Cross-border transport and storage

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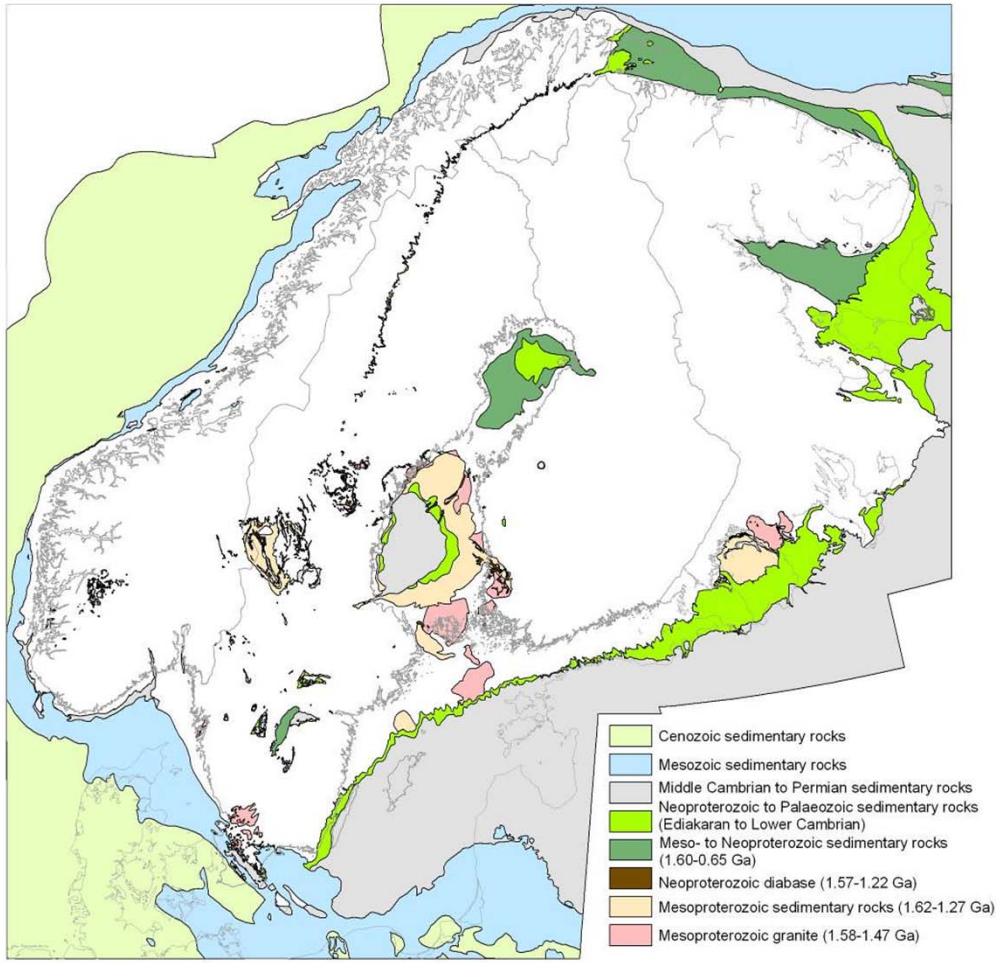
Overview

- Background, Nordic point of view in CCS
- EC Directive cross-border transportation and storage
- Questions and actions needed

Background

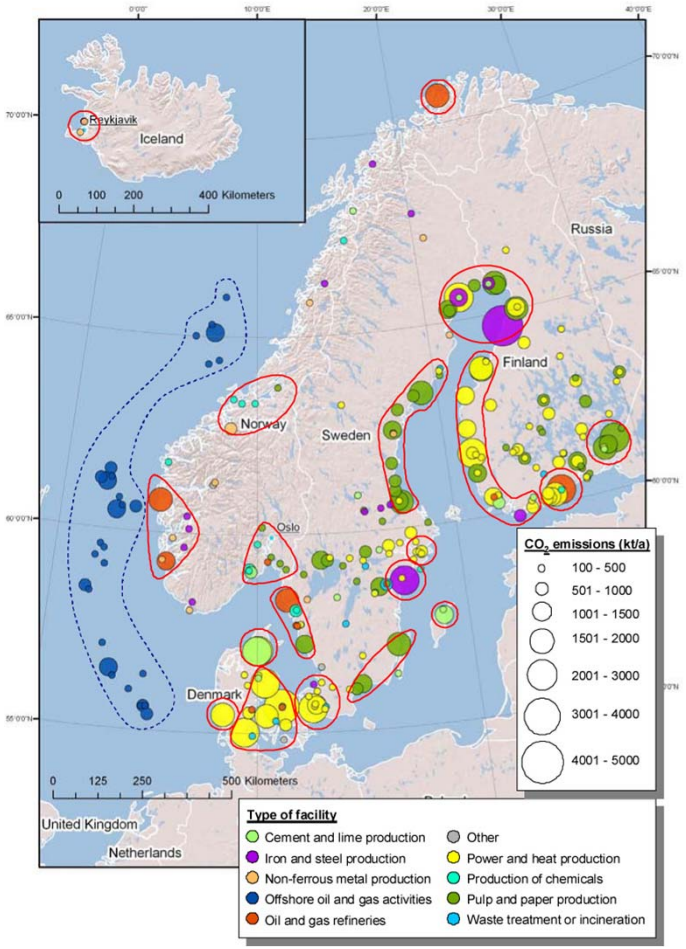

Cenozoic sedimentary rocks
Mesozoic sedimentary rocks
Middle Cambrian to Permian sedimentary rocks
Neoproterozoic to Palaeozoic sedimentary rocks (Ediakaran to Lower Cambrian)
Meso- to Neoproterozoic sedimentary rocks (1.60-0.65 Ga)
Neoproterozoic diabase (1.57-1.22 Ga)
Mesoproterozoic sedimentary rocks (1.62-1.27 Ga)
Mesoproterozoic granite (1.58-1.47 Ga)

Mineral Carbonation in Finland

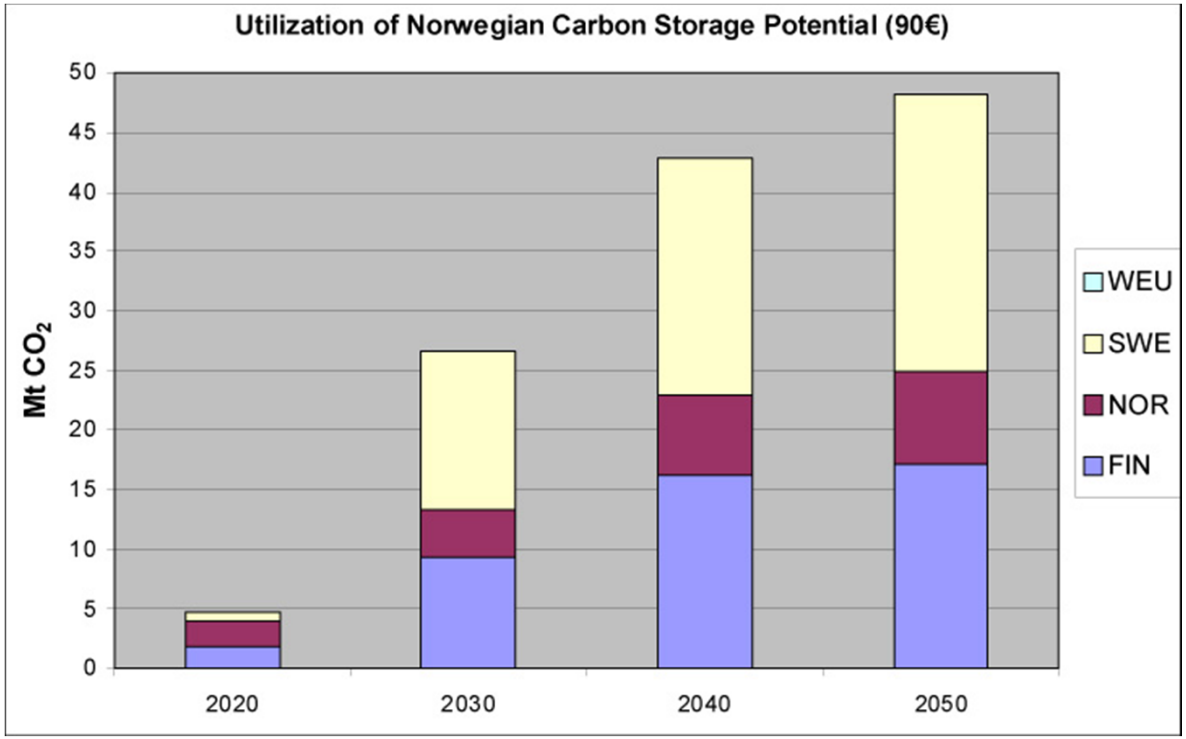
- Alternative option for storage
- Research in Finland: Åbo Akademi University, Aalto University, University of Turku, GTK etc.
- EU and International cooperation
- Extraction of Mg from ultramafic and mafic rocks using ammonium salts. Precipitation of Mg-hydroxide. Reaction with CO_2 to $MgCO_3$ + H_2O.
- 1 mole MgO ⇔ 1 mole $MgCO_3$
- **Laboratory line at Åbo Akademi University (Turku / Åbo). Next step => bigger volumes**
- Extraction of Ca from industrial slag products and precipitation of $CaCO_3$ (Aalto University)

Role of CCS in the Nordic countries

- Regional potential for CCS adaptation in the Nordic countries
- Source clusters with a shared infrastructure around the North Sea basin
- Benefit: transportation of CO_2 can be jointly handled



Competition of Norwegian storage capacities



Rough scheme for CCS deployment in the Nordic countries

- Full and cost effective deployment of CCS in the Nordic countries would require a large scale transport and storage infrastructure
- CCS plant cluster sharing a common CO_2 transportation pipeline by the year 2020 is unlikely
- Large pipeline infrastructures crossing international borders is unlikely to occur before 2030
- Strong political agreements and appropriate legislation is needed

EC Directive - cross-border transport and storage

- In case of transboundary transport of CO_2, storage sites or storage complexes, the competent authorities of the Member States concerned shall jointly meet the requirements of the Directive and of other relevant Community legislation

- In the event of cross-border disputes, the dispute settlement arrangements of the Member state having jurisdiction over the transport network/storage site to which access has been refused shall be applied

EC Directive (2)

- Final provisions chapter (chapter 8, article 38) declares that in the report transmitted by 31 March 2015, the Commission shall assess in particular, on the basis of experience with the implementation of the Directive, in light of the experience of CCS and taking account technical progress and the most recent scientific knowledge:
  - Experience with the provisions of CO_2 stream acceptance criteria
  - Experience with the provisions on third-party access and with the provisions on transboundary cooperation pursuant
  - The need for further regulation on environmental risks related to CO_2 transport

  (among other things)

Economic and political actions needed for deployment of CCS recommended of the VTT report

- Topic emphasized: Research programs that analyse to what degree co-ordinated CCS infrastructure development will be essential for CCS deployment
- important topics for future research on the role of European-level policy for development of a CCS system in the Nordic region:
  - What is the need for EU-level coordination and planning with respect to transportation and storage infrastructures?
    - Are current national and EU level initiatives sufficient to develop the required infrastructure for a major CCS system on the required timescale?
    - Is improved coordination, planning or regulation from the EU required?
    - Does the need for EU coordination, planning or regulation increase if the geographic scope is extended?

Questions

- Multiple sources in the pipeline → purity requirements, standards?
- What should be included in the national laws regarding cross-border transport and storage?
- Need for guidance report on cross-border transport and storage?

Thank you for your attention!

Acknowledgements

- Aspelund, a., Molnvik, M. J. & De Koeijer, G. 2006. Ship Transport of CO_2 – Technical Solutions and Analysis of Costs, Energy Utilization, Energy Efficiency and CO_2 Emissions. Chemical Engineering Research and Design 84 (A9), 847-855.

- EC 2009. Directive 2009/31/EC of the European Parliament and of the Council on the geological storage of carbon dioxide. Official Journal of the European Union, L140/114-135. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0114:0135:EN:PDF.

- Teir, S., Hetland, J., Lindeberg, E., Torvanger, A., Buhr, K., Koljonen, T., Gode, J., Onarheim, K., Tjernshaugen, A., Arasto, A., Liljeberg, M., Lehtilä, A., Kujanpää, L. and Nieminen, M. 2010. Potential for carbon capture and storage (CCS) in the Nordic region. VTT Research Notes : 2556. ISBN 978-951-38-7661-6 (soft back ed.); 978-951-38-7662-3. 188 p. + app. 28 p.