ROUTING DEPLOYMENT OF CC(U)S IN THE BALTIC SEA REGION

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OUTLINE

- The need for CC(U)S in the Baltic Sea Region (BSR)
- The geological storage potential in the Nordic-Baltic region
- National CCS regulations
- Politics and social aspects of CCS in the region
- Conclusions

The need for CC(U)S in the BSR

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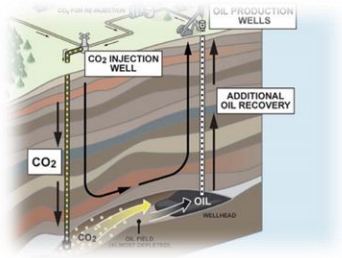

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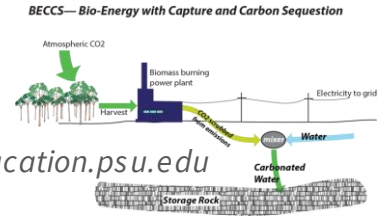

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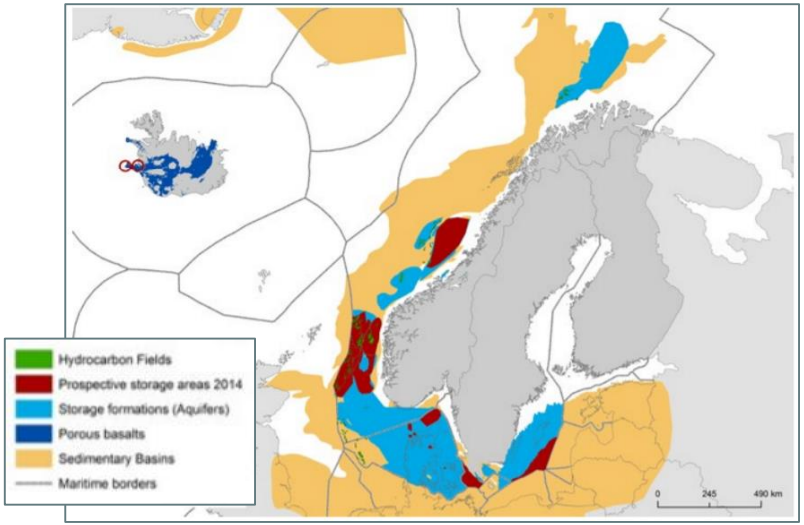
- To fully **decarbonize heavy industry** like cement and steel. In Sweden, e.g., the cement industry produces 5% of the country's total CO2 emissions. Thus, decarbonization of the cement ind. will play a vital role in achieving Sweden's climate goals.
- In **enhanced oil recovery (EOR)**, whereby pressurized CO2 is injected into existing oil and gas reservoirs to extract more hydrocarbons. Evaluation of CO2 injection for EOR has already been performed by oil companies in Lithuania and Russia.
- In processes where **underground minerals are utilised to mineralise CO2**, or in enhanced geothermal systems (EGS) where CO2 would be used instead of water as heat transmission fluid. Geologic storage of CO2 is an ancillary benefit. In Poland, there are currently two candidate fields for EOR.
- **Cooperation with renewable energies** – e.g., as Finland is a large consumer of biomass, adding CCS to bioenergy solutions (BECCS), would enable removal of (biomass originated) CO2.

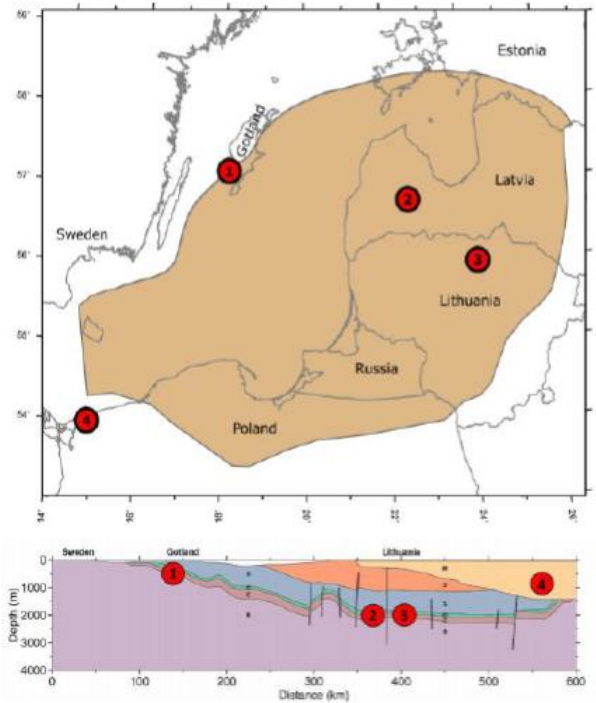
The geological storage potential in the Nordic-Baltic region



The mapped Nordic storage formations in blue and the selected most prospective areas in red, NORDICCS*; www.sintef.no)*

- **Potential storage sites** are localized in the Baltic Basin within the borders of **Sweden, Latvia, Lithuania, Poland and Russia**.
- There are also **many places in Danish subsoil with suitable reservoirs** which could probably host up to 22 GT of CO2 (Anthonsen et al., 2008). This corresponds to 400-700 yr. of total Danish emissions at the current level.
- The total theoretical storage capacity of CO2 within the territories of Sweden, Denmark and Norway are up to 120 Gt (saline aquifers). As a comparison, Sweden's industrial sector emits app. 19 Mt every year. (NordiCCS; unfccc.int).
- **In Finland**, all deep rocks are expected to be crystalline basement rock and not suitable for CO2 storage. CO2 storage potential in **Estonia** is also **almost non-existent**.

The geological storage potential in the Nordic-Baltic region



Nordbäck, N. et al. (2017)

- Potential CO2 storage reservoirs can exist in the Cambrian sandstones that are present below 500 m depth (Fig -in brown).
- The locations of the **four potential storage sites** identified in the study by Nordbäck, N. et al. (2017) are shown on the map: 1) Southern Gotland, Sweden; 2) South Kandava, Latvia; 3) Vaškai structure, Lithuania; 4) Kamień Pomorski, Poland.
- In Poland, the latest national studies estimated the country's underground CO2 storage capacity to be 10-15 Gt (predominantly onshore). This corresponds to 50-75 yr. of Polish ETS industrial installations emissions at the current level.

National CCS Regulations

CO2 permitted for industrial scale

COUNTRY	ONSHORE	OFFSHORE
Denmark	No	Yes- for EOR
Estonia	No	No
Finland	No	No
Germany	No	No
Latvia	No	No
Lithuania	No	No
Poland	No / except for demo-projects	
Sweden	No	Yes
Norway	No	Yes
Russia	NA	NA
Belarus	NA	NA

- CO2 injection is permitted for research and pilot projects in all BSR countries, which are members of the EU (except Lithuania). Permit for injection is needed from local authorities. For offshore transboundary storage Amendment to article 6 of LP should be ratified.
- Denmark: in the recent Climate Change report on Denmark's climate action towards 2030, CCS is presented as one of the main tools in order to reach CO2 neutrality. At present, however, it is not possible to obtain permits for CO2 storage in the Danish subsoil, but the Danish Government is uncovering the regulatory obstacles within the sectors in which the technology may be of relevance.
- Poland: CO2 storage is prohibited until 2024 except for demonstration offshore projects in the Cambrian reservoir. CO2 use for EOR & EGR and associated CO2 storage onshore and offshore are allowed.

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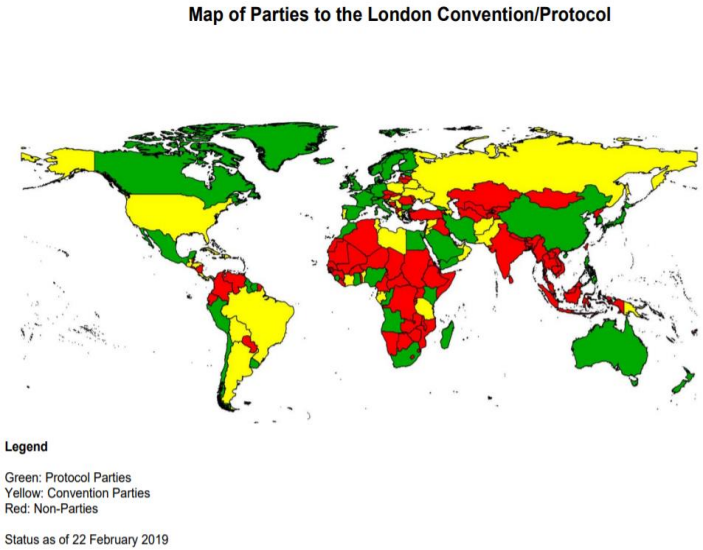
- Germany: Carbon Capture and Storage Act (KSpG) - the total admissible annual storage volume is limited to 4 Mtons of CO2 in total, with a max annual storage volume of 1.3 Mtons of CO2 per storage site. Permits can only be granted if an application for a CO2 storage facility has been made by the end of 2016. The government is now looking into tapping the sizeable carbon storage potential under the North Sea.
- Estonia, Finland and Latvia: CO2 storage is prohibited except for research and development
- Sweden and Norway: offshore CO2 storage is permitted. Sweden has recently accepted the Amendment to article 6 of the LP.
- Russia: specific CCS regulations are not available yet

National CCS Regulations



- Article 6 of the London Protocol (LP) prohibits “export of wastes or other matter to other countries for dumping or incineration at sea”.
- The amendment to Article 6 adopted in 2009 enables the export of CO2 streams for the purpose of sequestration in transboundary subseabed geological formations.
- So far it has been officially ratified by only 7 countries: Finland, Estonia, Iran, The Netherlands, Norway, Sweden and UK. The amendment requires acceptance by two-thirds of the parties to enter into force.
- In 2019 the LP parties adopted a resolution to allow provisional application of the amendment to Article 6 of the LP to allow subseabed geological formations for sequestration projects to be shared across national boundaries.

Politics and social aspects of CCS in the region

Germany rejects carbon dioxide storage plans

Photo: DPA

Germany's upper house of parliament, the Bundesrat, has knocked down a proposal to start storing the greenhouse gas carbon dioxide underground in a bid to reduce emissions.

Source: thelocal.de

- **Various perceptions among stakeholders** have led to fragmented governance, hampering the process of development and deployment of CC(U)S in the region.
- Strong sentiment against CCS exists among various stakeholders such as NGOs and the public in Germany, and to some extent, in Poland.
- Neutral to moderate lack of acceptance in the Baltic States. Neutral to moderate acceptance in Finland, Sweden and Denmark. An exception is Norway where NGOs support CCS as a measure for combating climate change.
- A comprehensive BSR campaign for social outreach should include effective and transparent communication with the public regarding the cost, economic benefit and advantages of CC(U)S.

CONCLUSION

- As the key technology in the clean energy transition, during which fossil fuels still have the major share in the global primary energy consumption, the CC(U)S can help countries to ensure their energy security and security of supply.
- The BSR is not homogenous, particularly when it comes to challenges of deployment of technologies such as CC(U)S. Enabling policy and regulatory changes for industrial-scale projects is required in the entire region.
- Combining challenges, competence and possibilities in the different countries would lead towards creating more possibilities for establishing complete and optimal CC(U)S value chains in the region.
- International cooperation is crucial to expedite CCUS development given the costly infrastructure and limited geologically suitable storage sites.

THANK YOU!

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