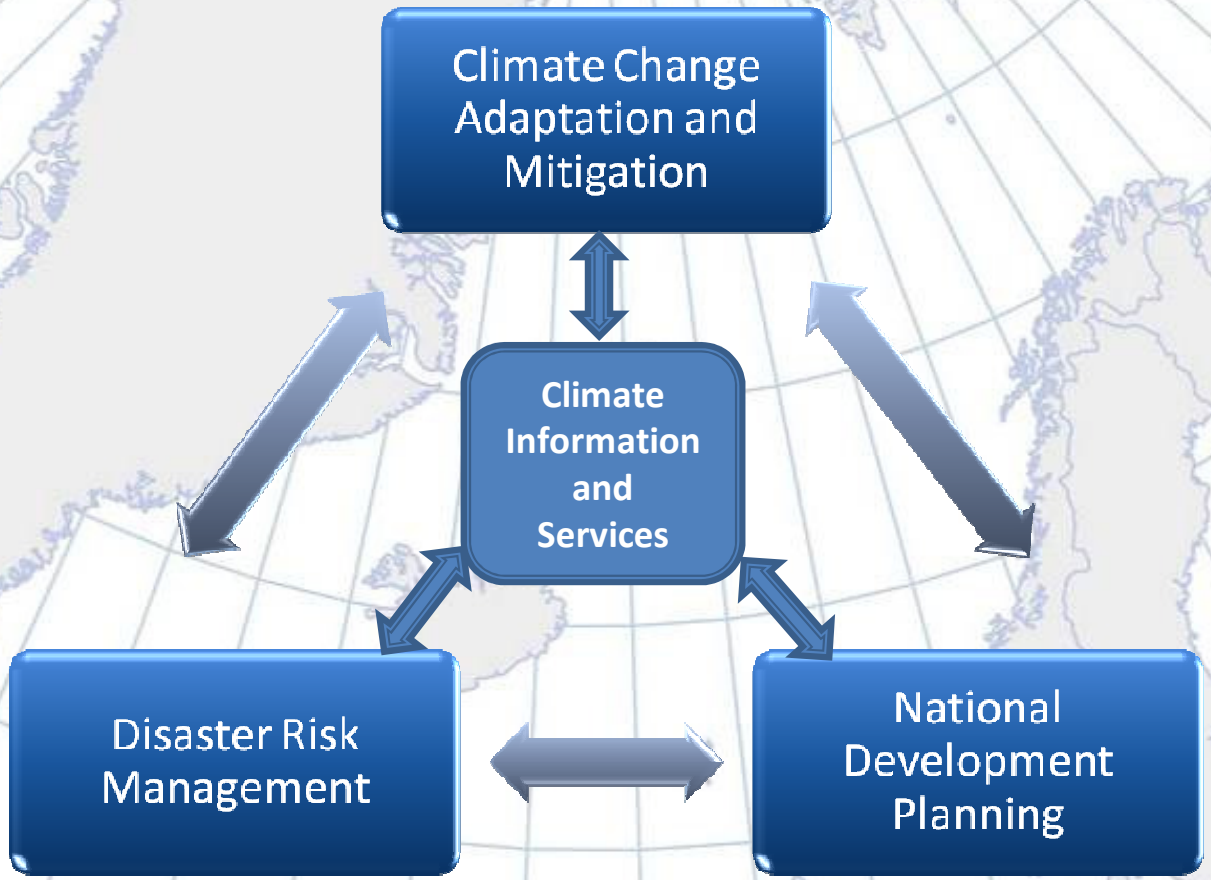
Bridging the gap between providers and users of climate information



Role of climate information for sustainable development



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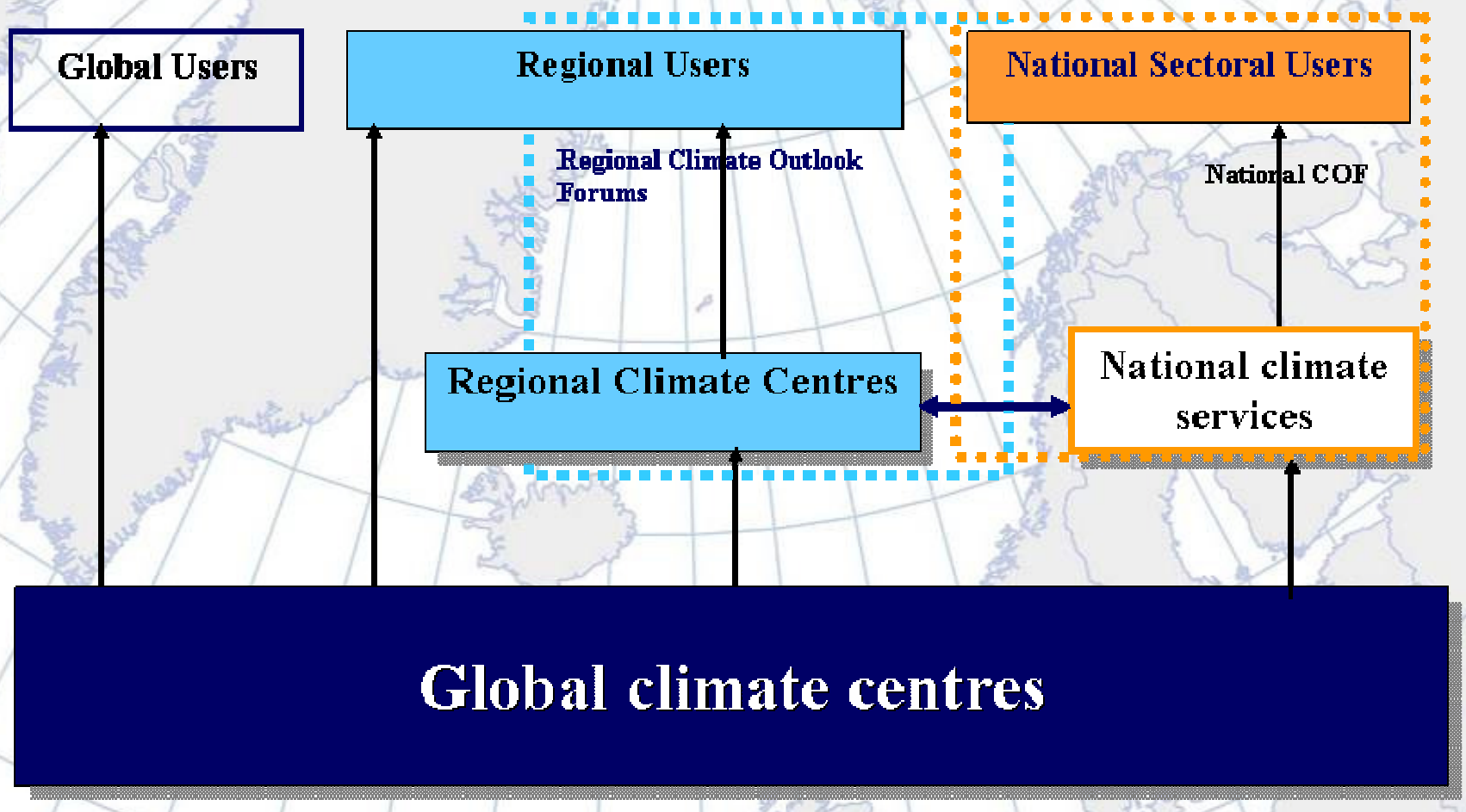
Elements of Climate Services Information System



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Regional Climate Centres (RCCs)

- downscale, interpret and assess relevant prediction products from global centres;
- monitor regional climate variability and extremes;
- implement and conduct Climate Watches;
- develop quality-controlled regional climate datasets;
- share regional and sub-regional products and information; and
- downscale climate change scenarios.