



NTNU – Trondheim
Norwegian University of
Science and Technology

Coastal Infrastructure and Climate Change Adaption

A new interdisciplinary area of research at NTNU?

Background

Norwegian Coast

- Essential for Norway's economy
- Perhaps a growing role?
- Unique world-wide

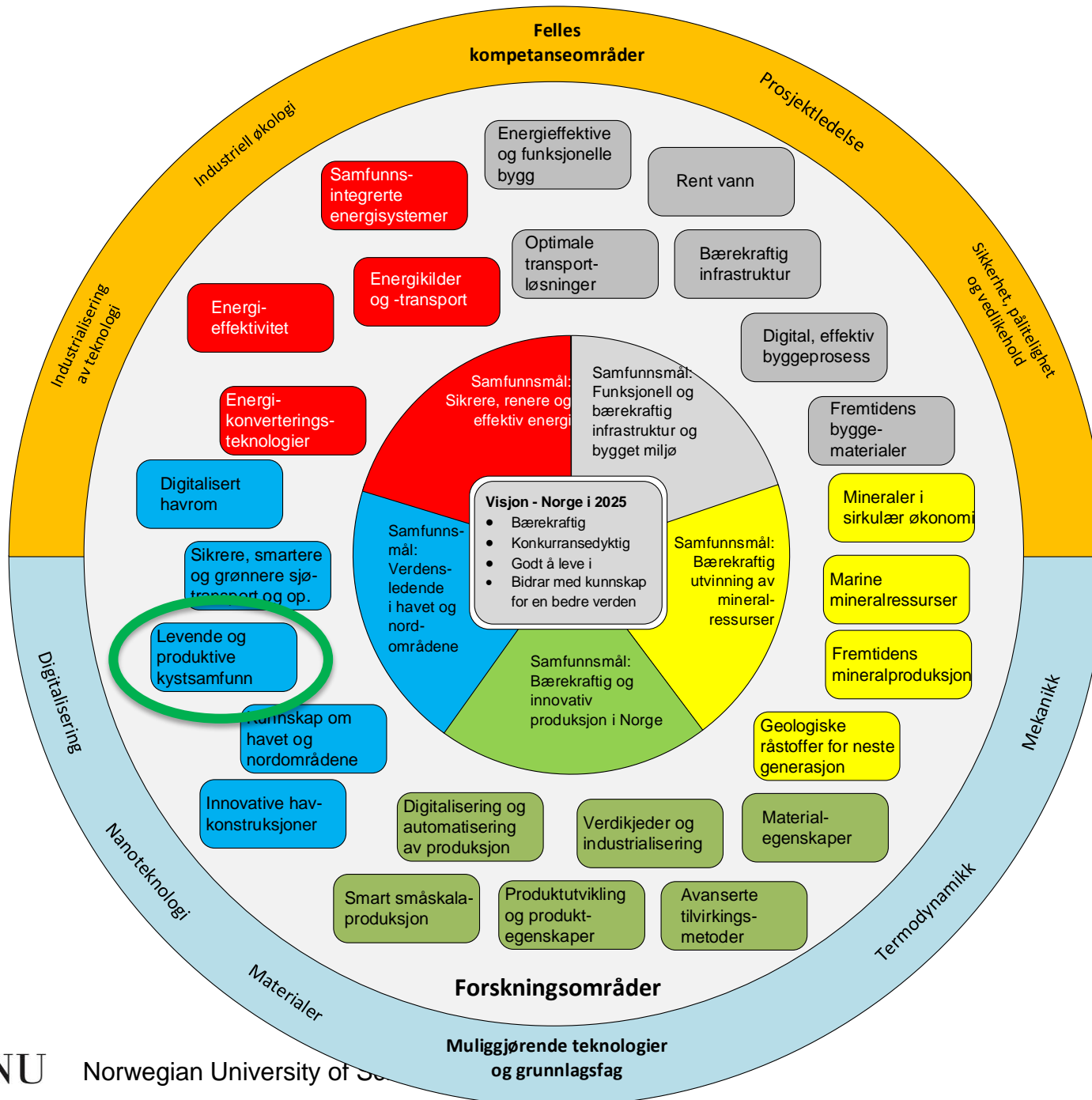
Socio-economic structure has made funding challenging

Political level needs to understand the importance

Climate change may enhance challenges

IV faculty at NTNU revises its strategy

- Coastal infrastructure becomes a Priority area



Goals

Establish an interdisciplinary centre at NTNU and identify:

- Societal challenges
- Internal competence
- Industry needs

Reach to a Political level

Ensure relevant laboratory facilities at NTNU

Includes the following

Harbours and Fairways

Fish farming

Renewable energy (Offshore Wind, tidal, ...)

Roads, Railways and Fjord-crossings

Houses and other buildings on coastline

Arctic Coastal Technology

Interdisciplinary topic – need to address:

Hydro-dynamics and waves

Structural dynamics

Avalanches and land slides (above and below water)

Pollution in soil and in sea

Sustainability

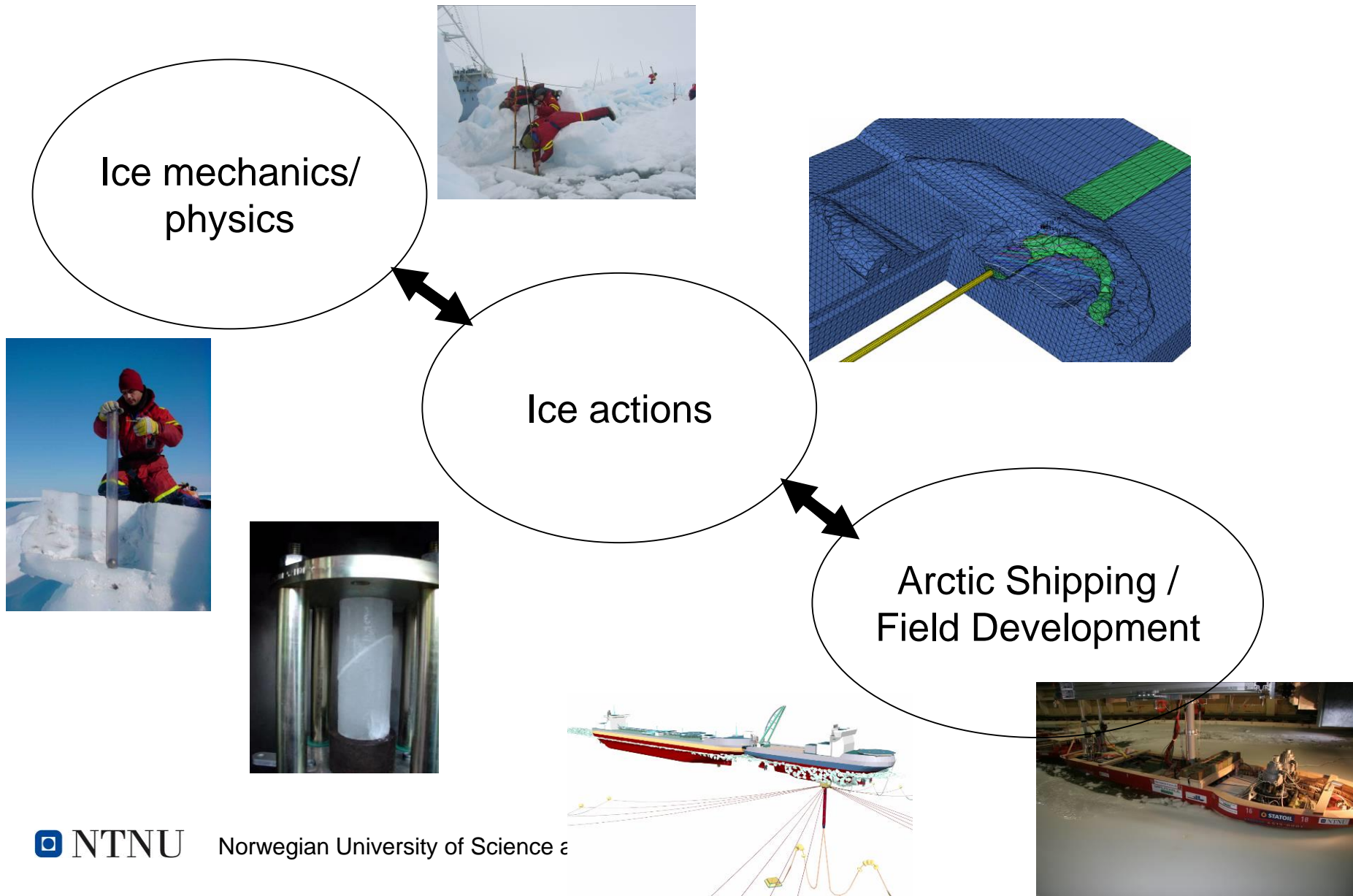
Durability and concrete/materials

Risk, reliability and adaptivity

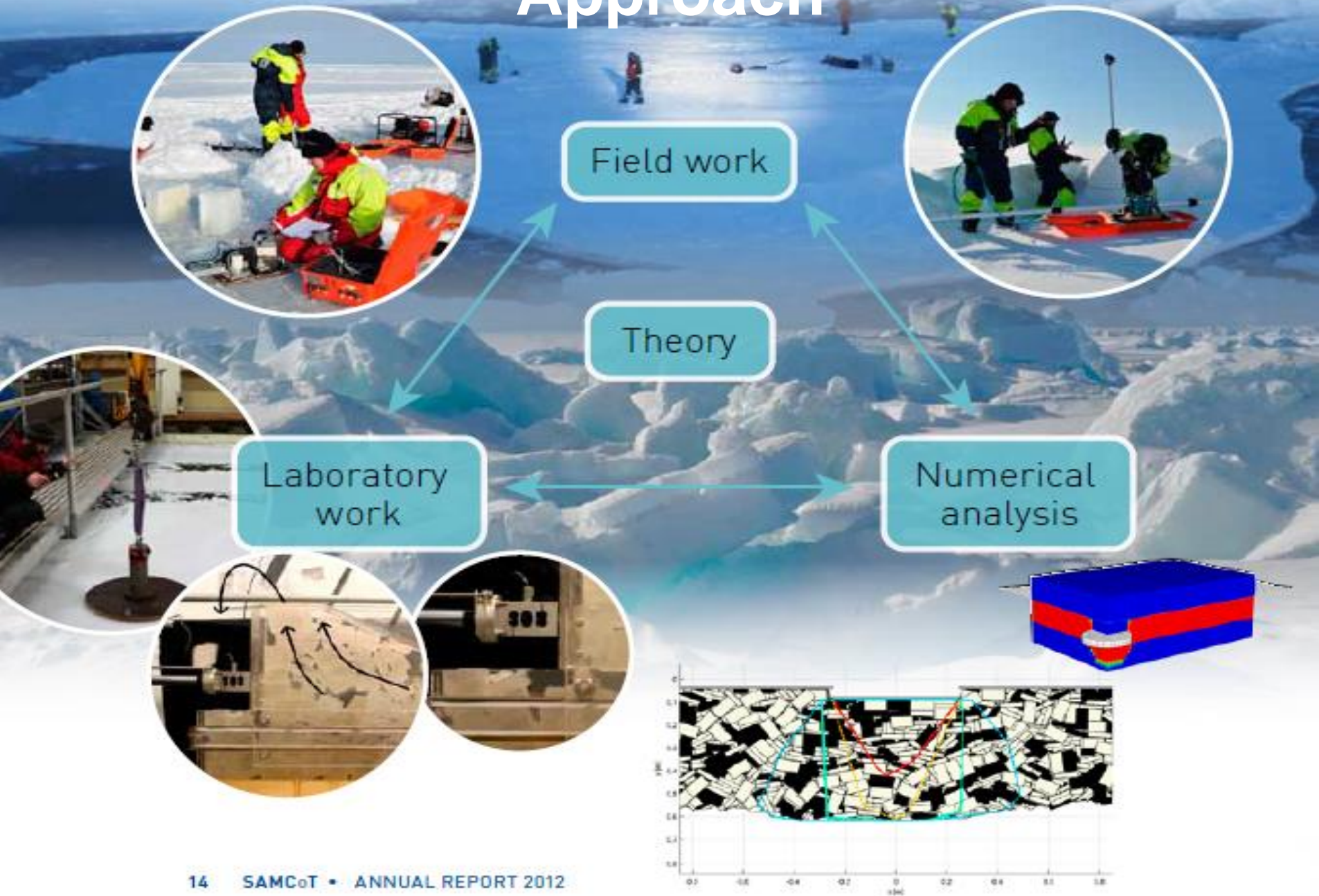
Maintenance planning

Ice and Permafrost

Combine Practical use and High level research



Approach



Active groups at NTNU

Marine Civil Engineering

Structural Dynamics

Geotechnics

Marine Structures

Marine Systems

RAMS

Remote Sensing and sensors

Road and railway engineering

Industrial Ecology

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What next?

Identify a leader group NTNU and Industry?

Form sub-groups responsible for

- Applications
 - Harbours and Fairways
 - Fish farming
 - Renewable energy (Offshore Wind, tidal, ...)
 - Roads, Railways and Fjord-crossings
 - Houses and other buildings on coastline
 - Arctic Coastal Technology
- Disciplines
 - Hydro-dynamics and waves
 - Structural dynamics
 - Avalanches and land slides (above and below water)
 - Pollution in soil and in sea
 - Sustainability
 - Durability and concrete/materials
 - Risk, reliability and adaptivity
 - Maintenance planning
 - Ice and Permafrost

Form groups and sub-groups?

	Harbours	Fairways	Renewable	Roads, Fjord-crossing	Fish farms	Houses	Autonomous ships etc.	Arctic
Hydrodynamics and waves	MB, MSy, B	MB,MSy	MB,MSt,GT	MB, SD, MSt,GT	MS, MB,	MB, GT	MSt	MB
Structural dynamics								
Avalanches								
Satellites								
Logistics								
Risk, reliability, regularity and durability								
Environment, pollutions								
Ice and permafrost								

MB – Marine civil Engineering, B – Concrete, MSy – Marine systems, MSt – Marine Structures
 GT – Geotechnics, SD – Structural dynamics,

Arctic Coastal Technology

Waves, permafrost and ice

Ice free season

- Wave loads
- Coastal erosion

Ice season

- Landfast ice
- Drift ice

Little and uncertain data

Have little data

- Sea ice, soil properties, bathymetry, ...

Climate change makes prediction even more challenging

Climate change enhances coastal erosion rates

- Less sea ice → more waves
- Higher air temperatures → thawing permafrost

Ice action in Harbours and on Coasts

More complicated than Offshore Structures

Similar challenges as ice action on bridges

Identify possible scenarios

Small fetch limits driving force

- Evaluate probability of ice crushing
- Thermal expansion
- Limit force
- Vertical and horizontal forces
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Thank you!



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