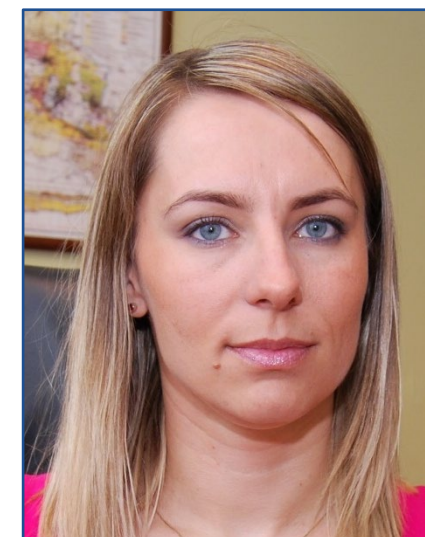
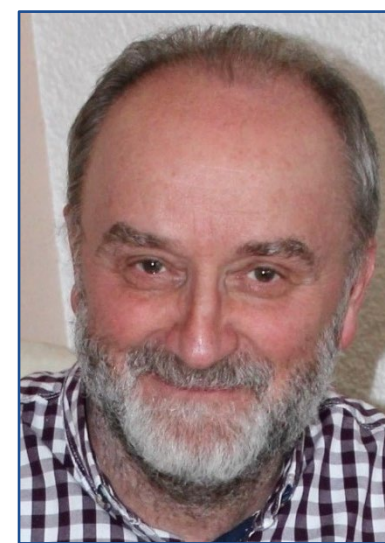




The European Network
of excellence on the
Geological Storage of CO₂

Overview and key messages

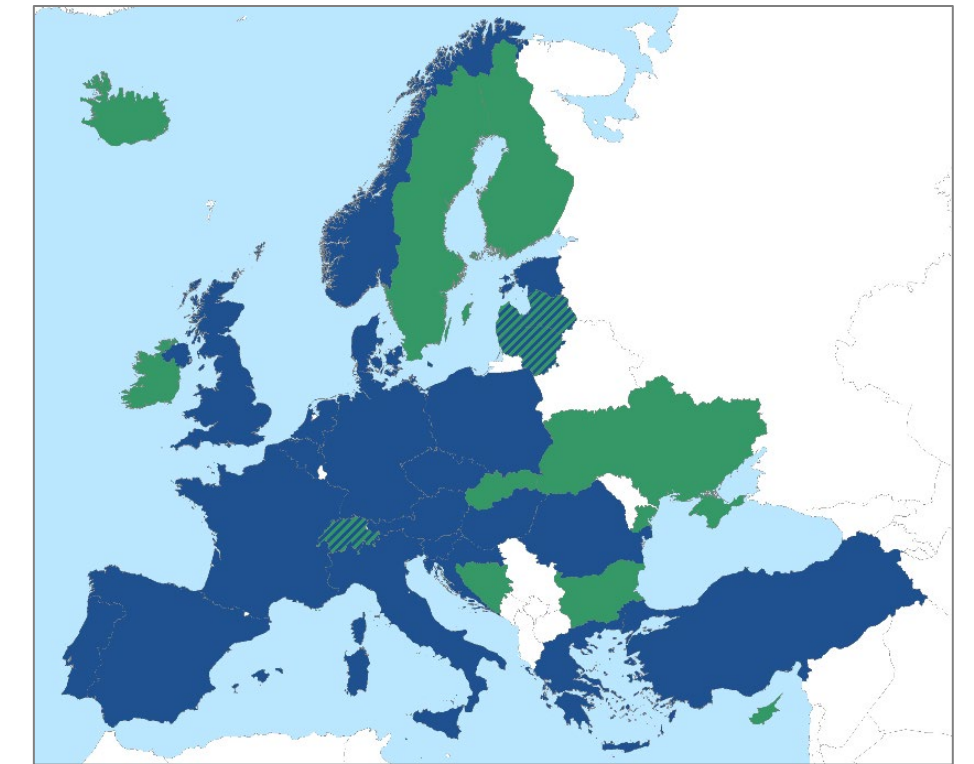
Heike Rütters, BGR



21st February 2022 CO₂GeoNet Webinar



Key messages – overview

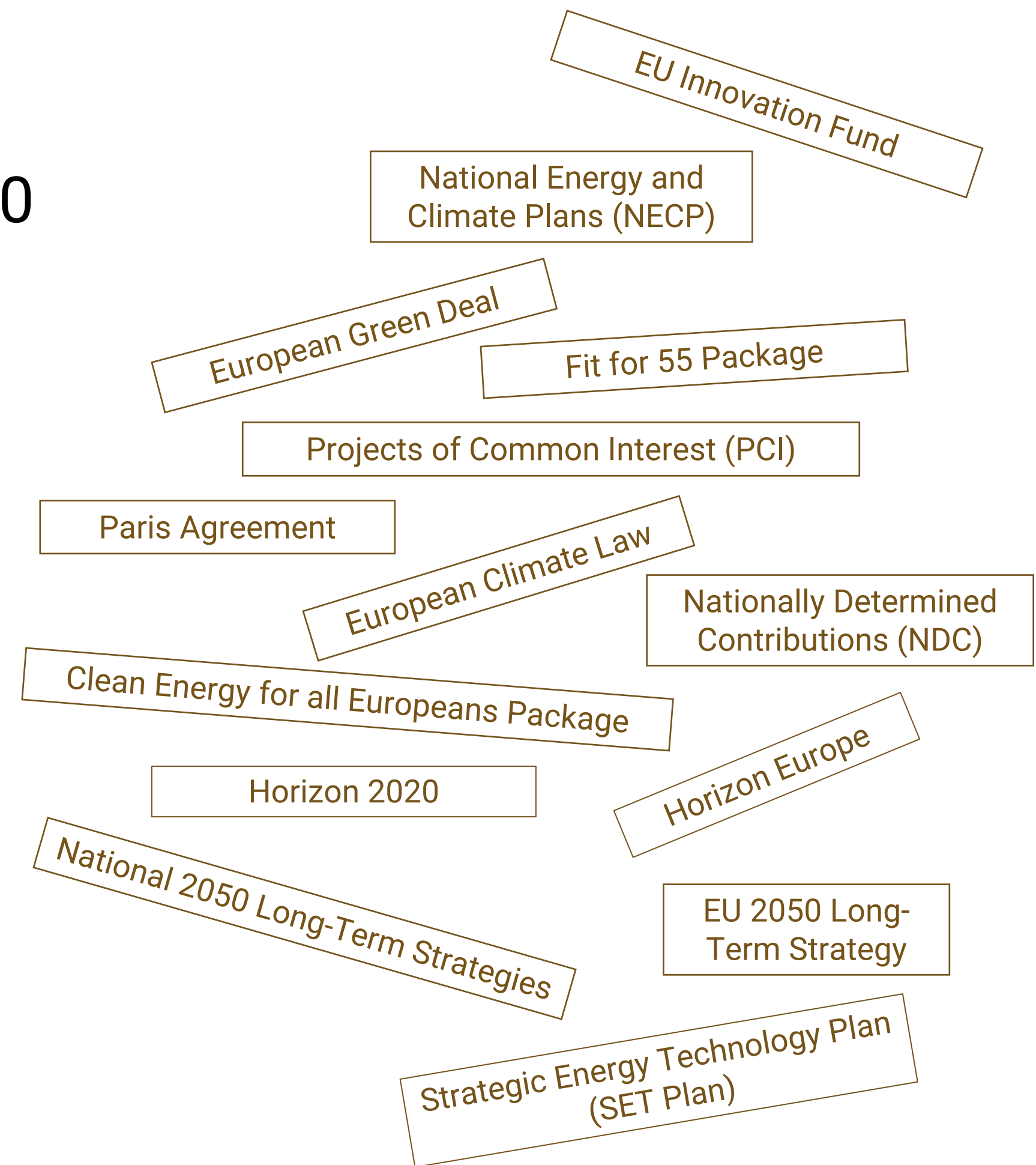


Clear progress in Europe since 2012 in

- bringing CCS back onto national agendas for climate protection \Leftrightarrow EC policies & measures; set up of national climate protection strategies; options for negative emissions etc.,
- moving from CCS/CO₂ storage research to implementation \Leftrightarrow many larger-scale (cluster and hub) CCS projects now in advanced planning and implementation stages (still only Sleipner and Snøhvit projects and Icelandic pilot sites for in situ mineral storage in operation in Europe),
- transposing the EU CCS Directive and implementing respective national legislation; enabling CO₂ export for offshore storage,
- advancing national storage capacity assessments (updates in most countries),
- diversifying concepts including i) capture from energy plants (fossil-fuelled, geothermal or bioenergy), waste incinerators, industrial facilities (e.g. chemical, cement and steel, “blue” H₂), direct air capture and ii) geological or mineral storage or CO₂-EOR/-EGR or CCU.

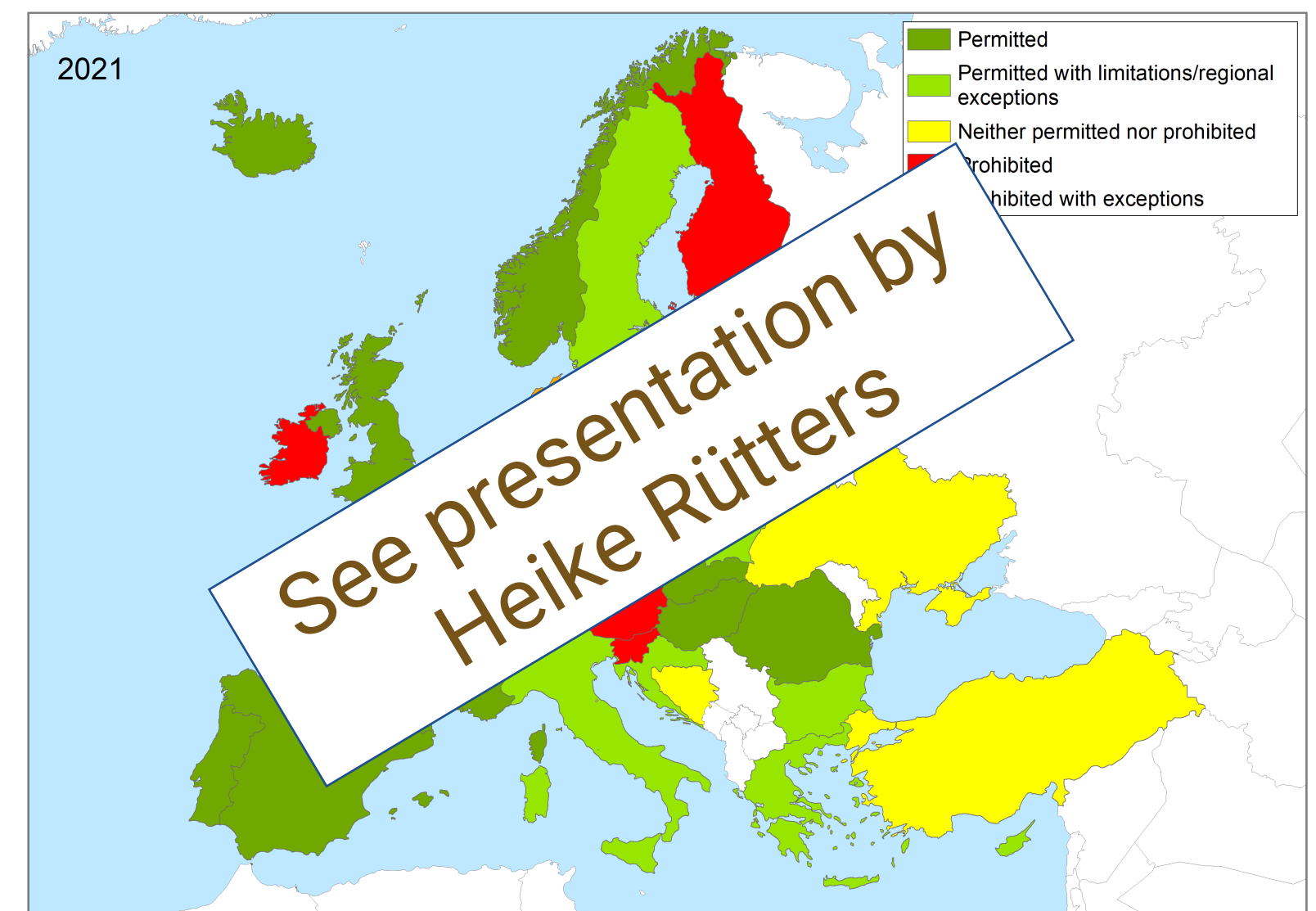
European and national policies and climate-protection strategies

- Important international & EU level policy developments ⇒ new national policies and measures to address 2030 and 2050 climate objectives – wide variation of targets & pathways.
- Example: EU MS: most NECPs mention CCS – “CCS activities” range from consideration in scenarios, support for research activities, national capacity assessments and feasibility studies to implementation of specific large-scale CCS projects.
- Some countries consider only part(s) of CCS chain in national strategies, some favour CCU over CCS.
- Aim to establish regional, bi- or multilateral cooperation in Europe (involving EU MS and non-MS).



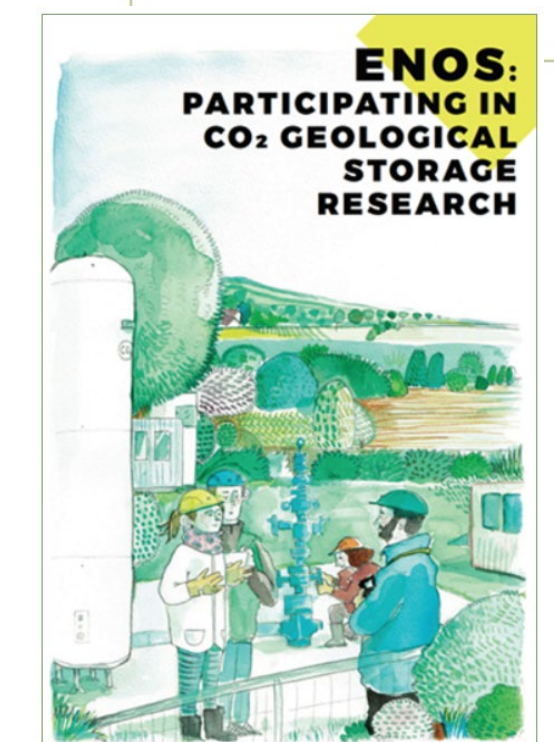
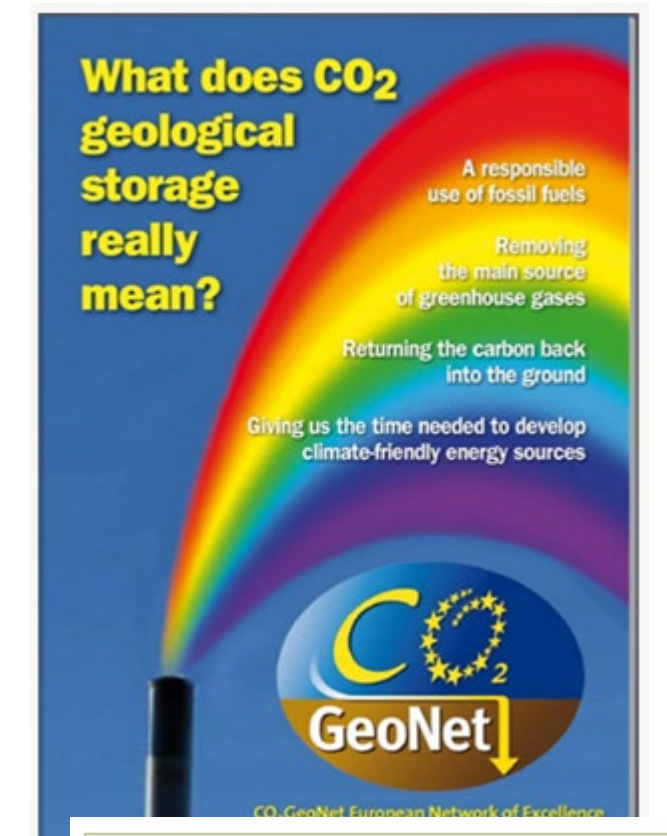
National legislation and regulations

- All EU MS transposed EU CCS Directive; also UK, NO and IS
- CO₂ storage is permitted: 19/32 countries (some excluding certain regions or impose certain limitations or adaptations to mineral storage in basalts), prohibited: 9/32 countries, neither nor: 4/32 countries.
- No clear trend cf. 2012 situation – some countries now permit CO₂ storage, others prohibit it.
- Land and subsurface ownership differs in European countries ⇒ specific challenges.
- Very limited experience with licensing procedures for CO₂ storage under EU CCS Directive ⇒ exchange useful.



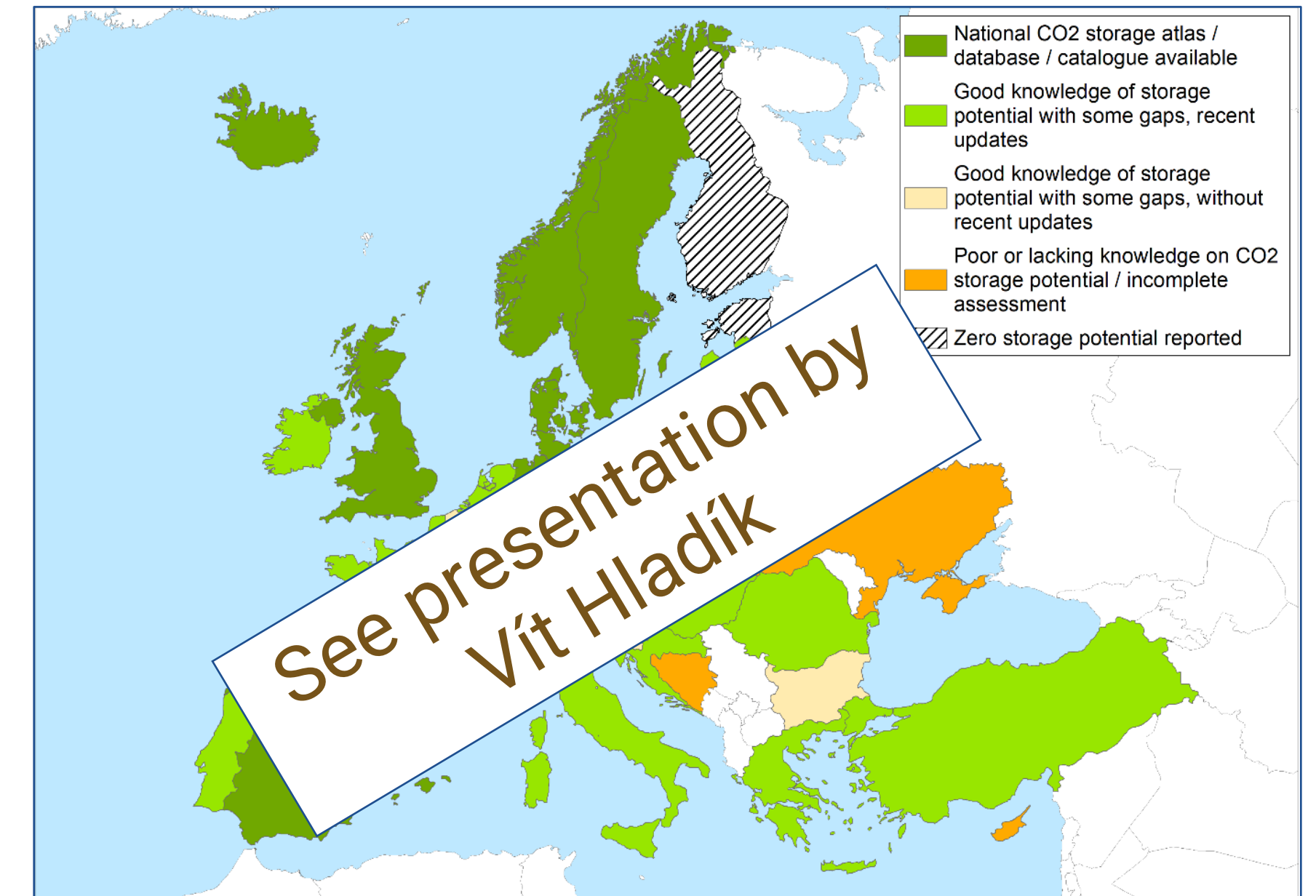
National actors driving CCS forward, public awareness and engagement

- Various national advocates: national CO₂ Clubs and networks, national scientific or engineering academies, think tanks or governmental fora, individual institutions/industry representatives, national representatives of regional networks.
- Awareness of CCS within the general public: low to very low; somewhat higher among political and industrial stakeholders; media coverage of CCS increased during negotiations on national climate protection strategies.
- CCS often perceived as a risky technology; more positive perception in case of capture from e.g. industrial facilities, bioenergy plants or directly from air (negative emission option) and/or offshore storage.
- Iceland and Norway: (very) high awareness levels and neutral to positive attitudes towards CCS → Why? See presentation later today 😊



National storage options, potential and capacity

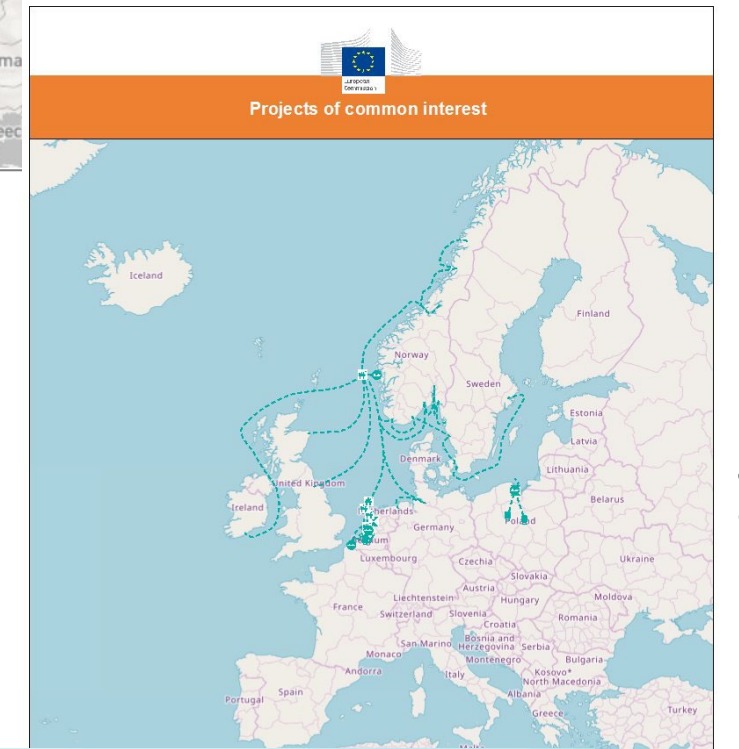
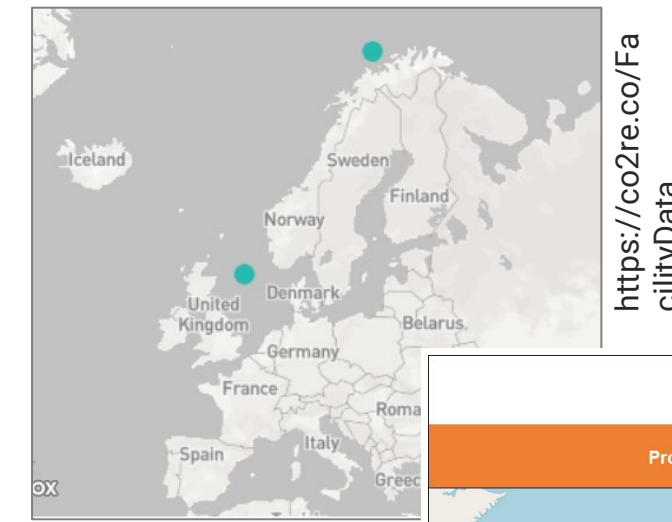
- Most recent compilation: CO₂StoP Project (2010-2013; used existing data only); Carbfix Mineral Storage Atlas.
- Updates of national storage capacity assessments in 25 countries; diverse assessment levels
⇔ necessity to prepare a consolidated, up-to-date European CO₂ storage atlas.
- Preferred storage option: saline aquifers (25 countries) and depleted/depleting hydrocarbon fields (22 countries); in-situ mineral storage (IS, also GR, PT).
- CO₂-EOR = considered option in some countries from Central and Eastern Europe, whereas associated prolonged oil production seen critical in other countries.



Large-scale & demonstration CCS projects; pilot & test sites

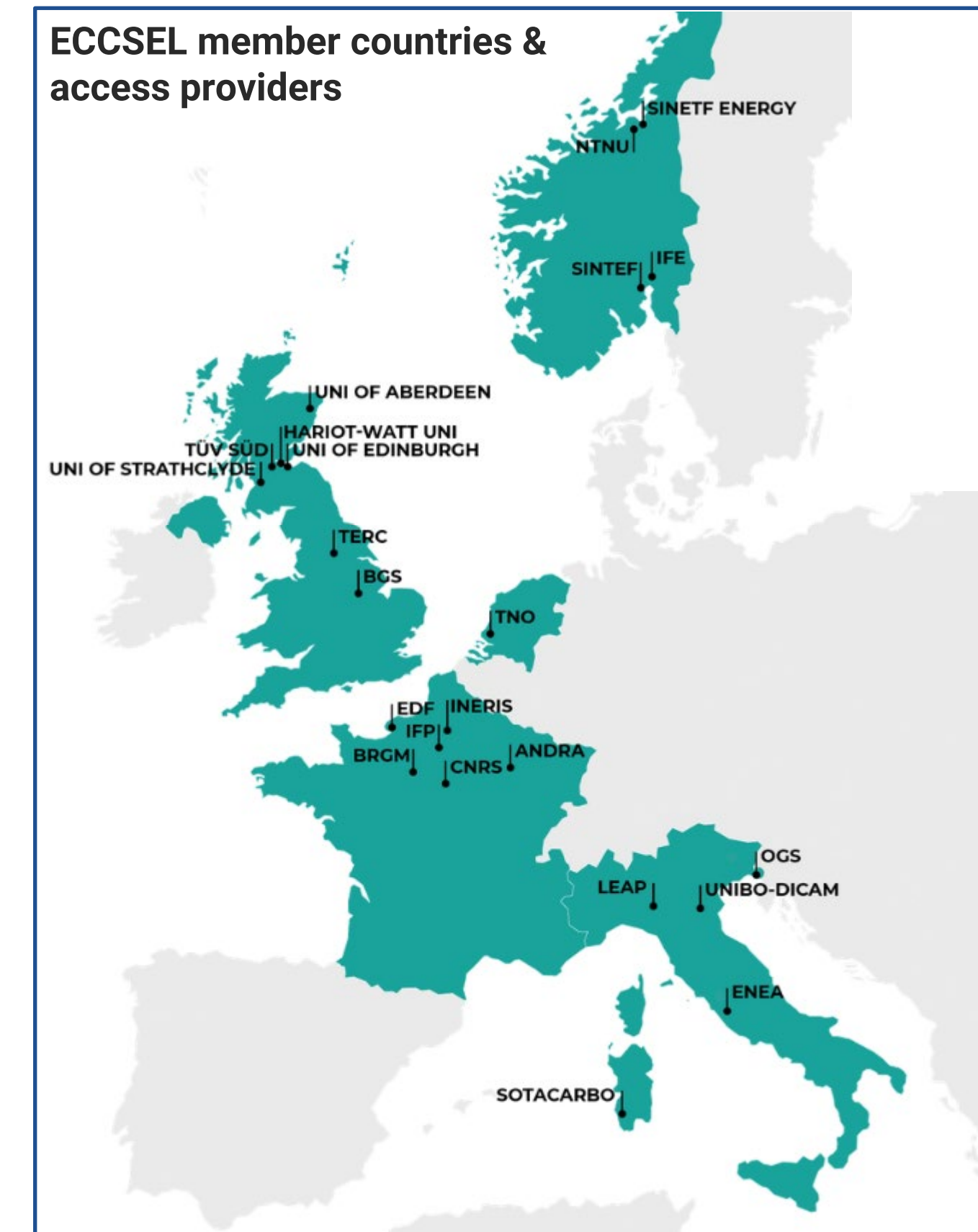
CCS-related projects in Europe: different foci, scales and stages:

- 2 large-scale storage projects in operation + 2 Carbfix (pilot) injection sites; pilot sites at Ketzin (DE), Lacq (FR) and K12-B (NL) finished as planned; pilot project at Hontomín (ES) on hold since 2018; CO₂-driven enhanced oil recovery ongoing in HU, TR and HR.
- Several test & pilot facilities for capture (from power and industrial plants) and transport (e.g. in Porsgrunn, NO, since 2020) available.
- Projects of Common Interest: X-border CO₂ transport networks ⇒ nuclei for CCS full-chain, cluster or hub project development.
- EU Innovation Fund (2020-...): some large- and small-scale projects with “CCUS elements” selected/awarded from 1st calls.



Research activities with respect to CO₂ storage

- Nearly all countries:
 - i) CO₂ storage-related research (“hot spots” = NO, PL, UK, IT, FR, NL, PT, ES);
 - ii) involvement in EU-funded or regional projects.
- Large-scale research facilities for CO₂ capture, transport or storage available in many countries (⇒ part of European CCS Research Infrastructure - ECCSEL); also numerous small-scale research facilities in different countries (mostly for CO₂ capture).
- Few dedicated national CCS research programmes, but national research funding for CCS widely spread (from test site development to PhD support); CO₂ storage-related research focuses on capacity assessment.
- In some countries, research focus has been on CO₂ capture and/or utilization in recent years.



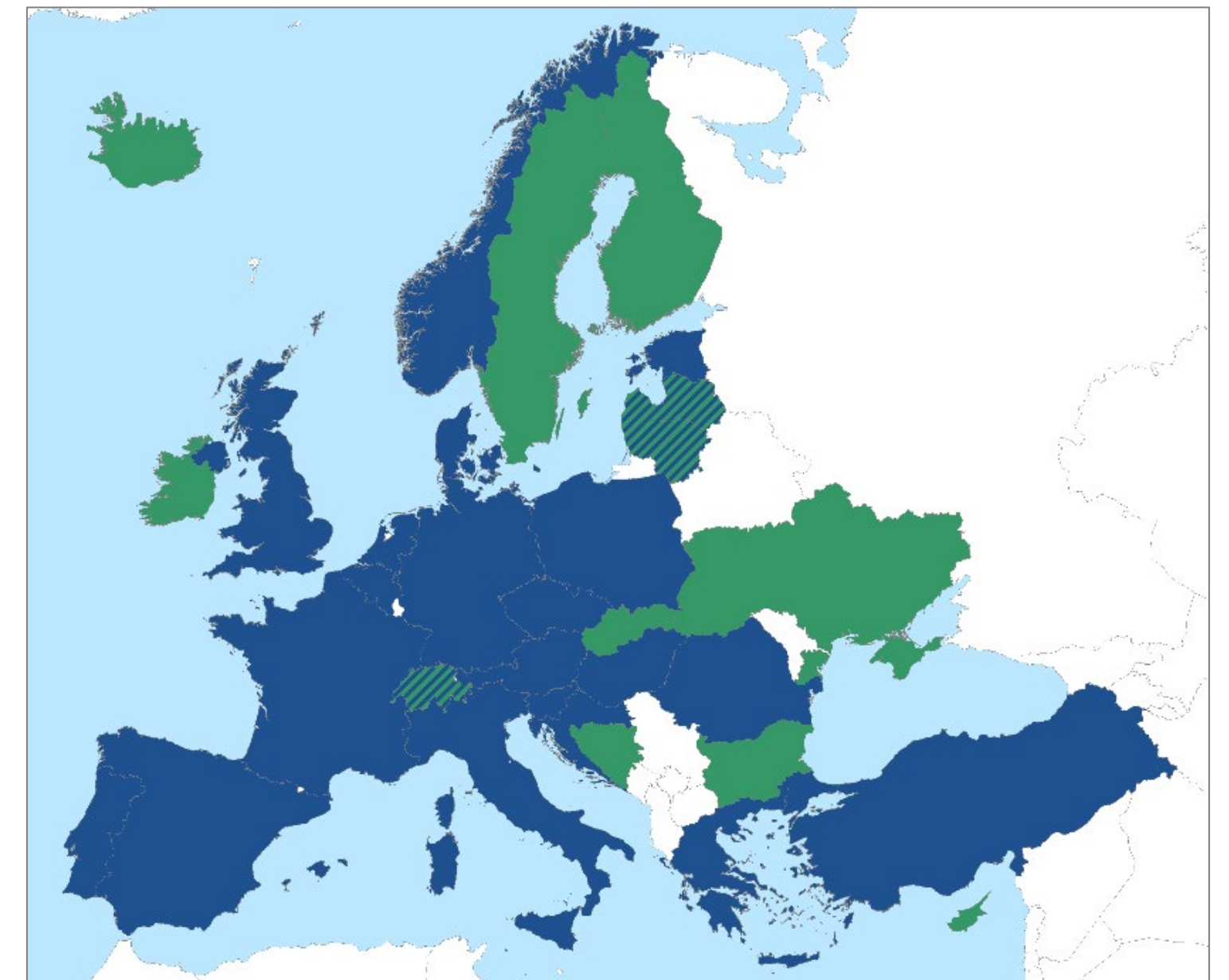
<https://www.eccsel.org/>

Summary & conclusions

Assessment reveals

- **clear progress** in Europe since 2012 in bringing CCS back onto national agendas to help to meet climate targets
- **wide spread** of activity and knowledge levels across Europe ⇒ continued need for pan-European knowledge exchange, research, technology transfer and cooperation on all aspects of CCS

to rapidly deploy CCS at the scale required for significant CO₂ emission reduction in Europe.



Webinar agenda

Session 1: Framing aspects - policies, legislation and public perception

- 14:20 **European and national policies and climate protection strategies** | Aleksandra Koterias, GIG
- 14:30 **National and international legislation and regulations with respect to CO₂ geological storage**
Heike Rütters, BGR
- 14:40 **National actors driving CCS forward, public awareness and engagement** | Heike Rütters, BGR

Session 2: Technical aspects - storage potentials, projects and research

- 15:15 **Assessment of storage options, potential and capacity in Europe** | Vit Hladik, CGS
- 15:30 **Large-scale and demonstration CCS projects; pilot and test sites for CO₂ capture, transport and storage** | Cornelia Schmidt-Hattenberger, GFZ
- 15:45 **CO₂ storage research activities on a national, regional and European level** |
Jan Tveranger and Walter Wheeler, NORCE

