A vision for the EU CO_2 storage investment atlas and the role for the geological community

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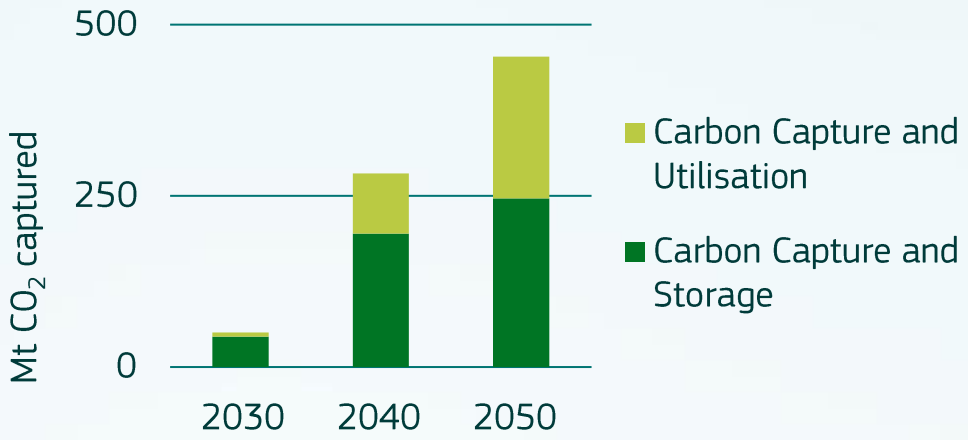
Enabling CO_2 storage to achieve climate targets

CO_2 capture needs in the upcoming decades:

- **2030**: at least 50 Mtpa (entirely for storage)
- **2040**: ~280 Mtpa (~200 for storage)
- **2050**: up to 450 Mtpa (~250 for storage)

Today: no operational CCS project in the EU



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Increasing political support for ICM at EU level

Policy developments at EU level

- **Net Zero Industry Act (NZIA)**
  - Proposed by the Commission in 2023, including a CO2 injection capacity objective for 2030
  - Political agreement reached
  - Entry into force: June 2024
- **EU Industrial Carbon Management (ICM) Strategy**
  - Published in February 2024
  - Puts forward actions to be implemented by the Commission and Member States

Policy initiatives at MS level

- 22 EU Member States include ICM in NECPs
- 7 EU Member States include ICM in Recovery and Resilience Plans
- 3 European countries have already implemented ICM subsidies and pioneering CO_2 storage (others under development)
- National ICM strategies under development

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Net Zero Industry Act

General objective of NZIA

"Establishing a regulatory framework to ensure the Union's access to a secure and sustainable supply of net-zero technologies including by scaling up the manufacturing capacity of net-zero technologies and their supply chains."

Two political benchmarks:

- at least 40% of annual technology deployment needs at EU level;
- reaching 15% of world production of selected technologies by 2040.

One deployment target: establish by 2030 a Union market for CO_2 storage services (50 Mtpa of CO_2)

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Overview of CCS in NZIA

Articles 13, 15 & 16	Possibility for Member States to recognize as **net-zero CO2 hubs as strategic projects** → facilitating permitting
Article 20	EU-wide **objective** to achieve an **annual CO_2 storage capacity of 50 million tonnes by 2030** and potential further objective, based on market development **Guidelines** to be published by the Commission **on CO_2 purity**
Article 21	Obligations for **Member States and oil and gas titleholders** for **data release and transparency** → data on CO_2 storage sites, CCS value chain projects and developments, and support measures in place at Member State level
Article 22	Provisions to incentivise **CO_2 transport regulation and development**, including for cross-border infrastructure
Article 23	**Obligation for oil and gas titleholders** to contribute operationally and/or financially to achieving the CO2 injection capacity objective
Article 24	Commission to assess the functioning of the market and identify potential shortcomings
Article 42	Monitoring and reporting obligations for the Commission and Member States

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CCS in NZIA – CO_2 injection capacity objective

- EU-wide objective to achieve an **annual CO_2 injection capacity of 50 million tonnes by 2030** in sites permitted under Directive 2009/31/EU (Art. 20):
  - Exclusion of projects combined with enhanced hydrocarbon recovery (EHR)
  - Storage sites operational for minimum five years, observing the principles of fair and open access
- By end-2028 → Commission to potentially propose a new CO_2 injection capacity objective for 2040 or earlier.
- In order to achieve an annual CO_2 injection capacity objective by 2030, the **European oil and gas producers must contribute**, with their assets and/or their financial resources, to develop operational geological CO_2 storage sites (Art. 23).

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CCS in NZIA – potential permitting facilities

- Net Zero strategic projects (Art. 15 & 16) → **full value chain Net-Zero "CO_2 hubs"** recognized by Member States shall benefit from permitting streamlining:
  - **All permits** needed to operate a storage site → issued **within 18 months** after complete application.
  - **Overriding public interest** → status of the **highest national significance** possible for the project
  - All **potential dispute resolution procedures** → treated as **urgent**, in line with national law.

- CO_2 hubs can include any of the below (Art. 13):
  - a **CO_2 storage project** in the EU that has a applied for a storage permit and will be operational by 2030, **and**
  - a **CO_2 capture project** and the **related CO_2 infrastructure** necessary to transport captured CO_2 to a storage site.

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CCS in NZIA – data release and transparency

Within 6 months from the entry into force of NZIA, Member States shall make steps to (Art. 21):

- **Make publicly available data on all areas where CO_2 storage sites could be permitted** on their territory, including saline aquifers (with the protection of confidential information) – this shall include at least data requested on CCS in the context of reporting for the update of the National Energy and Climate Plans;
- **Oblige** active and former **oil and gas titleholders to make publicly available geological data from hydrocarbons sites** that have been decommissioned / are under decommissioning, including any assessments on CO_2 storage potential, if available, except if a permit application has been submitted for that site as per Directive 2009/31/EC. Such data release shall include information regarding:
  - Site suitability for CO_2 storage;
  - Availability or need for transport infrastructure/options to the site.

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CCS in NZIA – data release and transparency

Within 6 months from the entry into force of NZIA and every subsequent year, Member States shall report to the Commission on (Art. 21):

- **CO_2 capture projects in progress** (national or cross-border) and the corresponding CO_2 storage and transport needs;
- **CO_2 storage and transport projects in progress** on their territory, including expected FIDs and entry into operation;
- National **support measures** that have been or will be adopted, including on cross-border cooperation, national **strategies and targets**;
- **Cross-border cooperation** for CO_2 transport and plans to facilitate the decarbonisation of industrial sectors, if no CO_2 storage projects are in progress on their territory;
- Estimated **CO_2 transport capacity foreseen** to match the corresponding capture and/or storage developments.

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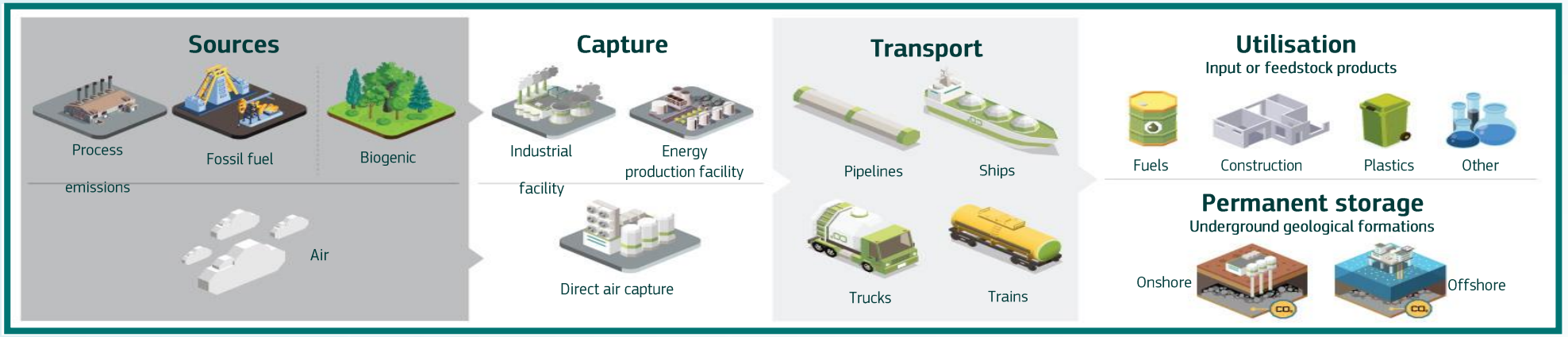
Industrial Carbon Management Strategy

- Building on the ground laid by NZIA for CCS, the Strategy comes with proposed actions on additional ICM solutions, for the Commission and Member States to implement.
- Focuses on three main technological pathways:
  - **Capturing CO_2** emissions for **storage** (CCS)
  - **Removing CO_2** from the atmosphere (BioCCS and DACCS)
  - **Capturing CO_2** for **utilisation** (CCU)

CO_2 transport infrastructure = **key enabler** necessary to establish a CO_2 market in Europe.



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Capturing and Storing CO_2

- **Aim(s)**: Decarbonisation option for industry (ETS = incentive).
- **Challenge(s)**: No operational storage sites (NZIA), no storage market, limited bargaining power, lack of geological data, insufficient investments.

Commission will develop:

- **CO_2 demand aggregation platform** to match demand and supply for storage.
- **Guidance**: permitting support for MS, in line with the CCS Directive.
- **Investment atlas of CO_2 storage sites** for the EEA to identify several gigatonnes of investable geological storage capacities for 2040 and beyond.

Member States shall:

- support **Net Zero Strategic Projects** under NZIA.
- Facilitate **storage permits**
- **Empower geological surveys** to create CO_2 Storage Atlas for investors.

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Research and innovation (R&I)

Aim(s):

- Drive efficiency and cost reductions
- Increase the availability of ICM technologies and solutions to the market
- Sharing of knowledge and best-practice

Commission will:

- Support a **knowledge-sharing platform** for industrial CCUS projects.
- Continue to invest in R&I for ICM (including energy and cost efficiency optimisation of processes and pre-normative research to contribute to standardization).

Data release & Knowledge sharing foreseen

2024

June (est.)
NZIA entry into force

2025

End-'24

- MS release data on potential storage sites
- O&G titleholders obliged to release data on relinquished HC sites
- MS report on ongoing projects & measures in place (**annually**)

2026

During '26

Investment atlas of potential CO2 storage sites

Knowledge-sharing platform of CCUS projects

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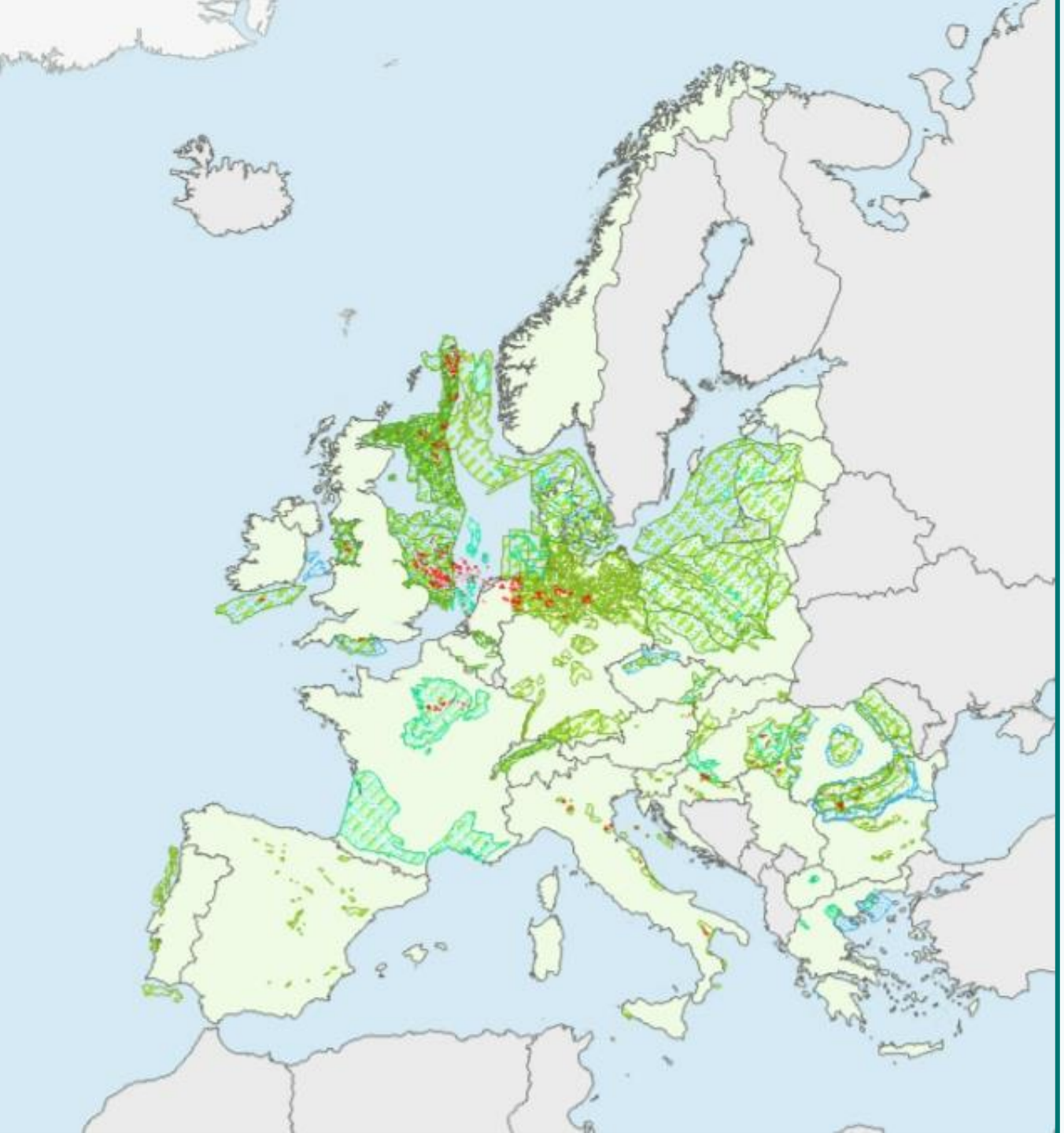

CO2STOP Atlas

- Publicly available since 2014*
- Result of collaboration between several geological surveys
- Potential CO_2 storage locations in hydrocarbon fields and saline acquifiers, in 27 countries analysed
- Theoretical storage capacity identified:
  - 513 hydrocarbon fields identified, with a total capacity of 25 Gt
  - 418 saline aquifer storage units identified, with a total capacity of 482 Gt

* *Assessment of the CO2 Storage Potential in Europe (CO2Stop) - European Commission (europa.eu)*
EGDI (geus.dk)

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GSEU Project

- **Pan-European Online Atlas for Sustainable GeoEnergy Capacities (SGEC)**
- The new atlas looks at various geological thematic areas, including the potential for geological storage of CO_2
- Compared to the CO2STOP database, the project will cover more countries and will provide updated data and information

* *GeoEnergy Resources | Areas of Expertise | GSEU (geologicalservice.eu)*

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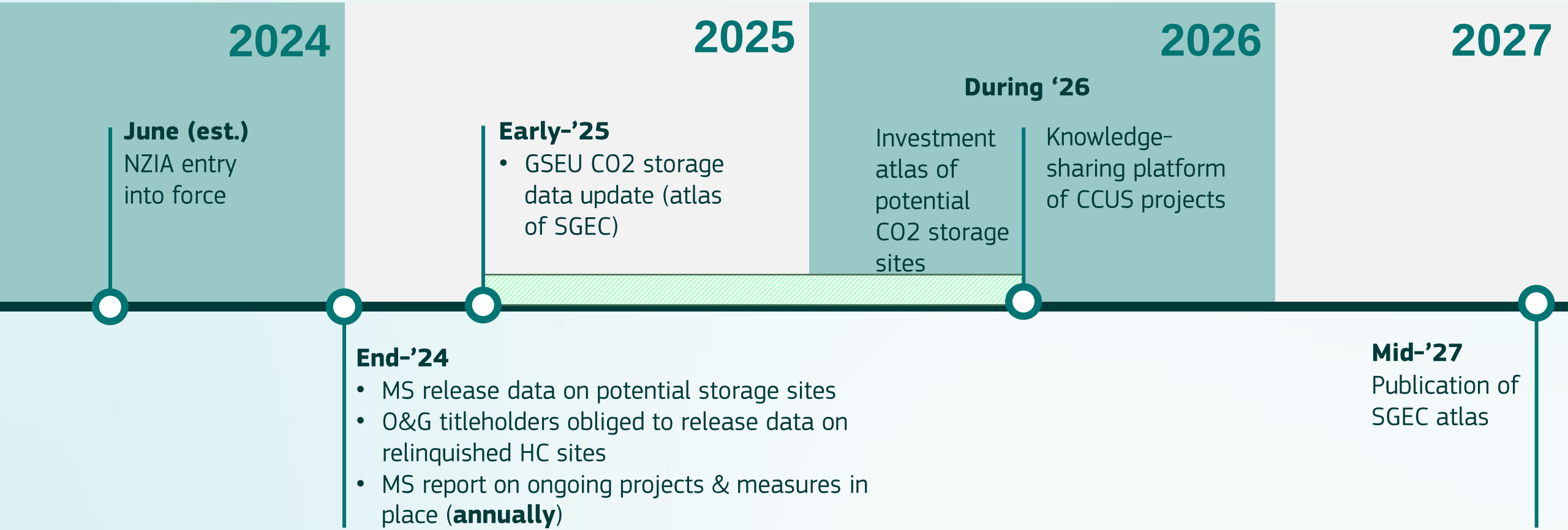
Data release & Knowledge sharing foreseen



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Main purpose of a theoretical storage atlas

To support policymakers in Europe in their efforts to deploy CCS, by answering two main questions:

Where is this CO_2 storage potential?

How much CO_2 storage capacity can be relied on?

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Reducing constraints* for investment relevance

Data related constraints

Challenge: Lack of availability and different quality of existing data

Policy solution: Data release and transparency for potential storage locations and decommissioned hydrocarbons fields

Additional steps: Mandate for Competent Authorities on types and format of data

"Surface" constraints

Challenge: regulatory and socioeconomical constraints

Policy solutions:

- Aggregated reporting from Member States on national measures and projects development
- Knowledge-Sharing Platform of CCUS projects

Further steps: How can conclusions of reports be used as criteria applied to data?

** Constraints & recommendations raised in the Final Report of the CO2STOP project*
https://energy.ec.europa.eu/system/files/2015-05/56-2014%2520Final%2520report_0.pdf

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Reducing constraints* for investment relevance

Additional work could be funded

- **Moving to the dynamic domain**: methodology to estimate the dynamic capacity of aquifers
- **Understanding storage cost**: cost model so that storage cost curves for various fractions of the resource can be produced.

Need for new data to be acquired

- hydrocarbons exploration activities downsizing
- **Opportunity**: Obligation of oil and gas companies likely to increase activity in the seismic survey market

** Constraints & recommendations raised in the Final Report of the CO2STOP project*
https://energy.ec.europa.eu/system/files/2015-05/56-2014%2520Final%2520report_0.pdf

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Why your collaborative contribution is essential

Investment atlas of CO_2 storage sites = an investment tool built on top of theoretical data mapping

This means moving from a theoretical field closer to a commercial one

How can gaps be filled through collaboration?

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Thank you

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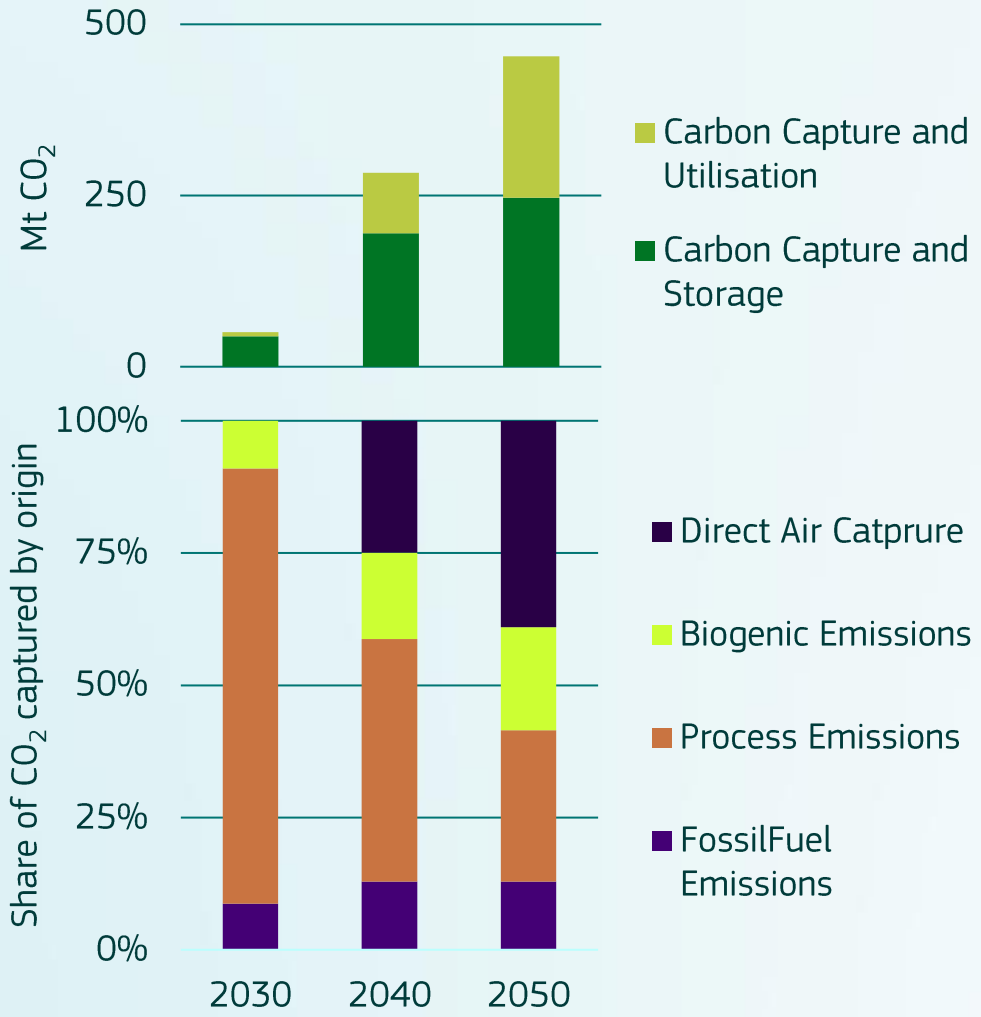
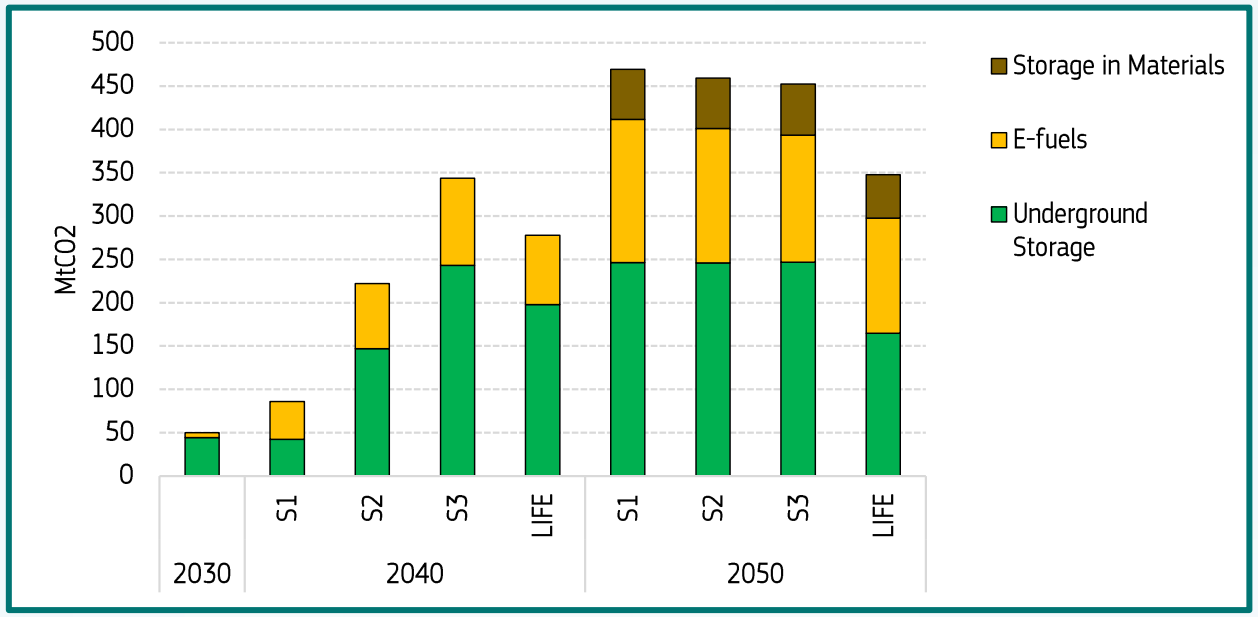
CCS assumptions to achieve climate targets





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