CCSA

CCSA Europe Market Study 2026

De-Risking CCUS: A One-Stop Shop to Bankable Projects

February 2026

Disclaimer

This report has been developed by Deloitte in collaboration with the Carbon Capture and Storage Association (CCSA), based on extensive stakeholder engagement across the CCS value chain, including industrial emitters, transport and storage operators, investors, public authorities, and other relevant experts across multiple markets.

The analysis is grounded in interviews, workshops, and publicly available sources, and has been conducted with the objective of providing a rigorous, evidence-based assessment of current practices, challenges, and enabling conditions for CCS deployment in Europe.

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Preface

Europe is at a critical juncture in its industrial and climate transition. Delivering a competitive, net-zero industrial base will require rapid and coordinated deployment of Carbon Capture Utilisation and Storage (CCUS) across emissions-intensive sectors. Yet, despite the strategic importance of CCUS, projects across Europe still face substantial bankability barriers, regulatory uncertainty, and fragmented policy signals that slow progress and undermine investment decisions.

CCSA commissioned Deloitte to assess the current state of play and the critical risks inherent to the deployment of, Carbon Capture Utilisation and Storage (CCUS) in Europe. It draws on lessons from more advanced markets such as the United Kingdom and Norway, as well as a deep dive into 11 priority countries: the Netherlands, Denmark, Germany, Italy, Poland, Romania, Greece, France and Belgium.

The study combines extensive market research with structured stakeholder engagement to deliver an evidence-based, high-visibility analysis for European policymakers, investors, and industrial leaders. Its purpose is to bridge the CCUS investment landscape across Europe, integrating insights on policy, regulation, finance, risk allocation, value-chain coordination and infrastructure development to provide a clear delivery framework and recommendations to decision-makers.

The report provides a roadmap to accelerate commercial deployment, with a particular emphasis on bankability, de-risking measures and proposed ownership, to unlock timely Final Investment Decisions (FID) and enable CCUS to deploy at scale.

The report is structured in two main sections:

Section 1 presents a phased approach for priority actions, identifying blockers, suggesting solutions and proposing which actor (EU institutions, Member States, and industry stakeholders) should take decisions and lead implementation. The priority actions address the critical risks hindering CCUS deployment, both cross-cutting and value-chain-specific, and identify corresponding mitigation measures.

Section 2 provides a country-by-country analysis, outlining specific risks, regulatory gaps, barriers, and priority actions for each national context. For each country, the section also includes a bankability assessment and a summary of the mechanisms currently in place to de-risk CCUS value chains.

This report is the product of broad collaboration across the **CCUS ecosystem,** bringing together stakeholders from a broad range of sectors including energy, utilities and infrastructure, oil and gas, chemicals, industrial gases and materials, heavy industry, construction and manufacturing, logistics and transport, as well as finance, investment, and banking. The majority of participating organisations operate within the European Union, complemented by several stakeholders with global operations, ensuring that the analysis is grounded in the EU context while informed by relevant international experience. We thank the many organizations and experts who contributed their insights, ensuring that the report reflects both the complexity of the European CCUS landscape, and the urgency of action required.

Purpose of the report

This report is intended as a recommendation paper for decision-makers across Europe. It consolidates the views of industry leaders, highlights cross-cutting and country-specific bankability barriers, and proposes no-regret actions to accelerate policy development. The report draws on lessons learned from recent market developments, including the Danish auction mechanism and FID delays in the Netherlands. It serves as a one-stop reference for understanding the risks, required enabling conditions, and policy levers necessary to unlock Europe's CCUS potential. **This report does not, and is not intended to, constitute investment advice.**

Executive Summary

Carbon Capture Utilisation and Storage: decarbonisation without deindustrialisation

The European Union (EU) Clean Industrial Deal calls for aligning ambitious climate objectives with global industrial leadership and competitiveness. Achieving this dual goal requires the rapid deployment of Carbon Capture and Storage (CCS) as a cornerstone for decarbonising hard-to-abate sectors.

Vision for Europe's CCS Sector: the scale of the challenge is significant

The EU is committed to achieving economy-wide climate neutrality by 2050, underpinned by an intermediate target of 90% net GHG emissions reductions by 2040 vs 1990[1]. To achieve such targets, the 2024 Communication on Industrial Carbon Management (ICM) highlights that within the EU, around 280 Mt of CO_2 should be captured annually by 2040, increasing to roughly 450 $MtCO_2pa$ by 2050.[2]

The Net Zero Industry Act (NZIA) further sets out a binding target to achieve a CO_2 injection capacity of 50 $MtCO_2pa$ by 2030. The current operational CO_2 storage capacity within the EU only stands at 0.185 $MtCO_2pa$, highlighting a clear capacity challenge.[3]

Europe cannot afford delay

To meet 2030 and 2040 targets, first-mover CCS projects must reach Final Investment Decision (FID) by 2026. The success of these early projects will determine whether Europe builds the momentum required to scale.

Yet the pace is insufficient and the investment landscape remains fragile

While CCUS projects are gaining momentum globally with more than 950 projects across different maturity stages, of which approximately 40% are in Europe[4], uncertainty remains on what share of the portfolio will become realized and by when.

Persistent uncertainty across commercial, regulatory, technical, operational, and financial dimensions continues to create decision paralysis, delaying investment commitments and weakening the bankability of first-mover projects, underscoring the critical need to identify and advance consensual no-regret actions that enable and support early movers in their decision pathways.

Market confidence is fragile where regulatory signals are incomplete or inconsistent. Member States' policies remain heterogeneous, with many states lacking national CCS strategies or inclusion of CCS in national legislation.

Insights from more advanced markets reinforce the urgency. In the UK, for example, 75% of respondents to a recent survey by the CCSA stated that they would consider reallocating UK development expenditure to other markets if they cannot progress, as global competition for CCUS investment intensifies[5]. Additionally, advanced markets highlight the importance of subsidies paired with clear risk ownership, in the early phases of market development. In the UK and the Netherlands, such frameworks enhance investment certainty and support early CCS deployment amid growing global competition.

The case for de-risking: a full value-chain perspective

CCS is a system of interconnected segments of a complex value chain: capture, transport, storage, supporting industries and supply chains, each governed by different risk profiles, regulations, and investment incentives. If one component stalls, the entire chain fails. Moreover, high and uncertain costs of infrastructure create a value gap across interdependent stakeholders.

Stakeholders consistently stress that CCS must be developed as a coherent value chain, not as individual segments. Decision-making must therefore account for:

- Interdependencies between emitters, transport & storage (T&S) operators, engineering, procurement and construction contractors (EPCs), and financiers;
- Implications of cross-border transportation of CO_2;
- The sequencing of infrastructure build-out;

1 European Commission (2025) 2040 climate target: Council and Parliament agree on a 90% emissions
2 European Commission (2024) Towards an ambitious Industrial Carbon Management for the EU
3 The Antwerp Declaration for a European Industrial Deal (2026) Antwerp Declaration Monitoring Framework
4 IEA (2025) IEA CCUS Projects Database 2025
5 CCSA (2025) CCUS Delivery Plan

- The need for stable, predictable demand for each component of the value chain;
- Subsidy intensity required to avoid deindustrialisation of hard to abate sectors;
- The requirement for early-stage de-risking mechanisms to unlock private capital;
- The necessity of accessing storage facilities, particularly in the case of countries that lack domestic storage capacity.

First-mover risks remain unacceptably high without targeted support, risk allocation and mitigation ownership. Delivering on the EU ambition demands immediate and coordinated political, regulatory, and budgetary actions and decisions across the value chain. Further clarification and support on the EU and EU Member State (MS) roles is crucial for its development. To scale-up early projects, governments must demonstrate flexibility in funding, risk allocation and regulations, to swiftly operationalize major projects, and recalibrate level of support as the market matures.

A phased approach: 10 actions

This report identifies 10 most critical actions for a sequential and pragmatic path for reaching a fully integrated, self-sustaining market where dense hubs, interconnected corridors, and seamless cross-border CO_2 flows operate. When this is achieved, most risks will be carried by the market under stable, long-term regulatory frameworks, with only targeted public intervention. Private capital will become the dominant driver of investment, enabled by mature project finance, institutional investors, and developed insurance markets. Small and medium enterprises (SMEs) and land-locked emitters will be able to access CCS on fair, open-access terms across Member States, while strong demand-pull mechanisms will make low-carbon products mainstream, ensuring that CCS deployment is driven by competitiveness rather than subsidies.

Identifying Member State priorities

In addition, this report provides a country-by-country assessment of CCS readiness according to the 10-action framework. It highlights the specific regulatory gaps, permitting challenges, funding mechanisms, and infrastructure constraints that shape bankability in each national context. The analysis identifies priority actions for each country, reflects the degree of policy maturity, and outlines which elements of the value chain are most at risk without targeted intervention. Section 2 concludes with key best practices and lessons learned.

By combining a European-wide roadmap with granular national diagnostics, the report equips policymakers with both the strategic direction and the practical guidance required to enable timely FIDs, unlock value chain development and secure Europe's position in the global CCS landscape.

Phase 0 **Establish solid national CCS conditions**

- Action 1: Set the national CCS direction and targets
- Action 2: Establish the legal basis and permitting framework
- Action 3: Designate competent authorities for CCS policy, permitting and oversight

Phase 1 **Enable first-of-a-kind (FOAK) projects across the full CCS value chain**

- Action 4: Build the enabling regulatory framework
- Action 5: Deploy financial de-risking and funding mechanisms
- Action 6: Activate clusters and scale the transport & storage infrastructure
- Action 7: Accelerate infrastructure deployment

Phase 2 **Deploy European networks and corridors**

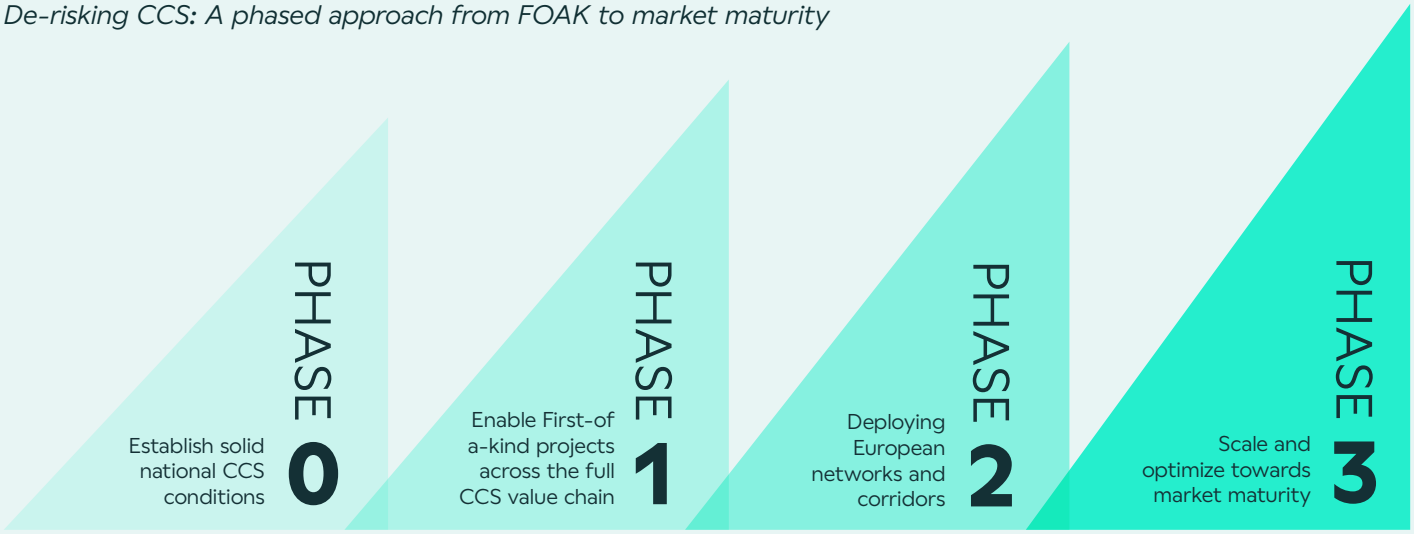
- Action 8: Build regional CO_2 hubs, networks and cross-border corridors
- Action 9: Enable efficient access to CO_2 networks
- Action 10: Evolve the CCS market model

Phase 3 **Scale and optimise towards market maturity**

Some actions qualify as **no-regret actions**: decisions that must be taken irrespective of market design, political choice, or national strategy because they directly mitigate critical system risks and unlock subsequent phases.

Other actions present **pathways rather than a single recommendation**. The market presents different but equally viable solutions, requiring the report to outline more than one pathway. In these cases, we explain the benefits, risks, potential impacts and cascade effects of each, to support policy makers in choosing the model that best fits their national context.

De-risking CCS: A phased approach from FOAK to market maturity



ACTIONS

1	2	3	4	5	6	7	8	9	10
Set national CCS direction and targets	Establish legal basis and permitting framework	Designate competent authorities for CCS policy, permitting and oversight	Build the enabling regulatory framework	Deploy financial de-risking and funding mecha-nisms	Activate clusters and scale the Transport & Storage infrastruc-ture	Accelerate infrastruc-ture deploy-ment	Build regional CO_2 networks & cross border corridors	Enable efficient access to CO_2 networks	Evolve the CCS market model

Transition to a competitive, "liquid" and self-sustaining CCS market.

RISKS

Cross value-chain risks

- Cross-chain dependency risk — Actions: 5 and 6
- Unclear risk allocation — Actions: 2 and 3
- High (upfront) CAPEX — Action: 5
- Construction risks
- Liquidity & ticket size risk
- Lack of domestic storage capacity
- Single point of failure risks
- EU vs national level misalignment — Action: 1
- Policy fragmentation — Actions: 1, 3 ,4, 8 and 10
- Policy uncertainty and instability — Actions: 1 and 4
- Early over / lack of regulation risk
- Permitting and local opposition — Actions: 3 and 6
- Funding fragmentation, limitations and oversubscription — Actions: 5 and 6
- Market and ETS price volatility — Actions: 8 and 10
- Interface and governance risks — Actions: 4 and 6
- Skills and capacity gaps — Action: 6
- Public and local opposition

Capture risks

- Technology maturity
- Underperformance of capture facility — Action: 6
- Revenue uncertainty — Action: 5
- Energy price volatility
- Double penalty risk (e.g. forced venting) — Actions: 5, 6 and 9
- T&S contractual rigidity (incl. stringent CO_2 specs)
- Access to T&S
- Grid access and security of supply — Action: 9
- EPC contractual exposure
- Lack of demand-side uptake mechanisms — Action: 10

Transport & storage risks

- Corrosion risks
- Long-term liability — Actions: 2 and 4
- Contract termination risk — Actions: 2 and 4
- Tariff uncertainty — Actions: 5, 6 and 9
- Early volumes / underutilization risk — Actions: 4, 5, 6 and 9

Risk categories

- Overarching
- Infra risk
- Regulatory
- Economic
- Societal

Approach & Methodology

This report is built on a comprehensive analysis of CCS bankability barriers across Europe, enriched by extensive stakeholder engagement. The study ran from September to December 2025, combining desk-based research, market intelligence, and structured dialogue with industry and policy actors.

More than 40 decision makers from the industry across ~25 organisations contributed through interviews and workshops, representing all parts of the CCS value chain: from emitters; transport and storage (T&S) operators; EPC contractors; banks, investors, and insurers; national regulators; industry associations and technology providers.

This report **does not reflect** public affairs policy positions; it represents the outcome of in-depth, evidence-driven engagement with key CCS industry stakeholders.

These discussions provided real-world insights into risk allocation, bankability constraints, operational challenges, and policy gaps, using concrete case studies from ongoing CCS projects across Europe. A series of dedicated workshops enabled stakeholders to validate and refine the risk map, identify the actions needed for mitigation, distinguish where consensus exists versus where diverging views remain, assess interdependencies across the value chain, and stress-test the phased approach and "critical path items" (CPIs).

- Consensus areas were consolidated as clear no-regret actions.
- Diverging views were framed as two alternative models, each with its own implications, allowing policy makers at MS and EU levels to make informed policy choices.

From risks to actions: the sequencing logic

Not all actions can or should occur simultaneously, as some need to take place first, in order to unlock others or to avoid delays in early implementation phases.

Based on stakeholder input, the study develops a phased approach, identifying:

- **Phase 0** What Member States must put in place upfront; national CCS strategies, targets and enabling legislation;
- **Phase 1** What must happen to unlock first-of-a-kind project FIDs across the entire value-chain;
- **Phase 2** What must then follow to enable cross-border systems and market growth across the value chain;
- **Phase 3** What long-term actions are needed for a mature European CO_2 market.

This sequencing provides a structured foundation for policymakers, with the aim of helping to accelerate CCS deployment while preserving flexibility in national approaches.

SECTION 1

Unlocking Europe's CCS value chain: risks, mitigations and the path to bankability

The current CCS project landscape: 2025 EU data at a glance

As of late 2025, 77 commercial CCS projects are in operation globally with a combined CO_2 capture capacity of 64 million tonnes per annum ($MtCO_2pa$). Notably, an additional 44 $MtCO_2pa$ of capture capacity is currently under construction, which means that the operating capacity is expected to increase by nearly 70% in the coming years as these projects become operational.[6]

According to the Global CCS Institute (GCCSI), by 2030 the global CO_2 capture capacity of operational facilities is expected to be five times greater than in 2025[5]. Taking into account projects currently under development, total operating CO_2 capture capacity could rise from 64 $MtCO_2pa$ today to 337 $MtCO_2pa$ within the next five years, reflecting a potential compound annual growth rate (CAGR) of nearly 40%. When including planned projects or those scheduled to begin operations after 2030, the total capture capacity in the pipeline reaches 513 $MtCO_2pa$. Although this growth is substantial, it still falls significantly short of the levels needed to meet climate ambitions, indicating that further capacity expansion is essential.

According to IEA, although planned capacity for 2030 increased since last year, the pipeline of current projects is only just approximately 40% of the Net Zero Scenario (NZE)[a] target of 2030.

Figure 1: Capacity of current and planned large-scale CO_2 capture projects vs. the NetZero Scenario (Global)

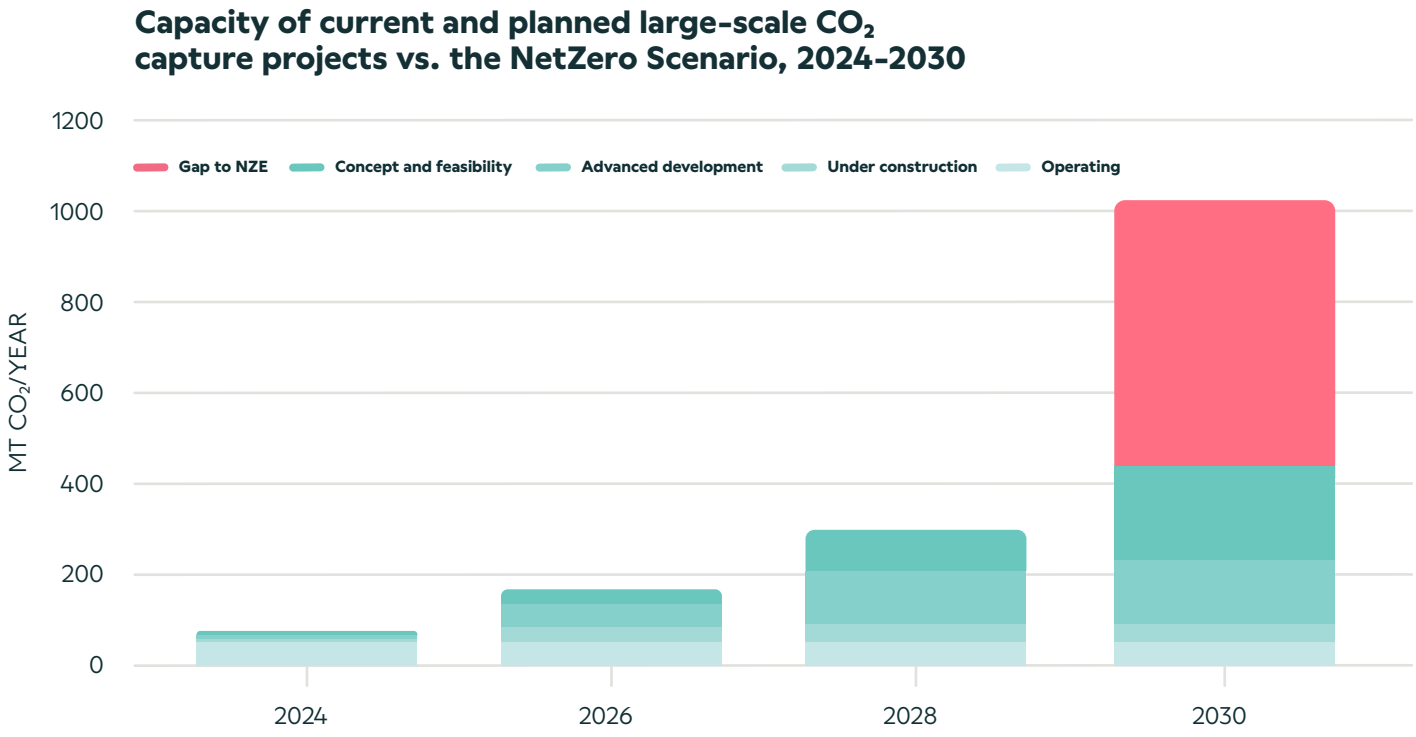


Figure caption: Capacity and planned large-scale CO_2 capture projects versus the NetZero Scenario for 2024-2030 based on IEA data (last updated 25 Apr 2024)[a].

6 GCCSI (2025) Global Status of CCS Report 2025

As of 2024, Europe's operational CO_2 storage capacity remained extremely limited. Within the EU, only a handful of small-scale storage operations are active, adding up to well below 1 Mtpa of injection capacity; even when including Norway and Iceland, total operational storage capacity remains only in the low single-digit Mtpa range, still far from what is required. This stands in stark contrast with the NZIA mandate of at least 50 $MtCO_2$pa in injection capacity by 2030. Bridging this gap in fewer than five years requires an acceleration in project development, permitting, and investment.

Progress to date illustrates the scale of the challenge. EU storage capacity stayed flat at 0.16 $MtCO_2$pa for nearly a decade (2015–2023), with the only operational site being MOL's Szank CO_2-EOR project in Hungary. The first addition came only in 2024 with the commissioning of Ravenna Phase 1, bringing EU capacity to just 0.185 $MtCO_2$pa across two sites. Today, only two further storage projects, Porthos (Netherlands) and Greensand (Denmark), are under construction within the EU.

Several large-scale projects, including those in Norway, signal strong momentum. Northern Lights (currently expanding into Phase 2) is a critical development for European emitters seeking cross-border storage access. However, as Norway lies outside the EU, its capacity does not count toward the NZIA target, nor can it replace the need for substantial domestic EU storage deployment.

Storage projects typically require at least five years from concept selection to operation, meaning that the NZIA target can only be met if multiple Member States accelerate FID decisions immediately and move projects into construction at scale. Europe has the theoretical geological potential and technical expertise, but the current pace of operationalisation falls far short of what is needed. Achieving 50 $MtCO_2$pa by 2030 will require a dramatic expansion of storage capacity, consistent regulatory frameworks, and rapid mobilisation of public and private investment.

Figure 2: NZIA storage target by 2030 vs current CO_2 operational storage capacity in Europe in Mtpa

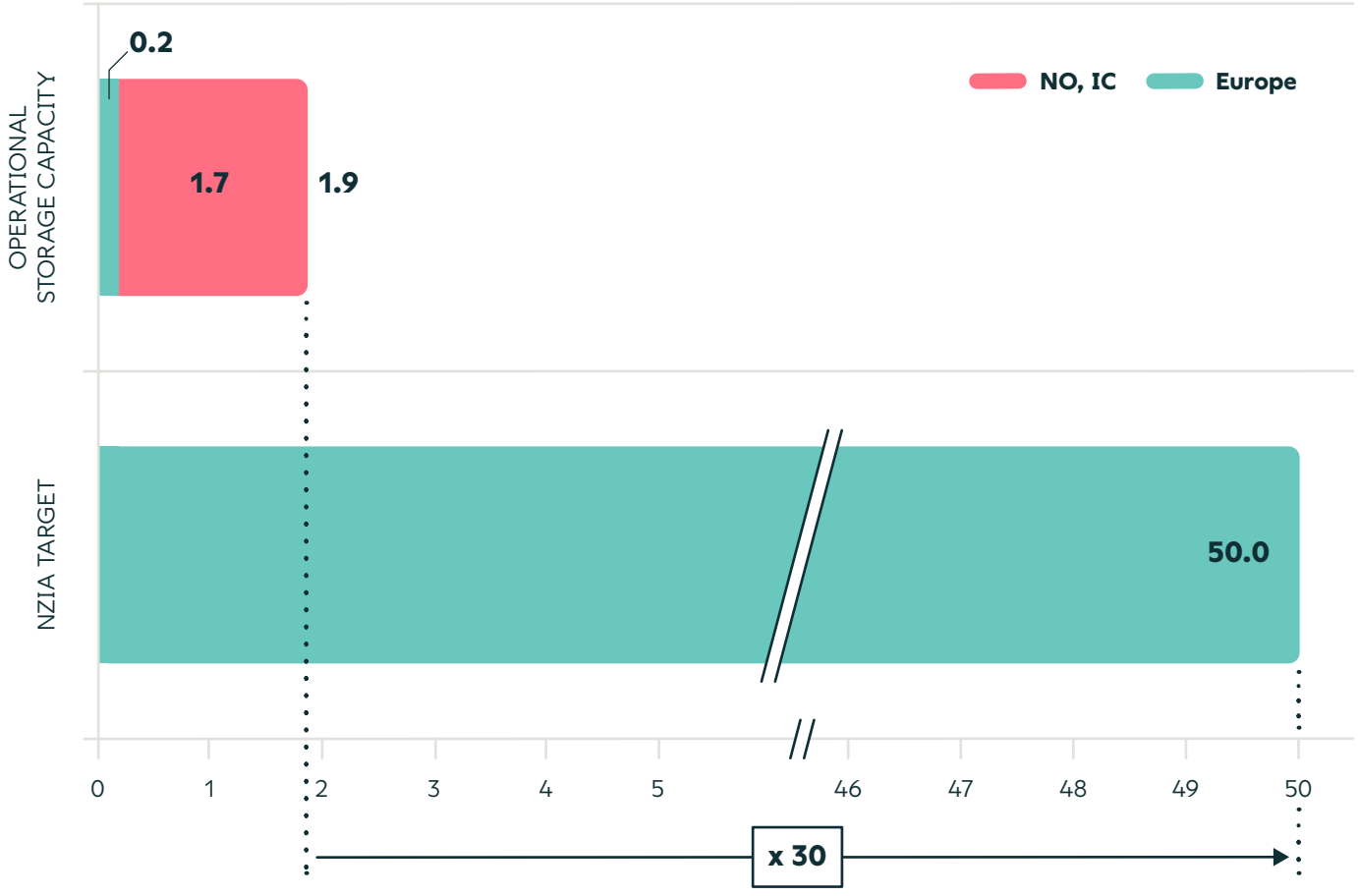


Figure caption: Shortfall in CO_2 current operational capacity compared to NZIA 2030 target[7, 8]

7 GCCSI (2024) Global Status of CCS Report 2024
8 CATF (2025) Carbon Capture Project Map

The below map (Figure 3) captures the Europe's current **carbon capture capacity**. The bubble size represents the announced capacity of each capture facility, in Mtpa.

Figure 3: European Carbon Capture Projects Map

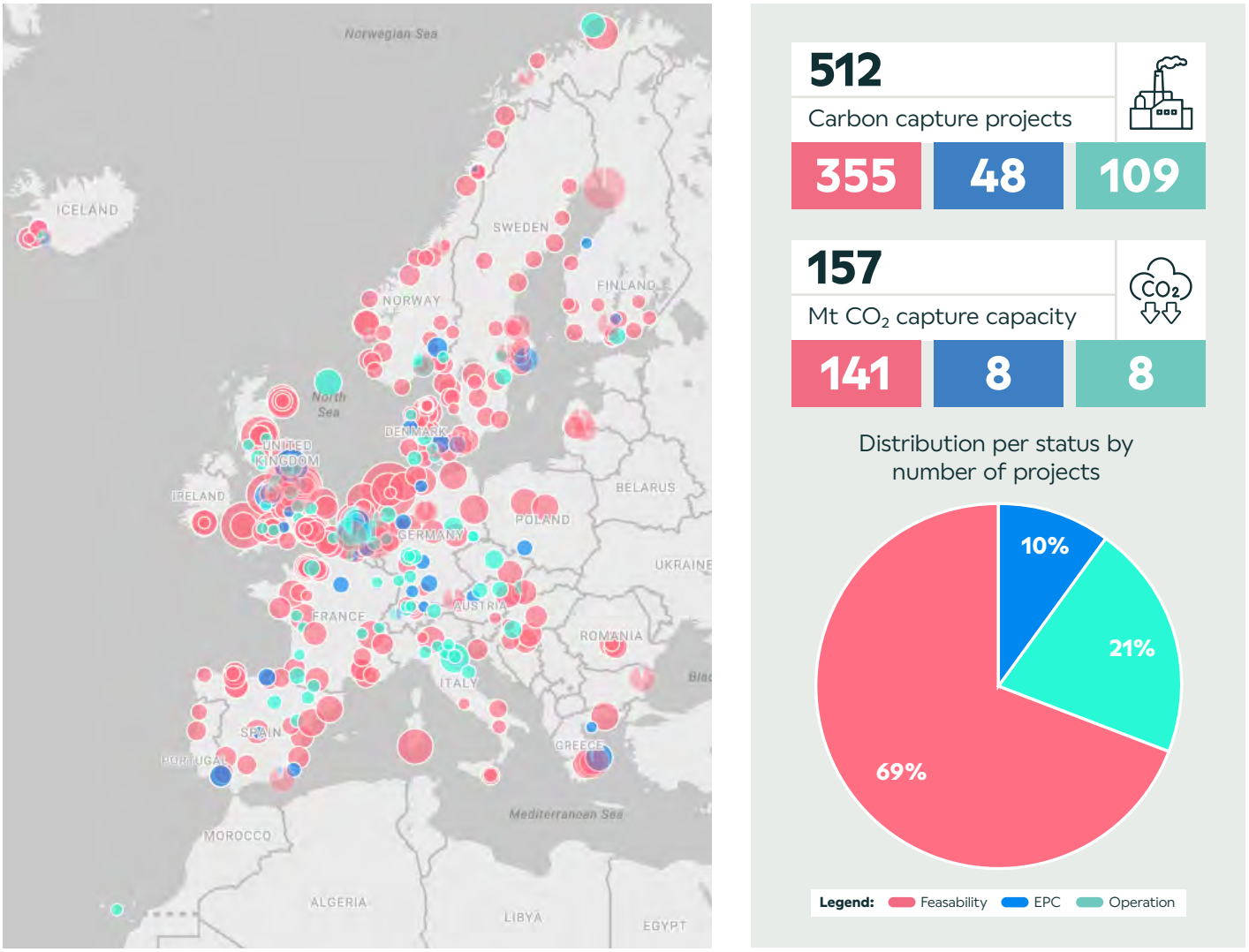


Figure caption: Map of carbon capture projects in the Europe (incl. UK, CH, NO, IC) based on CaptureMap data[9].

Notes:
Legend: size represents the capture capacity of the capture plant(s) at each facility.

- The map represents 512 publicly announced capture projects in development or operation across Europe. Together these projects represent a capture capacity, estimated at approximately 157 $MtCO_2pa$.
- Out of the 157 $MtCO_2pa$ projected capture capacity, only 8 $MtCO_2pa$ is in operation currently.

9 CaptureMap (2025) The industry standard for CCUS Market Intelligence

1.1 Understanding the CCS risk landscape

Why de-risking CCS is central to defining the path forward

Figure 4: Identified CCS risks across the value chain

The successful deployment of CCS in Europe hinges on acknowledging and addressing a set of interconnected risks that span the full value chain (detailed risks are listed in appendix, Appendix A – Risks and Mitigation actions). These risks - overarching, infrastructure, regulatory, economic, societal - shape the commercial viability of projects and determine whether early development can progress to Final Investment Decision (FID). Before outlining the phased approach and corresponding priority actions, it is essential to set out the risk landscape that all subsequent decisions must respond to.

The cross value-chain is highly interdependent, where capture, transport and storage depend on one another. This interdependency creates cross-chain exposure and project-on-project risk: delays or failures in one segment can jeopardise the entire value chain. Additionally, the early European market lacks liquidity and flexibility, meaning that emitters and T&S operators cannot easily switch partners or redirect volumes or ensure aggregated portfolio risk, heightening project-on-project risk and reinforcing the need for predictable, long-term contractual and regulatory frameworks.

Regulatory uncertainty further compounds these challenges. Divergent national interpretations of EU directives create fragmentation, slowing down cross-border transport, complicating permitting, and generating inconsistent liability regimes. In parallel, in some countries, the absence of clear long-term government commitments, whether relating to funding, liabilities, access rules, or market design, undermines investor confidence at a time when first movers face unprecedented CAPEX requirements and multi-decade exposures to ETS markets, technology performance, and infrastructure availability.

Economic and financial risks are critical. FOAK projects face high initial costs, limited lender and investor appetite, and fragmented subsidy regimes that rarely align across the value chain. National support schemes are often insufficient or uncoordinated, while EU-level instruments such as the Innovation Fund and the Connecting Europe Facility (CEF) are often oversubscribed, do not cover the full funding gap, or cannot guarantee value-chain synchronisation, creating stranded-asset risk. Meanwhile, emitters and T&S operators face specific commercial exposures from

performance penalties and CO_2 specification risks to termination risks, tariff uncertainty, and long-term storage liability.

Infrastructure and operational risks add another layer of complexity. These include leakage and integrity risks, injection pressure interactions across storage sites, risks linked to CO_2 specifications and purity, insufficient skilled labour, and early underutilisation of T&S infrastructure, requiring mechanisms to bridge revenue gaps in early years.

Societal risks include low public awareness, safety concerns over storage sites, perceived fossil fuel lock-in, local resistance to new infrastructure, and lack of stakeholder trust, requiring proactive community engagement and transparent communication to secure a social licence.[10]

Taken together, these risks demonstrate why CCS requires a coordinated effort at local, regional, national, and EU levels, and a sequenced de-risking approach. They also illustrate why decisive action from EU institutions, Member States, and industry is essential: no single actor can solve the challenge alone, and early policy signals will shape Europe's competitiveness in securing CCS investment.

1.2 Mitigation levers to address the CCS risk landscape

A coordinated set of interventions to stabilise early projects and align value-chain development.

Addressing this risk landscape requires a coordinated set of mitigation levers that collectively reduce uncertainty, improve bankability, and enable value-chain synchronisation (detailed mitigations are listed in appendix, Appendix A – Risks and Mitigation actions).

At the EU level, the most powerful interventions focus on providing clarity and filling regulatory gaps where national frameworks are absent, ensuring EU-wide action effectively complements Member State efforts. For example, the Transmission System Operators' (TSOs) need for a light touch regulation would provide the legal and technical certainty needed for long-term project finance. Similarly, EU-driven demand-pull mechanisms, such as public procurement for low-carbon materials and more flexible public-funding rules can help ensure that early industrial projects have a credible route to market. Introducing proportional performance-based funding, rather than binary thresholds, further reduces the risk of losing support due to temporary shortfalls in capture performance.

At Member State level, the most critical levers relate to financial de-risking and long-term revenue stability. Carbon Contracts for Difference (CCfD) can insulate capture projects from ETS volatility, with their effectiveness tied to a strike price anchored in a credible, long-term carbon price signal, while Regulated Asset Base (RAB) style approaches for T&S offer predictable, regulated financial model that materially reduce the cost of capital. Member States also play a decisive role in providing state-backed guarantees for early years of underutilisation of infrastructure; establishing clear long-term liability transfer rules; and creating public insurance mechanisms that complement private markets. Strategic designation of cross-border infrastructure and accelerated permitting pathways ensure that storage and transport development keeps pace with capture investment. Moreover, Member States can play a pivotal role in addressing the double burden risk that undermines confidence in FOAK investments linked to CCS supply-chain disruptions by implementing temporary, targeted mitigation measures that will provide short-term relief for verified, non-fault supply-chain interruptions, while remaining strictly neutral to the ETS market.

Some mitigation actions require **coordinated execution between EU institutions and Member States**. A structured EU–MS coordination platform can align national strategies with European infrastructure needs, reducing fragmentation and avoiding stranded assets. A transparent, forward-looking policy roadmap, including grandfathering provisions for projects reaching FID, can provide the predictability that private investors repeatedly identify as essential. Regulatory sandboxing for early projects can help test, refine, and accelerate emerging frameworks while ensuring that learning is shared across jurisdictions. Additionally, while the CCS Directive establishes a framework for harmonized cross-border liability, it requires more consistent and rigorous transposition.

10 European Commission (2024) Industrial carbon management strategy

Industry stakeholders themselves also carry a central role in reducing systemic risk. Standardizing contracts, developing common risk-allocation templates, aligning in CO_2 standards and engaging proactively with policymakers will ensure that commercial practices evolve alongside regulation. Industrial clusters and joint governance models can help share costs and expertise, while long-term hedging strategies such as Power Purchase Agreements (PPA) mitigate exposure to energy-price volatility. In parallel, insurers and private financiers can introduce CCS-specific financial products, portfolio approaches, and volatility hedges that will support more sophisticated project structures as the market matures.

Together, these mitigation levers form the foundation for the phased actions proposed in this report. They translate stakeholder experience into pragmatic solutions that directly address the risks inhibiting early investment and ensure that regulatory, financial and operational frameworks mature in parallel with Europe's CCS ambitions.

This report proposes a phased approach - Phase 0 to Phase 3 - that sets out **what must happen first, what can only follow once early conditions are met, and how Europe can progressively shift from government-led de-risking to market-based models. Each phase translates these risks into targeted,** "no-regret decisions", and, where applicable, alternative policy pathways reflecting differing Member State contexts or legitimate divergences across stakeholders.

The following sections introduce this phased approach and outline the 10 corresponding priority actions designed to reduce uncertainties that can delay decisions or slow progress towards a scalable CCS ecosystem in Europe.

1.3 From First-of-a-Kind to market maturity

A phased policy roadmap to move from government enablement to commercial CCS markets.

Europe is entering a decisive moment for industrial carbon management. While the EU has launched major initiatives, such as the Industrial Carbon Management Strategy and ongoing work on CO_2 transport rules, infrastructure planning, standards, and liability[b], the current landscape is not yet sequenced in a way that enables a truly developed CCS market.[10]

To progress from early projects towards a mature, market-driven system, Europe needs a phased policy framework that orders actions according to market readiness, reduces risks step-by-step, and supports coordinated development across the capture, transport, and storage value chain, while recognising that regions will advance at different speeds and that policy intervention should be targeted to accelerate progress where needed, and restrained where markets are already advancing.

This roadmap consists of four phases, each with a clear purpose and an enabling effect on the next:

Phase 0 **establishes solid national CCS conditions** by requiring Member States to set national strategies, targets, legal frameworks, and governance structures in line with the EU's CCS regulatory vision. This creates the basic conditions for projects to move forward.

Phase 1 **enables First-of-a-Kind projects across the full CCS value chain** projects, infrastructure, and the deployment of clusters. The objective is to secure FIDs by putting in place the de-risking tools, financing mechanisms, and consistent rules needed for FOAK projects to succeed.

Phase 2 **deploys European networks and corridors,** expanding beyond early clusters to connect a wider range of emitters including aggregated volumes of landlocked sites through interoperable, cross-border networks. This phase aligns incentives, permitting, and liability frameworks to unlock large-scale T&S capacity.

Phase 3 **scales and optimises towards market maturity,** progressively transitioning from public support to commercial instruments, enabling merchant-based pricing, and establishing stable long-term liability and governance frameworks.

Together, these phases form a coherent, sequential market transition while acknowledging that market regions and industrial clusters will naturally progress at different speeds[c]; building national readiness, securing FOAK projects, expanding infrastructure to reach all emitters, and ultimately establishing a competitive

European industrial carbon management market with predictable revenue streams and minimal reliance on public subsidies.

The following chapters detail each phase's goals, focus and expected outcomes, and highlight how current EU initiatives fit into this broader, integrated roadmap.

PHASE 0

PHASE 0 PHASE 1 PHASE 2 PHASE 3

Establish solid national CCS conditions

Phase 0 is foundational and should be tailored to each Member State, aligning with the EU regulatory vision and established mechanisms (see Section 2 for a country-by-country assessment) to enable the parallel development and scalability of CCS deployment across EU. Without national strategies, legal and financial frameworks, and governance clarity, no FOAK project can progress to FID, and no country can effectively participate in cross-border CCS networks.

This phase sets the minimum conditions for the internal market to function: alignment with EU objectives, legal certainty for investors, and coordinated national decision-making.

The tables below provide a comprehensive overview of the phase and detail the priority actions, including for each action a sub table with summary of its description, ownership, and associated risks.

Overview ▸ Actions ▸ Detail

Overview table for Phase 0

Goal	Key focus	Desired outcomes
Create the national commitments, legal certainty, and governance structures required for countries to participate meaningfully in the CCS market.	- Integrate CCS into national decarbonization strategies and National Energy and Climate Plans (NECP), with clear 2030/2040 targets, - Establish a legal and permitting basis for capture, CO_2 transport, and storage, - Define governance and competent authorities	- A foundational enabling environment for early CCS investments and permitting. - Member States positioned to join and contribute to an interoperable EU-wide CCS market

Priority actions for Phase 0

Priority actions	Ownership
1 **Set the national CCS direction and targets** a. Publish a national CCS strategy with 2030 and 2040 targets b. Integrate CCS into NECPs and national climate legislation	MS EU guardrails
2 **Establish the legal basis and permitting framework** a. Define the legal basis for CO_2 capture, transport and storage	MS guardrails
3 **Designate competent authorities for CCS policy, permitting and oversight** a. Establish clear government structures	MS

Detailed actions for Phase 0

1	**Set the national CCS direction and targets**

Action 1.a Publish a national CCS strategy with 2030 and 2040 targets

Description

Member States should publish long-term CCS strategies aligned with the EU Industrial Carbon Management Strategy and NZIA, defining capture and storage targets, timelines, available national subsidies, required infrastructure, and priority sectors. This strategic clarity will mitigate policy uncertainty and send a commitment signal to investors and emitters.

Ownership

MS

Linked Risk(s)

EU vs national level misalignment; policy fragmentation and overregulation; policy instability; public and local opposition.

Action 1.b Integrate CCS into NECPs and national climate legislation

Description

Explicit recognition of CCS in NECPs and national law will ensure the technology is embedded in national decarbonization pathways. Formal inclusion will enable access to national and supra-national funding mechanisms and prevent regulatory misalignment between national and EU levels.

Ownership

MS EU guardrails

Linked Risk(s)

EU vs national level misalignment; regulatory fragmentation and overregulation; policy instability; public and local opposition.

2	**Establish the legal basis and permitting framework**

Action 2.a Define the legal basis for CO_2 capture, transport and storage

Description

Member States should transpose and operationalize the CCS Directive and related EU rules to provide clarity and simplify permitting, transport access, storage licensing, liability allocation, closure obligations, and cross-border movements. This certainty is required for early project investment decisions[d].

Ownership

MS EU guardrails

Linked Risk(s)

Unclear risk allocation; contract termination; long-term liability.

3	**Designate competent authorities for CCS policy, permitting and oversight**

Action 3.a Establish clear governance structure

Description

Member States establish clear governance structures with delineated responsibilities for strategy, funding tools, permitting, regulatory implementation, and oversight. This avoids fragmentation, reduces permitting delays, and provides a single interface for industry.

Ownership

MS EU alignment

Linked Risk(s)

Unclear risk allocation; policy fragmentation; permitting and local opposition.

PHASE 1:

Enable First-of a-Kind projects across the full CCS value chain

Phase 1 focuses on enabling FOAK CCS value chain projects that prove technical feasibility, establish commercial and regulatory precedents, and unlock the confidence needed for large-scale market deployment. These early projects require a coordinated package of regulatory clarity, financial de-risking, value chain de-risking (project-on-project risk) and early infrastructure activation in order to reach FID.

During this stage, the CCS market remains nascent. Private actors cannot yet carry the full weight of cross-chain dependency risks, long-term liabilities, or early-volume uncertainty. Therefore, Member States and the EU must lead with decisive regulatory and financial interventions, while ensuring that early actions remain compatible with the emergence of a more competitive and interconnected market in later phases.

Phase 1 is therefore characterized by three foundational pillars:

1. Build an enabling regulatory framework, including clarity on liability, long-term policy stability through grandfathering, and early decisions on vertical and horizontal coordination models across the CCS chain;
2. Deploy robust financial de-risking and funding mechanisms, covering CAPEX, DEVEX and OPEX exposure; revenue stability; and government-backed guarantees;
3. Activate and scale T&S infrastructure, with early volume commitments to infrastructure capacity, and cluster development;

These interventions are essential for securing FOAK FIDs and setting the conditions under which private capital can begin to enter the market.

The tables below provide a comprehensive overview of the phase and detail the priority actions, including for each action a sub table with summary of its description, ownership, and associated risks.

Overview table for Phase 1

Goal	Key focus	Desired outcomes
Bring the first wave of CCS value chains to FID and establish the foundations for shared infrastructure.	This phase requires three simultaneous pillars: - Regulatory enablement. - Financial de-risking; - Infrastructure and cluster activation.	- FOAK value chains reach FID. - Stable, predictable regulatory frameworks enable early investment. - T&S corridors are committed and financed. - De-risking tools reduce the barriers to bankability for early projects. - Industry financing begins to enter on the back of public risk absorption. - Foundational templates and rules to start harmonising approaches across the EU

Priority actions for Phase 1

Priority actions	Ownership
1. Build the enabling regulatory framework a. Legislate and implement enabling regulatory framework for FOAK CCS value chains. b. Clarify liability allocation across capture, transport, and storage, including long-term storage responsibility.	MS (within EU guardrails)

Priority actions	Ownership
c. Establish long-term policy stability through grandfathering and political continuity mechanisms. d. Define the coordination model for vertical and horizontal cooperation across the CCS value chain.	MS (within EU guardrails)
2. Deploy financial de-risking and funding mechanisms a. Unlock sufficient public funding to fill CAPEX, OPEX and, DEVEX gaps, and provide revenue stability. b. Deploy state-backed guarantees to address early-volume, underutilization, and counterparty risks. c. Enable member states to develop compensating mechanisms in case of CCS supply chain disruption. d. Synchronise Carbon Removals and Carbon Farming Regulation (CRCF) integration within the EU ETS allowances cap to maintain allowance prices and strengthen decarbonisation efforts.	EU and MS
3. Activate clusters and scale Transport & Storage infrastructure a. Enable cluster development in high-volume industrial regions. b. Commit early to building T&S infrastructure, including oversized capacity to accommodate growth.	MS and Industry
4. Accelerate infrastructure deployment a. Standardise commercial agreements (e.g., T&S service agreements, ship-or-pay structures, cross-chain Service Level Agreements (SLAs). b. Streamline permitting for transport & storage infrastructure.	EU and MS and Industry

Detailed actions for Phase 1

1	**Build the enabling regulatory framework**

Action 1.a Legislate and implement enabling regulatory models

Description

Phase 1 requires each Member State to adopt and legislate a coherent regulatory model that allows projects to proceed at place while recognizing that no single model fits all geographies.

At least, two legitimate pathways exist:

- **Pathway A** – Heavily regulated with comprehensive derisking (UK or Italian model)
- **Pathway B** – Light-touch regulation with partial state risk-sharing (NL/DK/NO)

The purpose of the pathways is to provide Member States with clear regulatory directions that allow FOAK projects to reach FID at pace.

Regulation should also detail liability allocation, this is described in Action 1.b

Ownership

MS

Linked Risk(s)

Policy instability; Policy fragmentation; liability uncertainty; credit risk; early-volume risk; underutilisation risk, cross-chain mismatch risk; construction risk.

Pathway options - Action 1.a

	Pathway A: More regulated, UK model	Pathway B: Light-touch regulation with partial state risk-sharing (e.g.: NL / DK / NO)
Description	The UK model is a comprehensive package combining Economic Regulatory Regime (ERR)/ Regulated Asset Base (RAB) style regulation paired with fiscal support:[11] • The ERR is supervised by Ofgem ensuring predictable allowed revenues).[12] • A Government Support Package covers low-probability/high-impact risks (stranded asset, catastrophic failure, leakage).	In this model, the state still plays a major role but avoids designing a fully regulated environment upfront. These models feature: • High flexibility for commercial arrangements. • Partial or targeted state guarantees. • Competitive tendering or auction-based funding (DK).

Description	• Cross-chain risk mitigation.[12] • Contractual backstops ensure that T&S operators receive regulated revenue irrespective of short-term volume fluctuations. *State backed guaranteed and contractual backstops are further elaborated upon in Action 2.b.* This model **reallocates systemic risks** from private actors **to the state**.	• State-supported geological development and long-term storage investment (NO & NL). • Public funding support but not systemic liability risks *(further detailed in Action 2.b.)*. This model is suitable for Member States requiring strong state involvement for a market push, or where early volumes are uncertain.
Advantages	• High bankability and predictable long-term returns. • Enables large-scale debt and equity mobilisation. • Addresses cross-chain dependency and early-volume risks systematically. • Provides lender-compatible risk allocation for FOAK.	• Faster to implement (fewer regulatory layers). • Encourages innovation in business models and commercial design. • Aligns well with shipping-based models[e] (NO). • Less burdensome for Member States with limited national budgets.
Considerations	• Cost-intensive for governments; long-term viability of such models is uncertain, and it maybe be difficult to transition to a market-based model. • May not be suitable for cross-border CO_2 shipping due to state-aid limits and governance complexity[f]. • High regulatory involvement may slow innovation unless paired with regulatory sandboxing. • The upside potential for equity investors in T&S infrastructure is limited by regulated returns[g].	• Some argue that the market is too immature for more merchant-model projects, as FOAK liquidity is insufficient. • Unresolved liability allocation slows FIDs and market development (e.g.: Aramis, Danish auction system). • Private actors bear most risk without full visibility on long-term tariffs. • Underutilisation risk remains largely unaddressed. • May require later transition to more structured regulation in Phase 2.

Action 1.b Clarify liability allocation across capture, transport & storage

Description

Clear and predictable liability allocation is a pre-condition for early CCS investment. FOAK projects struggle to reach FID because the distribution of operational, contractual, and long-term liabilities remains ambiguous, particularly at the interface between transport and storage, and for long-term responsibility of stored CO_2.

Two pathways are presented here:

- **Pathway A** – Strong state assumption, modelled on the UK approach
- **Pathway B** – Shared liability model, seen in NL/DK/NO

Ownership

MS (within EU guardrails)

Linked Risk(s)

Policy fragmentation; long-term liability risk; regulatory uncertainty; contract termination risk; performance penalties; single point of failure risk; EPC contractual exposure; corrosion risk.

Member States must define, early in Phase 1, a coherent liability framework covering:

- Project-on-project risks interdependence (including overrun cost, sequential delays or failures etc.)
- Operational liability (during capture, conditioning, transport, injection)
- Short- and medium-term storage liability (including leakage response, remediation obligations, and ETS exposure)
- Long-term post-closure liability transfer, including the timing, requirements, and financial security provisions
- Allocation of liabilities in case of chain failure (e.g., T&S outage triggering forced venting)

11 CATF (2024) Risk Allocation and Regulation for CO_2 Infrastructure

12 Ofgem (2024) Guidance on our economic regulation of carbon dioxide transport and storage

Unclear liability allocations are cited by all stakeholders interviewed for this study - banks, insurers, T&S operators, and emitters - as a major blocker to bankability. T&S operators cannot commit to FID without clarity on post-closure responsibility, while emitters cannot enter long-term ship-or-pay arrangements if they risk exposure to liabilities arising outside their control.

Pathway option - Action 1.b

	Pathway A: Strong state assumption, modelled on the UK approach	**Pathway B: Shared liability model, seen in NL/DK/NO**
Description	• Government assumes long-term liability after a defined performance period and closure certification. • This reduces risk premiums and accelerates early FIDs.	• Operators retain structured long-term liability with strict monitoring and financial security requirements. • This requires robust regulatory oversight and clear insurance frameworks.
Advantages & Considerations: For a detailed overview of advantages and considerations, please refer to Action 1.a: Legislate and implement enabling regulatory models.		

Action 1.c Establish long-term policy stability through grandfathering and political continuity mechanisms

Description

Long-term policy stability is essential for FOAK project investment cycles that span 15–20 years. Member States must formally commit to predictable frameworks, budgetary, regulatory, and strategic, across electoral cycles.

Two tools are central:

- Grandfathering: Early projects retain the policy, funding, contractual, and compliance conditions under which they invested.
- Political continuity mechanisms: multi-annual budgets, binding national CCS strategies, and legislated deployment targets.

Ownership

MS

Linked Risk(s)

Policy instability; regulatory fragmentation; investor confidence risk.

Action 1.d Define the coordination models for vertical and horizontal cooperation across the CCS value chain

Description

Early CCS markets require clarity on how coordination across the value chain will occur. This includes whether segments remain bundled (integrated commercial responsibility across capture, transport, storage) or unbundled (separate actors with regulated access rules).

Stakeholders emphasized that the choice must balance:

- Speed of deployment
- Risk transfer
- Competition and fairness
- Workforce and skill constraints in the current CCS value chain
- The long-term vision for an open-access market

Early pathways are:

- **Pathway A** – *Early vertical cooperation*
- **Pathway B** – *Early horizontal cooperation*

Ownership

EU (guardrails) and MS (design choice)

Linked Risk(s)

Interface risk; contracting complexity; governance fragmentation; counterparty risk; fairness to emitters.

Pathway options - Action 1.d

	Pathway A: Early vertical cooperation	**Pathway B: Early horizontal cooperation**
Description	Cooperation between multiple segments of the CCS chain (e.g., capture + T&S under one commercial entity).	Cooperation between entities operating at the same value-chain stage (e.g., skill sharing across different industries; cross-molecule infrastructure planning).

Advantages	• Reduces interface and governance risks • Concentrates responsibility, enabling faster negotiation and FID • Allows reuse of oil & gas expertise, accelerating deployment • Favoured by many emitters if open book contracting ensures equal treatment	• Faster T&S development (pooling geological, financial, and technical expertise) • Supports scaling of shared pipelines and stores
Considerations	• Requires transparency to avoid competitive distortions • Cross-subsidisation risks must be managed (e.g., the NL model and NO model have required state involvement to ensure fairness) • Must be reversible to allow future market opening	• Must be compatible with future open-access requirements • Requires safeguards to avoid the exclusion of independent emitters

A number of stakeholders noted that full unbundling will become more valuable later, once scale, liquidity, and competition exist in the market.

A historical parallel: from early bundling to unbundling in energy markets:

The evolution of Europe's gas and power sectors offers a useful parallel. In the early decades of system build-out, particularly before the market liberalisation wave of the 1980s, energy infrastructure was largely bundled: vertically integrated utilities developed and operated production, transmission and distribution networks under a single structure, which enabled rapid deployment and efficient coordination. As markets matured, the EU progressively mandated strict unbundling to ensure non-discriminatory access, transparent tariffs and competition. Early-phase cooperation - both horizontal and vertical - can accelerate deployment, but over time the system should naturally evolve towards more open, competitive and standardised market arrangements.

> **"Phase 1 must focus on enabling cooperation, not mandating separation. The objective is speed and bankability, not prematurely forcing a market structure."**

2	**Deploy financial de-risking and funding mechanisms** *The effectiveness of these financial de-risking tools is fully dependent on the prior adoption of clear enabling legislation (Action 1), without which funding instruments cannot be deployed or anchored in a bankable framework.*

Action 2.a Unlock sufficient public funding to fill CAPEX, OPEX and DEVEX gaps, and provide revenue stability.

Description

FOAK projects require a combination of CAPEX support, DEVEX funding, and OPEX instruments to overcome the financial barriers typical of immature value chains. Public funding must be adequate, timely, and sequenced across the chain.

This includes:

- CAPEX support via national schemes, CEF, and Innovation Fund calls
- DEVEX support (e.g. for geological appraisal, FEED, permitting, subsurface characterisation)
- OPEX bridging via CCfDs or other revenue stability mechanisms
- Targeted support for early T&S capacity, recognising oversized infrastructure in early years

Ownership

EU and MS

Linked Risk(s)

High upfront CAPEX; oversubscribed subsidies; underutilisation risk; revenue volatility; project delays.

Funding design requirements for Phase 1

- Targeted funding to unlock FOAK value chains end-to-end
- Flexible timelines to prevent forced withdrawal of awards
- Mechanisms allowing MS to complement EU instruments without breaching state aid constraints

Some stakeholders observed some funding limitations and design challenges:

Despite the central role of public funding in enabling early CCS deployment, stakeholders highlighted several structural limitations and design constraints that reduce the effectiveness of existing mechanisms.

- **Misalignment of funding timelines with project realities:** Key EU funding instruments often operate on fixed timelines that do not account for permitting delays, cross-border coordination, multi-party contracting, or FEED-stage uncertainties. As a result, several developers noted that Innovation Fund implementation deadlines can become a source of project risk rather than support.
- **Insufficient funding volume and persistent oversubscription:** Demand for funding significantly exceeds available budgets. In 2024, applications to the Innovation Fund across all eligible categories were five times above the available budget of the funding calls. This structural oversubscription signals strong industrial readiness but also illustrates that current funding volumes are insufficient to meet the scale and pace of decarbonization that is needed.[3]
- **Need for stronger coordination between EU funding instruments:** Several successful projects underline the value of synchronising Innovation Fund and CEF timelines. When aligned - as seen with the Ravenna CCS Hub and the Greece Apollo project - this sequencing enables cross-chain synchronisation, and coherent value-chain funding. Stakeholders emphasise that such alignment should become systematic rather than incidental.
- **A "valley of death" between funding instruments:** Projects progressing from Horizon Europe (supporting low-TRL innovation) to the Innovation Fund (targeting high-TRL/near-deployment projects) face a structural financing gap. This valley of death delays scaling and exposes promising technologies to financial and operational risk during the most fragile development period.[13]
- **Uneven distribution of support across sectors:** While strong uptake from the cement sector reflects real decarbonization needs, stakeholders- particularly large global players- highlight that project economics vary significantly across industries. Unlike cement, which serves local and regional markets, chemicals, petrochemicals, refining and fertilizers compete in global commodity markets. These sectors face far weaker market pull and cannot rely on local price premiums to sustain CCS costs. As a result, high CCS OPEX exposure and long-term commercial uncertainty make them highly dependent on predictable funding and demand-side measures, yet current schemes do not sufficiently address these sector-specific realities.

Action 2.b Deploy state-backed guarantees to address early-volume, underutilisation, and counterparty risks

Description

Guarantees are needed to reduce the risks that private capital cannot absorb alone in early markets, notably:

- Early-volume risk (slow ramp-up of emitters)
- Underutilization of oversized pipelines and stores
- Counterparty default
- Storage outage or force-majeure impacting capture operations

Guarantee mechanisms may be structured as:

- Utilisation backstops[h]
- Government-backed revenue recovery mechanisms
- Credit guarantees for smaller emitters
- Risk-sharing facilities for store leakage or long-term liability

Ownership

EU and MS

Linked Risk(s)

Cross-chain dependency; double burden risk; tariff instability; early underutilisation; credit risk.

13 Carbon Clean (2025): CCS tender delay and withdrawals

Action 2.c Enable Member States to develop compensating mechanisms in case of CCS supply chain disruption

Description

Authorisation for Member States to implement temporary, targeted mitigation mechanisms to prevent exposure in case of supply chain disruption[i] is needed. In the case of financial compliance with the ETS, this measure would ensure a harmonised EU-level safety net without new subsidy schemes.

The authorised mitigation measures should be decided with EU guidance and only upon verifiable exceptional operational circumstances.

Measures could provide short-term relief for verified, non-fault supply-chain interruptions, while remaining strictly neutral to the ETS market, limited in scope and duration, and subject to monitoring and verification.

Ownership

EU (guardrails) and MS (design choice)

Linked Risk(s)

Double burden risk; corrosion risk.

While EU institutions recognise the issue, progress at EU level is constrained by concerns around preserving ETS integrity and avoiding any perception of weakening carbon price signals.

Stakeholders emphasise that without a credible solution to this risk in Phase 1, early movers face disproportionate exposure, undermining confidence in FOAK CCS investments and delaying FIDs across the value chain. Supply chain disruption risk is particularly acute in early phases, when alternative routing options do not exist, and contractual structures are rigid.

Action 2.d Synchronise CRCF integration within the EU ETS allowances cap to maintain allowance prices and strengthen decarbonisation efforts

Description

Certification schemes for carbon dioxide removal (CDR) activities, should be integrated with the EU ETS in a way that avoids slowing down decarbonization efforts.

To ensure and protect EU ETS allowance price stability, the framework could potentially:

- Allow limited substitution of EU allowances with CRCF certificates within the existing cap: setting a strict quantitative limit on the number of CRCF certificates that entities may use for compliance would prevent an oversupply of certificates in the market and a potential devaluation of EU ETS allowances.
- Adjust the EU ETS cap only if necessary: Any modification to the total number of allowances should aim to preserve scarcity and environmental integrity, ensuring that CRCF integration does not weaken the overall decarbonisation trajectory.

Ownership

EU and MS

Linked Risk(s)

Revenue uncertainty

As stated in the EU ETS Directive, the European Union will evaluate CDR integration into the EU ETS by July 2026.

3 Activate clusters and scale transport and T&S infrastructure

Action 3.a Enable cluster development in high-volume industrial regions

Description

Clusters anchored by large emitters are essential for FOAK value chains.

They:

- Reduce unit infrastructure costs
- Concentrate skills and supply chain capability
- De-risk early T&S investment
- Provide political visibility and permit synergies
- Establish the backbone for Phase 2 corridors

Examples include the UK cluster sequencing programme (Hynet, East Coast Cluster, The Acorn Project, and Viking CCS), Porthos clustering major emitters in the Port of Rotterdam, and Kairos@C grouping emitters in the Port of Antwerp.

Parameters for Phase 1 clustering:

- Focus on large, high-volume emitters first;
- Ensure alignment of cluster timelines across capture, T&S, and permitting;
- Use public funding to support integrated FEED and cross-chain coordination;
- Reserve optionality for small/landlocked emitters to join in Phase 2.

Ownership

EU and MS and Industry

Linked Risk(s)

Underutilisation risk; skills gaps; permitting delays; interface risk.

Action 3.b Commit early to building T&S infrastructure, including oversized capacity for future growth

Description

T&S networks must be built ahead of demand. Early infrastructure is capital-intensive, must be oversized by necessity, and is exposed to low utilisation in initial years. Without early commitment by MS, FOAK capture projects cannot reach FID.

Commitments include:

- Subsurface appraisal and licensing
- Early pipeline and terminal investment
- Oversizing of trunklines to avoid future bottlenecks
- Early development of additional storage sites (not sequential, but parallel)

Design considerations:

- Oversizing must be funded through public support or guarantee structures
- Member States should develop long-term T&S build-out plans
- Early commitments should align with cluster strategies

Ownership

Member states

Linked Risk(s)

Early underutilisation; cross-chain dependency; funding gaps; tariff uncertainty.

4 Accelerate infrastructure deployment

Action 4.a Standardise commercial agreements (T&S service agreements, ship-or-pay, cross-chain SLAs)

Description

FOAK projects require standardised commercial templates to reduce negotiation time, ensure fairness, and accelerate bankability. Today, bespoke agreements across jurisdictions lead to:

- Lengthy bilateral negotiation cycles
- High legal and advisory costs
- Fragmentation of risk allocation
- Uncertainty for lenders

Ownership

Industry and MS and EU

Linked Risk(s)

Contracting delays; counterparty risk; tariff uncertainty; double burden risk; underperformance risk; T&S contractual rigidity; access to T&S.

Standardisation should cover:

- T&S service agreements (T&SSA)
- Ship-or-pay and take-or-pay arrangements
- Cross-chain service level agreements (SLAs)
- Liability clauses linked to quality specifications and outages
- Termination rights and reopener logic
- Financial security requirements

Action 4.b Streamline permitting for transport & storage infrastructure

Description

Permitting remains the largest cause of delay across storage, pipelines, and terminals. To support regional networks, MS must streamline procedures, strengthen regulatory capacity, and ensure permitting speed matches funding timelines.

Ownership

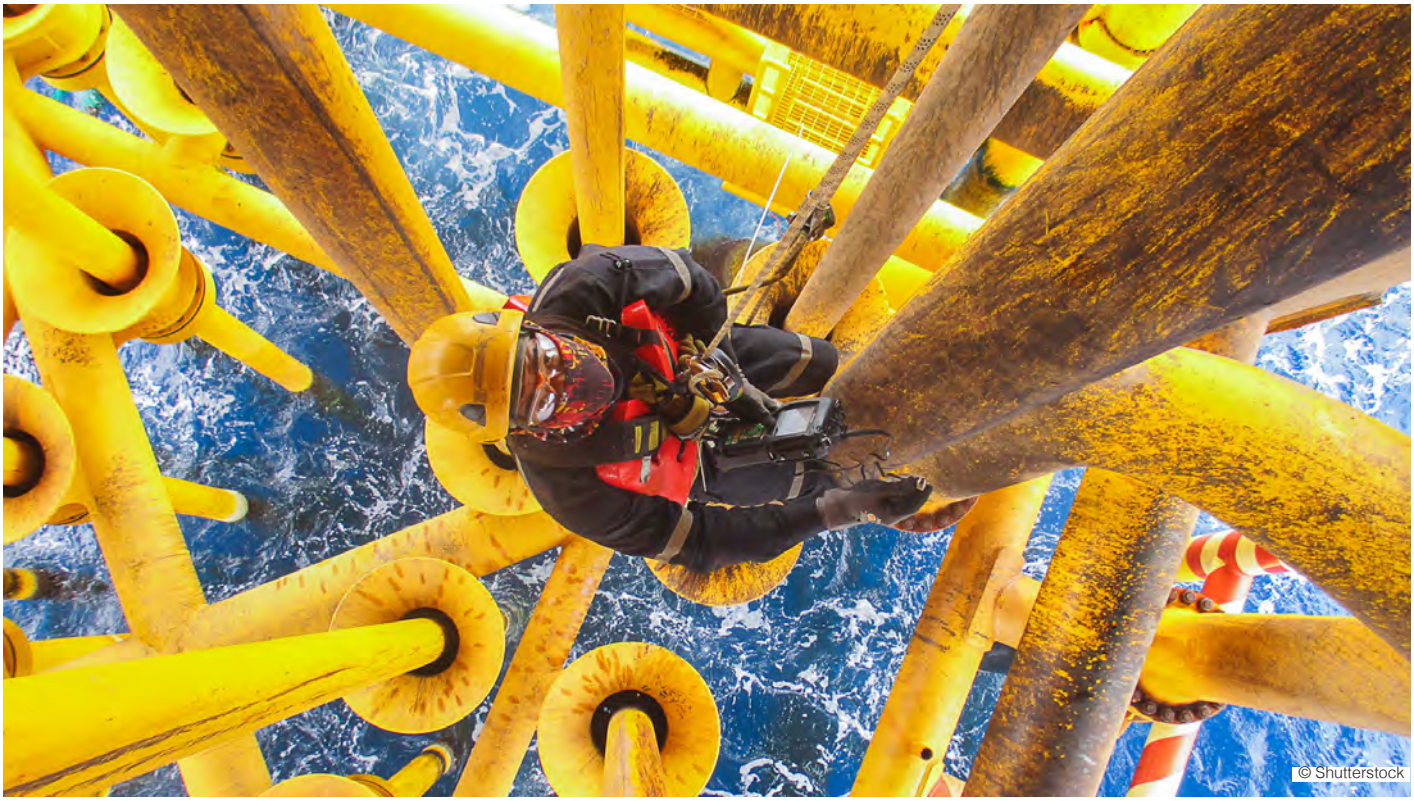
MS

Linked Risk(s)

Permitting; delays; capacity gaps; lack of domestic storage capacity; access to T&S.

Key activities

- Establish one-stop permitting shops with clear decision timelines.
- Set fixed statutory deadlines and escalation routes for delayed decisions.
- Strengthen resources and expertise in geological authorities, permitting bodies, and environmental agencies.
- Harmonise cross-border permitting processes through EU guidance.
- Align permitting timelines with IF and CEF funding implementation.



PHASE 2:

Deploying European networks and corridors

Phase 2 marks the transition from individual FOAK value chains (initiated in Phase 1) towards development of further hubs, interconnected clusters, and the emergence of regional CO_2 T&S networks. These networks, including Second-of-a-Kind (SOAK) corridors such as the Delta Rhine Corridor, the CO_2 Highway, or emerging North Sea basin connections, should build on the infrastructure foundations laid in Phase 1.

As clusters begin to connect across borders, CCS is expected to shift from a series of local projects to a network industry. This interconnection is expected to create aggregation effects, with shared T&S and shipping route capacity lowering tariffs over time, system redundancy reducing risk perception, and new emitters (including inland and smaller emitters) accessing the T&S value chain. As investment confidence increases, the cost of capital should decrease and commercial pathways should diversify.

Phase 2 is therefore about unlocking cross-border flows, expanding transport corridors, scaling-up storage, and aligning frameworks between Member States, so that CCS can become a functional, multi-country system rather than a patchwork of standalone projects. The tables below explore this in detail.

Overview table for Phase 2

Goal	Key focus	Desired outcomes
Create coordinated regional CO_2 T&S networks across Europe (including with the UK and Norway).	- Connect and replicate the clusters established in Phase 1. - Enable cross-border CO_2 flows through regulatory alignment and shared infrastructure. - Enable gradual risk transfer from public to private actors as market confidence grows. - Integrate inland, dispersed, and small emitters into regional networks.	- Regional, multi-node European CCS networks are operational. - Standalone FOAK/SOAK projects are integrated into hubs and corridors. - Cross-border routes facilitate storage access beyond national constraints. - CCS becomes a European network industry with decreasing cost of capital. - Smaller emitters, inland, and landlocked emitters can connect through aggregated systems.

Priority actions for Phase 2

Priority actions	Ownership
1. Build regional CO_2 hubs, networks and cross-border corridors (system planning, network design and coordination) a. Plan and coordinate European CO_2 networks and corridors b. Harmonise cross-border liability and regulation	EU and MS
2. Enable efficient access to CO_2 networks (market design, access rights, and utilisation mechanisms) a. Implement a standardised open-access regime for CO_2 networks b. Secure anchor customer commitments to support T&S FIDs c. Aggregate small and landlocked emitters	EU and MS
3. Evolve the CCS market model a. Transition toward a mixed regulatory model b. Expand demand-pull for low-carbon products	EU guardrails and MS

Detailed actions for Phase 2

1 Build regional CO_2 hubs, networks and cross-border corridors

Action 1.a Plan and coordinate European CO_2 networks and corridors

Description

Phase 2 requires the EU to coordinate beyond individual FOAK clusters toward regional CO_2 networks. This includes identifying priority cross-border corridors, synchronizing Member-State planning, and ensuring value-chain sequencing across capture, transport, and storage. This phase focuses on multiple regional networks, each shaped by industrial geography and storage availability.

The planning of networks and corridors must be embedded in strategic EU instruments, including PCI, IPCEI, TEN-E, Innovation Fund and CEF funding windows, to ensure timely, end-to-end deployment.

Ownership

EU

Linked Risk(s)

Regulatory fragmentation and overregulation; lack of domestic capacity.

Key activities

- Prioritise cross-border CO_2 corridors under PCI/ IPCEI (Projects of Common Interest/ Important Projects of Common Interest) frameworks. Recognising early corridors such as the Delta Rhine Corridor, Northern Lights extensions, or future Mediterranean and Baltic routes.
- Ensure EU funding windows (IF, CEF) support coordinated chain-wide deployment with aligned timelines (e.g., Apollo, Ravenna timings cited as positive examples).
- Facilitate replication of FOAK clusters into SOAK networks, while ensure MS cooperation on network planning to avoid mismatches in timing between capture, transport, and storage.

Action 1.b Harmonise cross-border liability and regulatory frameworks

Description

To enable interconnected corridors, Member States and the EU must align rules governing ETS treatment, tax, liability, accounting, and transport rules for CO_2 crossing borders.

Stakeholders emphasised the need for predictable, coherent frameworks and highlighted current blockages such as UK–EU ETS incompatibility.

Ownership

EU and MS

Linked Risk(s)

Market and ETS price volatility; policy fragmentation.

Key activities

- Align EU and UK ETS rules to unblock storage access.
- Establish bilateral agreements to clarify which jurisdiction governs liability in cross-border T&S.
- Use ROME I and ROME II as the legal basis for determining applicable law in cross-border commercial and non-contractual disputes.
- Reduce fragmentation by ensuring consistent interpretation and application of CCS-relevant directives across MS.

2 Enable efficient access to CO_2 networks

Action 2.a Implement a standardised open-access regime for CO_2 networks

Description

As regional networks emerge, access must be fair, transparent, and predictable. The timing of Third-Party Access (TPA) remains a key policy choice: early TPA supports wide emitter participation, while delayed TPA helps initial infrastructure developers achieve FID.

The regulatory challenge is to define how much access must be mandated at which stage, while protecting both early investors and late entrants.

- **Pathway A** – *Early mandated TPA*
- **Pathway B** – *Delayed TPA*

The choice determines which segment leads the market acceleration: capture (TPA early) or transport/storage (TPA later).

Ownership

EU and MS

Linked Risk(s)

Grid access and security of supply; double burden risks; underutilization risk; tariff uncertainty.

Key activities

- Define transparent booking rules and capacity allocation principles.
- Enable secondary trading of booked capacity.
- Introduce TPA guardrails to avoid discrimination and manage tariffs.
- Allow MS flexibility on the timing of TPA while converging toward EU-wide principles over time.

Pathway options - Action 2.a

	Pathway A: Early mandated TPA	Pathway B: Delayed TPA
Advantages	• Non-discriminatory access from the outset. • Better utilisation and reduced cost for users. • Accelerates FIDs for capture projects.	• Provides commercial flexibility for early T&S investors. • Helps secure initial financing with customised long-term contracts. • Infrastructure is tailored to anchor users, accelerating build-out.
Caveats	• Reduces expected return for early T&S developers. • Regulators may struggle to set tariffs for nascent infrastructure. • May slow initial infrastructure FID.	• Smaller emitters risk exclusion. • Future mandatory TPA may cause regulatory shock. • Without guaranteed access, capture-side investments may be delayed.
Favoured by	• Emitters, small industrials, countries prioritising rapid capture deployment.	• Early T&S developers, countries prioritising rapid infrastructure FIDs.

Action 2.b Secure anchor customer commitments to support T&S investment

Description

T&S projects require a minimum utilisation threshold to reach FID. However, requiring 90–100% capacity booking too early can stall projects. A staged approach, e.g. ~50% secured at FID, helps unlock investment while keeping space for future entrants.

- **Pathway A** – *High booking requirements*
- **Pathway B** – *Flexible early booking requirement*

Ownership

MS and EU

Linked Risk(s)

Underutilisation risk.

Key activities

- Require anchor customers to book minimum volumes.
- Allow lower booking thresholds for early pipelines and storage sites.
- Establish regulatory guardrails to ensure capacity remains available for additional emitters.
- Avoid an over-reliance on anchor loads that could structurally disadvantage smaller or landlocked emitters.

Pathway options - Action 2.b

	Pathway A - High booking requirements (e.g., close to 100%)	**Pathway B - Flexible early booking requirement (e.g., 50%)**
Advantages	• Strong underpinning for long-term capital-intensive assets. • Faster political and permitting validation.	• Enables earlier FIDs. • Maintains strategic flexibility for smaller emitters, late movers, and cross-border volumes.
Caveats	• Often unachievable in emerging markets. • Risks stalling critical infrastructure.	• Full private risk-taking for minimum booking capacity is unrealistic in early markets.

Action 2.c Aggregate small and landlocked emitters

Description

Landlocked emitters and SMEs face the highest barriers to CCS adoption. Regional aggregation models, via public facilitators or transport aggregators, allow these emitters to collectively access T&S infrastructure at viable cost and under shared contractual terms.

Ownership

MS

Linked Risk(s)

Underutilisation risk.

Key activities

- Establish regional CO_2 aggregators (public or market-based).
- Enable multimodal CO_2 collection routes (road/rail/ship to hub/pipeline extensions).
- Support fair access through MS-level policies, funding, and cluster strategies.
- Use EU funding tools to prioritise disadvantaged geographies and complement MS where they are unable to act.

3 Evolve the CCS market model

Action 3.a Transition toward a mixed regulatory model

Description

As markets mature, regulation must evolve from Phase 1's FOAK-oriented frameworks toward a hybrid model blending regulated de-risking (for system stability) with merchant features (to encourage efficiency and competition). CCfDs, revenue stabilisation tools, and guarantees can be gradually tapered as confidence grows, with EU level vehicles such as the emerging Industrial Decarbonisation Bank playing a role in running competitive, time bound support scheme.

Ownership

EU guidance and MS

Linked Risk(s)

Market and ETS price volatility; policy fragmentation; liquidity & ticket size risk.

Key activities

- Blend regulated and merchant elements progressively, using EU-level CCfD and stabilisation windows (e.g. via the Industrial Decarbonisation Bank) that are explicitly time-limited and tapering.
- Tailor national implementation to the maturity of local CCS ecosystems.
- Begin tapering[j] CCfDs and stabilisation mechanisms where appropriate.

Action 3.b Expand demand-pull for low-carbon products

Description

Emitters highlighted that without a guaranteed market for low-carbon products, investments in CCS remain exposed.[10] Phase 2 must therefore introduce demand-side mechanisms to ensure CCS-enabled products (e.g., low-carbon cement, steel, fuels) become commercially viable.

Ownership

MS and MS

Linked Risk(s)

Lack of demand-side uptake; liquidity & ticket size risk.

Key activities

- Implement CBAM-aligned quotas or product standards for energy-intensive sectors.
- Mandate green public procurement for construction materials and support markets for e-fuels, low-carbon chemicals, and waste-to-energy outputs.
- Empower consumers to choose low-carbon products through transparent carbon footprint labelling.

PHASE 3:

Scale and optimise towards market maturity

The long-term vision for the CCS market is its transition to commercial maturity and self-sufficiency, underpinned by strategic actions taken during its developmental phases.

In this future state, the role of the EU will be to focus on governance and facilitating connectivity:

- The EU must guarantee transparency of capture, transport, and storage prices to secure investor confidence.
- The finalisation of the EU and UK ETS linkage will be crucial to ensure equivalent regulatory treatment across the two systems.
- Support for regional CCS networks must prioritise leveraging increased connectivity and interoperability between clusters.

Simultaneously, Member States will systematically drive marketisation:

- States currently relying on regulated models for T&S infrastructure (e.g., the UK model) and emitter support mechanisms (like CCfDs) will gradually taper, transitioning the sector toward competitive, market-based pricing.

As the market matures, the current liability framework will require clarity:

- The EU will need to sharpen the long-term liability frameworks, providing Member States with a clear blueprint to account for any long-term failures across the T&S network.

With initial infrastructure in place (through the previous phases), the focus will shift to efficiency and innovation:

- The EU will retain a critical function in fostering innovation across the entire CCS value chain to optimise the cost and energy effectiveness of installations.
- The framework will be reinforced by the full integration of greenhouse gas removals, ensuring a holistic approach which will be necessary for achieving climate neutrality goals.

1.4 Conclusion: Turning Europe's CCUS ambition into bankable delivery

Europe's CCS ambition can only be realised through coordinated action and timely support. A successful CCS at scale-up will hinge on mitigating risks and generating investor confidence. De-risking the first wave of projects and reaching the Final Investment Decisions required to meet EU ambitions, is not only about funding, it is about creating predictability across the value chain, from capture to storage. By sequencing policy implementation, Europe can move from ad-hoc, first-of-a-kind projects towards a stable market that rewards performance, attracts private capital, and embeds CCS as a core pillar of industrial decarbonisation.

Ambition will be achieved by sequencing decisions that convert today's fragmented, high-risk pipeline into a bankable, interconnected value chain. This report therefore sets out **10 critical actions**, structured across Phases 0 to 3, that collectively build the conditions for investment, unlock Final Investment Decisions (FIDs), and enable the shift from government-led de-risking to a competitive, integrated market.

How to implement: no-regret actions and viable pathways

Across phases, the report distinguishes between

- **no-regret actions:** steps that must be taken regardless of market design or national priorities as they are necessary to move forward, and
- **multiple pathways**, for areas where equally viable options co-exist. In those cases, the report

sets out multiple rather than a one-size-fits-all recommendation, including pros, caveats, and likely cascade effects. This way, each MS can pick the approach that best suits its situation, while still ensuring it aligns with a united, interconnected European system in the future.

In **Phase 0**, Member States must establish the minimum national conditions without which no First-of-a-Kind (FOAK) project can proceed:

1. Set a clear national direction and targets: Member States must establish clear, long-term CCUS strategies with quantified 2030 and 2040 targets, embedded in national climate plans. Countries that moved early, such as the UK and Norway, demonstrate that explicit national direction is a prerequisite for investor confidence, coordinated permitting, and alignment with EU-level funding instruments. Without such direction, projects are likely to remain fragmented and unable to progress to FID.

2. Create a usable and robust legal and permitting basis: A clear legal and permitting foundation for capture, transport, and storage is essential to unlock FOAK projects. Experiences across Europe show that delays and uncertainty in permitting, particularly for storage, are among the most significant barriers to deployment. Countries with mature frameworks (e.g. Norway, the Netherlands) have been able to move beyond pilots, while others remain stalled despite industrial demand.

3. Assign competent authorities and governance structures with clear roles and decision-making rights: Effective CCUS deployment requires clearly designated national authorities with responsibility for strategy, permitting, oversight, and coordination across ministries, in alignment with NZIA's one-stop-shop principle[14]. Fragmented governance slows decision-making and increases project risk. Countries that consolidated CCUS responsibilities early have reduced interface risks and provided a single point of contact for industry, accelerating project development.

These actions are foundational: they align national pathways with EU objectives, reduce policy uncertainty, and create the governance "single interface" that industry and financiers require to progress projects at speed.

In **Phase 1,** the priority is to bring FOAK CCS value chains to FID across capture, transport, and storage; through a coordinated package of measures. This requires:

4. Build an enabling regulatory framework for FOAK projects: Phase 1 requires Member States to choose regulatory pathways that reflect national institutional legacies and market maturity. More regulated models (e.g. the UK's ERR/RAB-based approach) provide high bankability and systematic risk absorption, while lighter-touch models (e.g. Norway, Denmark, the Netherlands) prioritise flexibility and speed. Both pathways can be viable, but clarity and early commitment are critical to avoid prolonged regulatory uncertainty.

5. Deploy financial de-risking and funding mechanisms: FOAK CCUS projects cannot proceed without substantial public financial support addressing CAPEX, DEVEX, OPEX exposure, EPC risks and revenue volatility. Instruments such as CCfDs, investment grants, and coordinated EU funding (Innovation Fund, CEF) are essential. Evidence from early projects shows that misaligned funding timelines and fragmented support across the value chain can delay or derail otherwise viable projects.

6. Activate clusters and scale T&S infrastructure: Cluster-based development, prioritising a limited geographical area, is a proven mechanism, to reduce unit costs, pool risks, and accelerate early deployment. Successful examples (UK clusters, Porthos, Kairos@C, Ravenna) show that committing to T&S infrastructure ahead of full demand, often with oversized capacity, is necessary to unlock capture FIDs. Without early public commitment to T&S, FOAK value chains cannot form.

7. Accelerate T&S infrastructure deployment and permitting: Permitting speed must match the urgency of climate targets and funding timelines. Member States must streamline procedures, build permitting capacity, and introduce fast-track mechanisms for strategic CCUS infrastructure. Delays in storage or pipeline permitting have already proven capable of undermining entire value chains, even where funding and demand exist.

Phase 1 is designed to unlock investment in a nascent market where private actors cannot yet carry cross-chain dependency risks, long-term liabilities, or early-volume uncertainty alone.

In Phase 2, Europe must move from FOAK value chains to regional CO_2 networks and cross-border corridors, enabling scale, and access for a wider range of emitters. This phase requires:

8. Build regional CO_2 networks and cross-border corridors: Phase 2 marks the transition from isolated clusters to interconnected regional networks. Cross-border corridors, such as those emerging in the North Sea basin, enable aggregation effects, reduce costs, and unlock storage access for countries without domestic capacity. Coordinated EU planning and prioritisation under PCI/IPCEI frameworks is essential to avoid fragmented development.

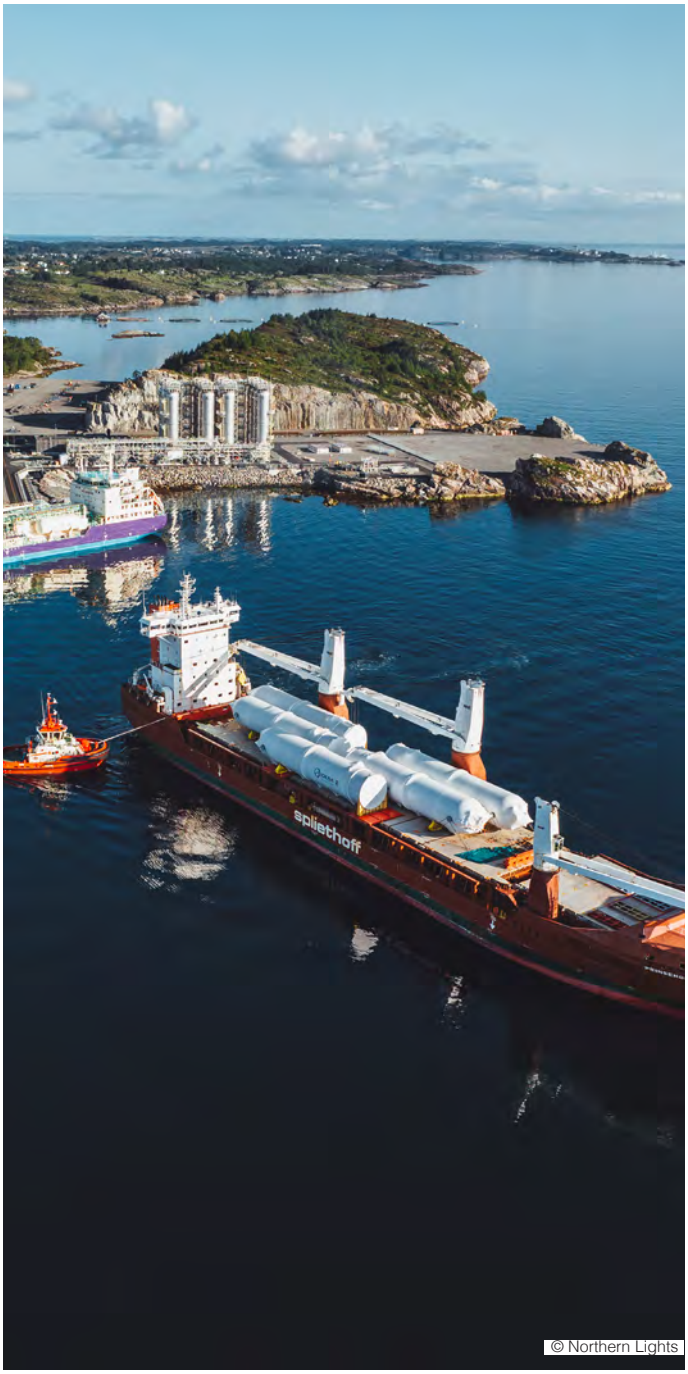
9. Enable efficient and fair access to CO_2 networks: As networks expand, access regimes must balance protection of early investors with openness for new entrants. Countries face a strategic choice between early and delayed third-party access, as well as between high and flexible early booking thresholds. Evidence suggests that requiring lower capacity booking, with anchor commitments, in early phases can unlock T&S investment while preserving space for future local, regional and international emitters, including smaller emitters and landlocked industries.

10. Evolve the CCUS market model toward maturity: As confidence grows and networks scale, CCS must transition from heavily state-led de-risking toward mixed and eventually market-based models. This includes gradually tapering guarantees and CCfDs, expanding demand-pull for low-carbon products, and harmonising rules across borders. The long-term objective is a competitive European CCS network industry, where private capital dominates investment, private investors step in and public intervention becomes targeted and limited.

Phase 3 defines the end goal North Star: a mature, self-sustaining CCS market where networks are integrated, most risks sit with the market, private capital dominates investment, access is non-discriminatory, and demand-pull makes CCS a competitiveness tool rather than a permanent subsidy dependency.

From roadmap to national delivery

Section 2 translates this roadmap into country-by-country readiness diagnostics, identifying the specific regulatory gaps, permitting bottlenecks, funding constraints, and infrastructure limitations that determine bankability in each national context. By combining a clear phased roadmap with granular national priorities, the report equips policymakers with both strategic direction and practical guidance to secure timely FIDs, unlock full value-chain development, and strengthen Europe's position in the global CCUS landscape.



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14 European Commission (2023) Questions and Answers: The Net-Zero Industry Act and the European Hydrogen Bank

SECTION 2

The European CCS landscape

2.1 Comparing momentum across Europe

Where countries stand on CCS readiness

Table 0: The European CCS landscape

	CCS offwicial targets	CCS legal regulatory framework	Cross border CO_2 shipping	National funding schemes (Support receiver)	Specific CCS risks protection	Maturity status
UK	Guiding target of 20 to 30Mtpa CO_2 captured and stored by 2030	EU CCS Directive transposed	Provisional application of LP Article 6	CCfD style business models, CIF**, RAB (Emitter, T&S)	Government protection against major risks	
Norway	Not mentioned but flagship projects are supported	EU CCS Directive implementation	Bilateral discussions incl. BE/UK/DE/CH/NL/US. Provisional application of LP Article 6	"Reverse tax" incentive, Enova (Emitter, T&S)	Not replicable	
Netherlands	Guiding target 20-25Mtpa including CCUS Klimaatakkoord target of 7.2 Mtpa until 2030	EU CCS Directive transposed	Bilateral agreement NL/ NOR Provisional application of LP Article 6	SDE++ (Emitter)	Not available	
Denmark	Danish 2024 roadmap: 2-5.5Mtpa in 2030 and from ~4.5-8Mtp in 2050	EU CCS Directive transposed	Bilateral agreements with BE/FL/FR etc. Ratification of LP Article 6	CCUS, NECCS, CCS; on-going auction (Emitter, T&S)	Not available	
Germany	Not mentioned but explicitly supported by government, 2045 Net Zero target	EU CCS Directive transposed	Envisaged ratification of LP	CAPEX Funding, CCfD (Emitter, T&S)	Not available	
Italy	4Mt of CO_2 injection capacity is projected to be developed by 2030 as stated in the NECP 2024	EU CCS Directive transposed	No revision yet of the LP, reported intention for a formal declaration for CO_2 transport with FR & GR	N/A	Not available	
Romania	Not mentioned, but officially recognized as a key technology for NECP 2024	EU CCS Directive transposed but gaps in implementation	Yet to ratify an amendment to the LP to allow the international transport of CO_2	N/A	Not available	
Poland	Not mentioned, but highlighted for further assessment in NECP	EU CCS Directive transposed	Yet to ratify an amendment to the LP to allow the international transport of CO_2	N/A	Not available	
Greece	Not yet clearly defined, but projected of capture 3.3 Mtpa by 2030 and 3.9 Mtpa by 2050.	EU CCS Directive transposed	Ratified the London Convention, but not the LP HEREMA signed a MoU with Cyprus & Egypt	Intention to launch a supportive scheme similar to CCfDs, but has not been implemented yet. (N/A)	Not available	
France	Clear NECP targets per year: 4-8 $MtCO_2$by 2030, 12-20 $MtCO_2$ by 2040, 30-50 $MtCO_2$ by 2050	EU CCS Directive transposed	Provisional application of LP Article 6	AO GPID, ZibaC,DEMIBAC, SPLEEN (Emitter, T&S)	Not available	
Belgium	Mentioned in NECP but not clear targets are defined	EU CCS Directive transposed	Provisional application of London Protocol Article 6	CCfD tool (pilot-not applicable to CCS), "Made to measure". (Emitter, T&S)	Not available	

2.2 National pathways and policy asks

Country by country deep dives into risk profiles and policy analysis

Across European countries, CCS deployment is advancing at different speeds, reflecting variations in regulatory maturity, public policy support, geographical specificities and varying industrial profiles. While early-mover countries such as the United Kingdom and Norway have established comprehensive frameworks and public funding models, others notably France, Italy, and Germany are now formalizingformalising their strategies, while Denmark and the Netherlands are emerging as pivotal transport and storage T&S hubs for the wider European market.

2.2.1 EU

The EU CCS Directive establishes a regulatory framework for the safe and responsible development and operation of geological CO_2 storage in the EU. It is applicable to commercial scale facilities with a capacity of 0.1 $MtCO_2pa$[15]. Alongside the CCS Directive, the EU's core policy framework for CCS is anchored in the NZIA, as outlined, and is complemented by a range of initiatives designed to support the achievement of established targets. Section 1, and is complemented

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by a range of initiatives designed to support the achievement of established targets.

The Trans-European Networks for Energy (TEN-E) regulation facilitates the development of major cross-border CO_2 transport infrastructure by designating such projects as Projects of Common Interest (PCIs) and Project of Mutual Interest (PMIs). Implementation of these projects is supported by the Connecting Europe Facility (CEF) fund.

The London Protocol plays a crucial role in enabling CCS deployment across Europe by providing an international legal framework for the storage of CO_2.

EU funding for CCS relies on a synergistic approach. The EU Emissions Trading System (ETS) provides the primary incentive by pricing carbon emissions, with the Market Stability Reserve (MSR) acting as a mechanism under the ETS to regulate the supply of emission allowances, thereby stabilising carbon prices and ensuring they remain reflective of market conditions. This tool adjusts allowance supply, which can strengthen long-term investment signals for CCS. In addition, the revenue generated from auctioning ETS allowances entirely finances the Innovation Fund (IF), which offers large-scale grants for CCS projects, a.o., across the value chain to cover significant capital and operating costs. Complementary to this measure is the Fit for 55 package, which sets the 2030 interim goal of a 55% reduction in GHG emissions, reinforcing the EU ETS and indirectly supporting CCUS uptake.

Significant, also, is that the EU has established the Carbon Removal Certification Framework (CRCF) as its first harmonised, voluntary system for certifying high-integrity carbon dioxide removals, including CCS-enabled permanent removals such as BECCS and DACCS. The European Commission will further assess the potential integration of CRCF-certified removals into the EU ETS by 2026, with careful consideration of market impacts and system integrity.

The EU Modernisation Fund, which is financed through auctions of EU ETS allowances, supports lower-income member states' investments in modernising the energy system, encompassing renewable energy, energy efficiency, and the just transition of carbon-intensive regions.

15 Carbon Gap (2024) CCS Directive

Table 1: Summary of CCS landscape in Europe

EU	Maturity status: N/A		
Supporting policies & regulations			
CCS target & emitting regulatory body	**CCS legal regulatory framework**	**CCS commercial framework**	**Cross border CO_2 shipping**
CO_2 injection capacity of at least 50Mt of CO_2 per year by 2030 Net-Zero Industry Act (NZIA)	EU CCS Directive & Industrial Carbon Management strategy (ICM)	Not yet a formal cross-border EU-level available	Not yet a formal cross-border EU-level available, rather supportive regulatory frameworks that enable cross-border collaboration such as Trans-European Networks for Energy (TEN-E), Projects of Common Interest (PCIs), Connecting Europe Facility (CEF) and London Protocol
Economic & Funding consideration			
Carbon pricing		EU ETS	
CCS Financials			
Funding scheme	CCUS IF Fund Carbon Capture & Utilisation Innovation Fund	CEF Fund Connecting Europe Fund	
Scope	Major funding program that supports the demonstration and commercial deployment of innovative low-carbon technologies, including CCS. Aims to finance a varied project pipeline, achieving an optimum balance between a wide range of innovative technologies in all eligible sectors and countries. Amounts for €40 billion from 2020 to 2030 (portion of this amount corresponds to CCS)	Major EU funding mechanism designed to enhance Europe's connectivity across the transport. With a total budget of €33.71 billion allocated for the 2021-2027 funding period, the programme supports projects that bridge gaps in European infrastructure.	
Support receiver	Emitter, T&S	T&S	
Duration of scheme	10 years	6 years	
Specific CCS risk protection	De-risk the first-of-a-kind innovation projects financially	Strengthen cross-border transport and geological storage infrastructure	
Additional considerations	N/A		

2.2.2 The United Kingdom

The United Kingdom has established a comprehensive and mature framework to enhance the bankability and investability of CCUS projects through a tiered approach to risk management. At the highest level, the cluster-based strategy, (e.g. East Coast and Hynet Clusters), facilitates multiple emitters connecting to shared T&S infrastructure. This model achieves economies of scale, optimises network utilisation, and enables effective risk-sharing across participants.

Supporting this cluster approach, the UK has implemented tailored business models that underpin long-term investment certainty. On the capture side, Carbon Contracts for Difference (CCfDs) provide revenue stabilisation, while on the T&S side, regulated asset base (RAB) models offer a familiar and robust framework drawn from the energy and utilities sectors. These mechanisms collectively manage cross-chain risks inherent in cluster setups.


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Complementing these layers, the government support package (GSP) acts as an insurer of last resort, stepping in to cover residual risks not addressed by the CCfDs or RAB models, such as such as those for T&S, Industrial Carbon Capture (ICC), and hydrogen production (HPBM), providing long-term support and confidence to investors. For instance, demand risks are supported by the government through the Transport and Storage Regulatory Investment model (TRI) model, and income revenue support is proposed to T&S operators. The Economic Regulatory Regime (ERR) is the framework used to calculate the operating revenue required by a T&S operator. This calculation, in turn, determines the fees (or tariffs) that the capture plant must pay to us.[16]

Finally, the UK Government's ability to enhance the bankability of the CCUS business models lies in its capacity to provide robust financial support both at the early, capital intensive stages of projects, though mechanisms such as the Carbon Capture & Storage Infrastructure Fund (CIF) or pre-FEED funding, and over the long term, by ensuring stable revenue streams through instruments like RAB for investors and T&S infrastructures; as well as CCfDs for investors and emitters. Such mechanisms provide investors with long-term confidence until carbon prices reach sufficient levels exceeding FAOK decarbonisation costs and ultimately making projects bankable.

While this substantial government support has successfully accelerated the deployment of two FOAK clusters in the CCS sector, the sector's heavy reliance on highly regulated business models may pose future challenges in the transition towards a self-sustaining commercial market which the government aims to create by the mid-2030s.[17]

This risk arises from uncertainties over whether existing market mechanisms, particularly the UK ETS, are robust enough to independently ensure bankable CCS investments, as current carbon price projections remain relatively low, based on forecasts published by the UK Department for Energy Security and Net Zero for the period of 2025 to 2050[18]. Moreover, although industries are theoretically exposed to the UK ETS, a significant proportion of emitters continue to receive free allowances to prevent carbon leakage, further weakening the market's decarbonisation signal[19]. The long-term reliance on substantial government subsidies is unlikely to be sustainable for the public sector. Therefore, it is essential for the government to implement targeted and effective policies to support the transition towards a self-sustaining CCS market.

Measures to unlock cost reduction opportunities have yet to be fully developed. These include enabling cross-border CO_2 transport, enhancing competition for network access, establishing low-carbon standards to stimulate demand, and promoting green public procurement options. Such initiatives could simultaneously lower the strike price and accelerate the adoption of CCS and CCUS technologies.

16 CATF Risk Allocation and Regulation for CO_2 Infrastructure: A UK Case Study
17 DESNZ (2023) Carbon Capture, Usage and Storage, A vision to establish a competitive market
18 DESNZ (2024) Traded carbon values used for modelling purposes
19 UK GOV (2021) UK ETS Allocation Table for operators of installations

Focus and specific risks

- Transition from a subsidy led CCS market to a self-sustaining commercial CCS market by mid 2030s.
- Ensure operationality of Track 1 and Track 2 clusters and FID decision for remaining projects.
- Ensure that the emitter voice is represented when T&S specs/ops are set with the possible creation of a "deal architect" role to link legal, technical, commercial workstreams and accelerate escalations.
- Small-emitter aggregation entities (public or regulated private) to bundle volumes, negotiate contracts and grid slots.
- Payment options for connection charges.
- Support supply chain and skills development.

Likely policy asks

- Explore voluntary carbon markets (VCMs)
- Pursue EU–UK ETS alignment to allow CO_2 captured in one jurisdiction to be recognised as stored in the other, a key step in opening up a Europe-wide CO_2 storage market and private investment.
- Ensure policy continuity regarding funding mechanisms, existing market mechanisms and energy prices.
- Identify a viable route to market for the next round of projects beyond the first clusters committed to by Government, as the current support framework only provides a route to market to develop the first UK CCS clusters.

Best practices and lessons learned

Cluster based approach:

- A cluster-based approach has proven instrumental in mobilising investment and supply chains, creating strong public–private partnerships. It enables multiple emitters to connect to shared T&S infrastructure, driving economies of scale, mobilising investment and supply chains, and fostering strong public–private partnerships.

Financial support for business models and Government risk endorsement:

- Financial support is provided by the government both at the early, capital intensive stages of projects, though mechanisms such as the CIF or pre-FEED funding, and over the long-term through a RAB for T&S operators and CCfD for emitters;
- De-risking mechanisms effectively manage cross-chain risks and increase investors' confidence, for example CO_2 leakage risk is covered by the GSP.

Table 2: Summary of the CCS landscape in UK

UK	Maturity status
Supporting policies & regulations	
CCS target & emitting regulatory body	Guiding target of 20 to 30 Mtpa CO_2 captured and stored by 2030 CCUS Net Zero Investment Roadmap (DESNZ)
CCS legal regulatory framework	Adaptation of the EU CCS Directive
CCS commercial framework	CCS Business model
Cross border CO_2 shipping	Provisional application of London Protocol Article 6
Economic & Funding consideration	
Carbon pricing	UK ETS
CCS Financials	
Funding scheme	CCfD Carbon Contract for Difference / CIF CCUS Infrastructure Fund / RAB Regulated Asset Based
Scope	Mechanism where emitters receive a subsidy for the difference between OPEX costs and the effective market price (e.g. UK ETS – free allowance). / Financial support allocated to the development of early business models for transport and storage operators, £1Bln total budget. Partial allocation to the Pre-FEED funding aimed to support the design and feasibility studies. / Regulated model allowing investors in transport and storage projects to earn a stable return at all stages of CCS deployment.
Support receiver	Emitter / T&S / T&S
Duration of scheme	10 - 15 years / n/a / n/a
Specific CCS risk protection	Fluctuating and insufficient UK ETS prices / Reduces up front capital and early development risk / De risking of the construction phase risk for investors
Additional considerations	✓ Transport and Storage Regulatory Investment Model ✓ Adjustable CfD-type subsidy ✓ O&G producers will receive tax relief on payments into decommissioning funds for assets repurposed for CCUS ✗ Regulated returns could limit interest of certain investors ✗ Complex and lengthy process

2.2.3 Norway

Norway continues to lead technologically and operationally in offshore CO_2 storage, building on decades of experience and strong public backing through initiatives such as the Sleipner, the Snøhvit, and more recently the Longship project. Norway introduced a carbon tax on offshore petroleum activities in 1991, long before most countries adopted carbon pricing. The tax applied to CO_2 emitted from oil and gas production on the Norwegian Continental Shelf and had been applied early for projects like Sleipner and Snøhvit. The government is currently evaluating proposals for a reversed tax and reversed auction scheme offering monetary rewards for every tonne of CO_2 removed and supporting CCS incentives. A report by the Climate Committee is due in November 2025. Enova, a state-owned enterprise under the Ministry of Climate and Environment, extends financial support and guidance for climate and energy projects through the Climate and Energy Fund. This support also includes CDR projects.

Norway's flagship project Longship is Europe's first complete CCS value chain project at industrial scale, and is aimed at decarbonising heavy industries. The Longship project includes capturing CO_2 from industrial

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sources – cement and waste incineration - in the Oslo-fjord region (Brevik) and shipping liquid CO_2 to an onshore terminal on the Norwegian west coast, Øygarden. From there, the liquefied CO_2 is transported by pipeline to offshore storage in the North Sea. Phase 1 of the project (Heidelberg Materials' cement plant) is complete, and Phase 2 was approved in March 2025, and will increase T&S capacity from 1.5 $MtCO_2$pa to at least 5 $MtCO_2$pa. The second project of Longship includes capturing CO_2 from Hafslund Oslo Celsio, Norway's largest waste incineration facility. After nearly two years of delay due to various reasons, the project was initiated in 2025 (FID). Heidelberg Materials and Celsio are expected to deliver approximately 0.4 $MtCO_2$pa and 0.35 $MtCO_2$pa, respectively.[20]

Following the success of Northern Lights[k] and the Longship projects, the CO_2 Highway Europe project aims to scale up carbon capture to 18-27 $MtCO_2$pa to reduce unit costs for CCS and serve the EU emitters. The project envisions an integrated offshore pipeline network connecting emitters in Northwestern Europe to Norwegian storage facilities via export terminals in Zeebrugge, Belgium, and Dunkirk, France, with future expansion potential to the Netherlands and other European countries.[21]

Focus and specific risks

- Risk around commercial scaling and post-2030 pipeline capacity.
- Lack of dedicated national strategy for CCS
- Heavily state-funded projects; lack of formal benefit/risk-sharing, support mechanisms.[22]
- Norway's funding model is not fully regulated but remains flexible to market demands with state-aid support.
- Criticism of Longship is that the State mainly supported Phase 1 and the Celsio project, without having a real regulatory support mechanism for projects after.

Likely policy asks

- Establish clear national CCS targets.
- Set a clear national CCS roadmap.
- Streamline export permits and EU-ETS crediting alignment.
- Government to assess the reverse tax proposal and set a clear baseline along with clear CCS strategy.

20 Gassnova (2025) The Longship CCS Project
21 Equinor (no date) CO_2 Highway Europe (Accessed: 20 February 2026)
22 Carbon Gap (2025) Carbon Removal Policy in Norway

Best practices and lessons learned

Best practices identified are stemming primarily from the longship project:

State Aid Provider

- Northern Lights has developed a clear business rationale for CO_2 transport and storage. Through the state aid arrangement, the company has been encouraged to engage with prospective clients across Northern Europe. Future profitability for Northern Lights will depend on the tariffs paid by these new customers.
- As Longship projects are the first-of a-kind, they face greater uncertainty than typical, well-established projects. As a result, industrial partners required cost sharing up to an agreed maximum level for both capital and operating costs.
- Longship has underlined the absence of climate policies that motivate CCS in sectors outside the EU ETS, as well as for biogenic emissions (relevant for Hafslund Oslo Celsio). These are addressed through the state aid agreements.
- It has been agreed that, in the event of leakages in relation to the Longship project, the cost will be shared between Northern Lights and the state.[23]

Regulation of resource management and safe storage

- The licensing regime for CO_2 storage is now in place, and necessary permits have been issued for Longship, being the first industrial CCS chain under the legal framework.

Regulation of CO_2 Emissions

- The EU ETS price signal alone did not provide enough economic motivation for Longship's industrial partners to invest in the project.
- CO_2 transport by ship was not covered under the EU ETS. For Longship, this challenge has been managed through specific arrangements between the industrial partners and the Norwegian state.
- Norway's system for reporting CO_2 emissions including captured and stored emissions from biogenic sources has been updated to align with the latest international reporting standards.
- A measurement regime for CO_2 in the CCS chain has been set. This is a prerequisite for transferring the responsibility for the CO_2 between parties in a CCS chain.
- A temporary framework has been created to allow cross-border CO_2 transport for offshore storage under the London Protocol. For Northern Lights to enter commercial deals with emitters outside Norway, a bilateral agreement must exist between Norway and the emitter's home country[24] (currently Norway has these agreements with Belgium, Great Britain, Germany, Switzerland, the Netherlands and the United States of America).[9]
- Revenue guarantees ensure that the government covers T&S tariffs if emitters experience delays, incorporate revenue-sharing mechanisms to prevent excessive profits, and impose budget caps to limit state financial exposure.

Lessons learned from Longship on cost-reduction:

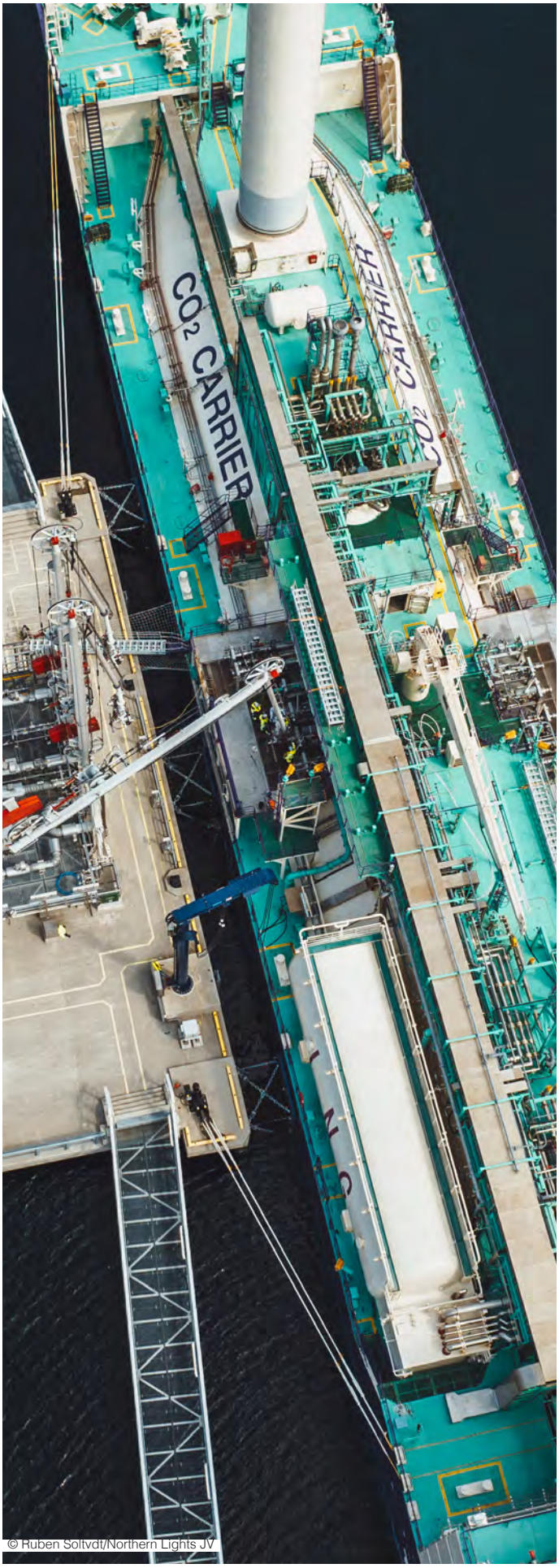
Gassnova's[m] analysis of the potential to reduce costs in the CCS value chain indicates the following:

- Gassnova's analysis of regulations and frameworks across the CO_2 value chain shows that storage sites face the biggest challenges related to long-term CO_2 liability costs. More specifically, theseThese challenges risenarise from uncertainties regarding the responsibility offor monitoring and managing potential CO_2 leakages over the long term, and how these responsibilities should be defined and assigned.
- Furthermore, Gassnova's cost analysis shows that the supplier market for CO_2 capture needs more expertise in CCS practices adapted from land-based industries to create cheaper solutions.
- Emitters need to improve their procurement skills to better match CO_2 handling technologies.
- Receiving terminals could reduce costs by using experience from land-based construction and applying specific CCS regulations.
- Clear rules are needed to define who is responsible for stored CO_2 in permanent offshore storage.
- Scaling up to capture 1.5 $MtCO_2pa$ shows that capture processes make up the biggest part of investment costs. This means developing capture technology along with the integration conditions with emission sources should be a top priority.[25]
- A mature oil & gas industry with established skills and expertise helps to maximise cost efficiency.

23 Gassnova (2022) Responsibility for CO_2 in the chain
24 Gassnova (2022) Regulatory Lessons Learned from Longship
25 Gassnova (2025) Potential for Cost Reductions in the CCS value chain

Table 3: Summary of the CCS landscape in NO

NO	Maturity status
Supporting policies & regulations	
CCS target & emitting regulatory body	Not mentioned but flagship projects are supported
CCS legal regulatory framework	Adaptation of the EU CCS Directive
CCS commercial framework	Not yet available
Cross border CO_2 shipping	Launched bilateral discussions with several countries including BE/UK/DE/CH/NL/US. Provisional application of London Protocol Article 6
Economic & Funding consideration	
Carbon pricing	EU ETS and carbon tax
CCS Financials	
Funding scheme	"Reverse tax" incentive: Enova
Scope	Reverse CO_2 tax incentive (under development) to pay producers capturing and storing CO_2 & Tax exemption for facilities that implement CCS.: Enova, overseen by the Ministry of Climate and Environment, offers financial backing and guidance for climate and energy projects via the Climate and Energy Fund, and this support also covers CDR projects.
Support receiver	Emitter: Emitter, T&S
Duration of scheme	To be finalized on November 25: 3 years
Specific CCS risk protection	Remediates financial and commercial risks: Focuses on early market introduction (pre-FEED maturation). Grants for scale of pilot and demonstration projects and full-scale testing.
Additional considerations	☑ Government is perceived to support CCS and storing of imported CO_2 in Norway ☒ Dedicated support for the flagship project, but not yet a clear business model for the next wave of projects



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2.2.4 The Netherlands

The Netherlands has adopted a pragmatic business-to-business approach to CCS, characterised by significant government involvement in shared infrastructure through government-owned companies, while utilising market mechanisms for emitters. The Netherlands affirms that carbon removal, along with other decarbonisation activity, is essential for climate goals. The government plans for this sector to contribute between 20 and 25 Mtpa of CO_2 reduction by 2040 (about 10% of 1990 emissions). To guide this scale-up, a Carbon Removal Roadmap[26] is part of the government's Climate Plan 2025-2035. The EU CCS Directive is incorporated in the Mining Act, thereby establishing the legal basis for the safe geological storage of CO_2.[27]

Government-owned companies have co-invested in and participated in open infrastructure projects, allowing industrial emitters to contract services on a transparent and non-discriminatory basis. For emitters, the primary government support is an operational subsidy via the CCfD (SDE++) and a CO_2 tax exemption for captured emissions. However, CCS lacks a specific dedicated funding mechanism, requiring emitters to compete for support with other decarbonisation projects.

The two largest projects running in the Netherlands are Porthos[28] (Port of Rotterdam CO_2 Transport Hub and Offshore Storage) and Aramis[29]. Porthos, currently under construction by the Port of Rotterdam Authority, Gasunie, and EBN, exemplifies early government backing and is fully subscribed to store 2.5 $MtCO_2pa$ starting in 2026. The follow-up project, Aramis, is an open-access expansion led partially by TotalEnergies, Shell and Eni who will develop the offshore CO_2 storage facility as well as EBN, and Gasunie. It aims to construct a major pipeline from Rotterdam to North Sea storage fields, with ambition to scale the capacity to 22 $MtCO_2pa$ by 2030 and is designed to create synergies with projects like Porthos to serve broader industrial demand across Northwest Europe. The project faced significant challenges with its initial consortium cooperation model and open access setup, leading, in addition to business case related issues, to the withdrawal of key partners, Shell and TotalEnergies, from the pipeline transport infrastructure. With these difficulties reaching FID for the offshore transport infrastructure ownership of the Aramis project without state support, the government (through EBN & Gasunie) responded by taking up the role of a majority infrastructure owner and operator[24]. Moreover, the government has announced support for the ramp-up risk ("vollooprisico") in the initial phase of the project.[30]

The CO_2next project is a nationally significant infrastructure project aiming to unlock CO_2 shipping solutions, including cross-border collaborations.


© PorthosCO2

CO_2next is a planned open-access terminal for liquid CO_2 at the Maasvlakte in Rotterdam, as part of new CO_2 infrastructure. This terminal will provide industrial CO_2 emitters the chance to supply CO_2 for permanent storage in depleted gas fields beneath the North Sea (CCS) or (in the future) for the reuse of CO_2 (CCU). The CO_2next is being constructed by Gasunie, Vopak, Shell and TotalEnergies. Furthermore, the estimated launch capacity will be 5.4 M $MtCO_2pa$ rising to approximately 10 $MtCO_2pa$ in the first growth phase and potentially reaching 15 $MtCO_2pa$ depending on market demand and CCS chain development. A final investment decision is targeted for 2026/2027; subject to approvals and on-schedule delivery, the terminal could commence operations in 2029/2030.[31]

The Delta Rhine Corridor, a Dutch-German infrastructure project establishing pipelines between the Port of Rotterdam and German industrial centres, is currently being developed. Gasunie, a key initiator, is directly responsible for developing and building the essential H_2 and CO_2 networks within the Netherlands as part of this cross-border energy transition effort.[32]

26 Ministerie van Klimaat en Groene Groei (2025) Routekaart Koolstofverwijdering
27 Rijkswaterstraat (no date) CO_2 storage (Accessed: 20 February 2026)
28 Porthos (2023) First CO_2 storage project in the Netherlands is launched
29 Aramis (no date) A large scale CO2 transport and storage service (Accessed: 20 February 2026)
30 Tweede Kamer (2025) Brief Van De Minister Van Klimaat En Groene Groei
31 CO2NEXT (no date) CO2NEXT Website, About Section (Accessed: 20 Feb 2026)
32 Gasunie (no date) Delta Rhine Corridor (Accessed: 20 February 2026)

Despite the progress, permitting remains a barrier, as demonstrated by the delay of the Porthos project due to nitrogen emission-related issues[33]. Furthermore, the Dutch government decided (in 2011 and reaffirmed later) to avoid pursing onshore storage publicly, limiting options to offshore geological storage in the North Sea (depleted gas fields) and secured capacity in Norway's Northern Lights project through bilateral agreements.[34]

While the first large-scale commercial CCS projects have received significant European governmental support, this limited number of projects is unlikely be sufficient to fully de-risk the sector for private-sector investors.

Focus and specific risks

- Commercial parties' difficulties in reaching FID without government backing (Aramis project).
- SDE++ subsidy scheme is a key tool to bridge the difference in costs for ETS and total cost for capture. The scheme, however, favours the lowest cost per tonne of CO_2 reduction, potentially excluding more expensive FOAK projects.
- Additional storage capacity should be secured across borders.
- Lack of demand for low-carbon products. This could provide sufficient certainty to investors if such a market exists.

Likely policy asks

- Institutionalise the public ownership model (Gasunie/EBN); replicate this best practice in EU guidance for certain MS; extend to new clusters.

Best practices and lessons learned

- A pragmatic approach characterised by using existing market mechanisms for industrial emitters (such as the operational subsidy through the SDE++ and CO_2 tax exemption for captured emissions) while simultaneously maintaining significant government involvement in developing and co-investing in foundational infrastructure.
- Implementing the highly competitive SDE++ national funding scheme to bridge the cost difference between the EU ETS price and the total cost of capture and storage, thereby channelling public funds efficiently towards viable decarbonisation projects.
- Institutionalising public ownership of backbone T&S infrastructure by using state-owned entities, specifically Gasunie and EBN, to de-risk initial investment and ensure long-term operational stability.

Table 4: Summary of the CCS landscape in NL

NL	Maturity status
Supporting policies & regulations	
CCS target & emitting regulatory body	Guiding target between 20-25 Mtpa of carbon removal technologies including CCUS. Klimaatakkoord includes a guiding target of 7.2 Mtpa untill 2030.
CCS legal regulatory framework	Adaptation of the EU CCS Directive
CCS commercial framework	Only subsidy for emitters
Cross border CO_2 shipping	Bilateral agreement NL/NOR Provisional application of London Protocol Article 6
Economic & Funding consideration	
Carbon pricing	EU ETS and carbon tax
CCS Financials	
Funding scheme	SDE++
Scope	Mechanism covering the operational cost difference between low carbon production and EU ETS prices.
Support receiver	Emitter
Duration of scheme	15 years
Specific CCS risk protection	Provides long term operational revenue certainty
Additional considerations	☑ Straightforward subsidy award criteria ☑ SDE++-type subsidy for emitter ☒ Lack of flexibility in subsidy adjustments ☒ No specific CCS subsidy domain

33 Gasunie (no date) Porthos timeline (Accessed: 20 February 2026)
34 Carbon gap (no date) Carbon Removal Policy in the Netherlands (Accessed: 20 February 2026)

2.2.5 Germany

Historically, Germany has operated under a de facto ban on commercial CCS since 2012 (legally limited to research and demonstration only, with tight caps and a Federal State (Länder) veto, "Landesrechtliche Gebietsbestimmung" under the 2012 Carbon Capture and Storage Act (Kohlendioxid-Speicherungsgesetz, KSpG); no commercial projects were permitted and new applications ceased after 2016), driven by strong political and public opposition to onshore storage, and concerns that the deployment of CCS projects would threaten transition to renewable energies.[35]

This changed significantly in November 2025 with the adoption of the Carbon Dioxide Storage and Transport Act (KSpTG) by the Bundestag[36]. This amendment marks a major policy shift, creating the legal basis for the commercial, industrial-scale use of CCS and the development of CO_2 pipeline infrastructure.

The law establishes strict guardrails:

- CCS is primarily limited to offshore storage in the German Exclusive Economic Zone (EEZ) and continental shelf, excluding marine protected areas.
- Onshore storage remains prohibited at the federal level, but an "opt-in" clause allows individual Federal States (Länder to permit it on their territory through state legislation.
- Government funding for CCS is restricted to unavoidable industrial emissions and is excluded for emissions from coal-fired power generation.[37]

Following the passage of the KSpTG, the focus now shifts from legal permission to practical implementation, embedded in the Carbon Management Strategy: initial guidelines (Eckpunkte) were issued by the previous government, but it remains to be seen what elements the current government will consider for the CMS.[38,39]

Focus and specific risks

- **Lack of storage capacity:** Preliminary studies suggest that Germany's domestic offshore capacity in the North Sea EEZ may not be sufficient to absorb all expected hard-to-abate industrial emissions[40]. This forces a high reliance on cross-border CO_2 T&S, which requires international agreements and robust infrastructure[m].[41]
- **Public acceptance:** Despite the shift to offshore storage, public scepticism remains high. Concerns centre on safety (leakage, seismic activity), costs, and the fear that CCS will weaken overall decarbonisation efforts (i.e. maintaining fossil fuel reliance).
- **Timing mismatch between regulation and projects:** industry readiness (e.g., Heidelberg Materials) outpaces regulatory progress. Context of new leadership questioning project's inertia.
- **Industrial competitiveness and energy cost pressure:** High energy prices reduce appetite for CAPEX-intensive CCS projects.

Likely policy asks

- **CMS finalisation:** The CMS will provide quantitative targets, guide the strategic build-out of infrastructure, and determine the priority of CCS applications.
- **EU State Aid Approval of CCfDs:** The German government has integrated CCS into its industrial decarbonisation funding, launching a €6 billion program that will use two-way CCfDs. These long-term, state-backed contracts will compensate companies for the added cost of CO_2 abatement, protecting investors from carbon price volatility and bridging the cost gap until new technologies become market competitive. However, the scheme requires final approval from the European Commission under EU state aid rules. While the EC has approved previous CCfD schemes, the revised inclusion of CCS and the new conditions still need approval for the

35 Grobe Kreul et al. (2024) Understanding public acceptance amidst controversy and ignorance: The case of industrial Carbon Capture and Storage in Germany
36 Deutscher Bundestag (2025) Beschlussempfehlung und Bericht des Ausschusses für Wirtschaft und Energie zum Kohlendioxid-Speicherung- und Transportgesetz (KSpTG) (Drucksache 21/2594)
37 Sachverständigenrat für Umweltfragen (SRU) (2024) Stellungnahme zur KSpG-Novelle: CCS in Deutschland rechtlich auf unvermeidbare Restemissionen begrenzen. SRU
38 Deutscher Bundestag (2024) Government presents carbon management strategy
39 Bundesministerium für Wirtschaft und Klimaschutz (BMWK) (2024) Eckpunkte der Bundesregierung für die Carbon Management Strategie (CMS). BMWK
40 Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), & CDRmare INSIGHT (2024) CO_2-Speicherung tief unter der deutschen Nordsee: Die sieben wichtigsten Erkenntnisse aus der GEOSTOR-Forschung. BGR
41 Bellona (2025) CO_2-Speicherkapazität: Von der Potenzialabschätzung zur realistischen Erschließbarkeit

next round. This is a critical next step. In addition, questions remain regarding the duration of the CCfD scheme (15 years) and the financial bankability of CCS projects in the long term.

- Advocate for swift approval of the German CCfD scheme by the European Commission, emphasising the critical role of CCfDs in unlocking private investment in industrial decarbonisation and meeting EU-wide climate targets.
- **Infrastructure build-out:** The immediate task is to develop a CO_2 pipeline network ("turbo speed" is the industry ask) to connect industrial clusters to domestic offshore storage sites and to European ports for CO_2 transport to countries like Norway and the Netherlands[42].
- **Public infrastructure funding:** Industry groups argue that CO_2 pipelines, critical for creating a national CO_2 market, should receive significant public funding and subsidies to accelerate construction and derisk in the long term the initial investment phase, similar to energy or hydrogen grid financing.

It's worth noting that the CCfD programme and BIK (Industry and Climate Action federal funding programme) are the only programmes funding industrial CCU/S applications.

- **Geological certainty and planning:** Developing a detailed Storage Registry (Speicherkataster) is a crucial policy ask. This register would provide high-certainty data on geological storage sites, reducing exploration risks for developers and promoting timely investment.
- **Regulatory certainty:** Implementing a burden system (Pönalensystem) is being discussed to ensure compliance among capacity providers, promoting fair and open access to the CO_2 transport network for all capture facilities. At EU level under the Net-Zero Industry Act (NZIA), Article 23, Member States must set penalties by July 2026. Germany is preparing its approach, but implementation details are outstanding. In addition, the EU CCS directive should be updated to enable the exploration of non-EU storage sites due to the lack of CO_2 offshore storage sites in continental Europe.

Germany has completed the essential political step of reversing its decade-long anti-CCS policy, acknowledging the technology as an indispensable tool for climate neutrality in hard-to-abate industry. The challenge now is one of execution speed and bankability.

While the German approach is not a traditional "best practice" model (as it follows other nations), its policy is characterised by a high degree of caution and rigour:

- The explicit, legally enforced exclusion of coal-fired power plants and the narrow focus on unavoidable industrial emissions set clear, non-negotiable climate integrity boundaries for the technology's application.
- The use of CCfDs provides a robust, market-aligned financial derisking model, making large-scale CCS projects more viable in the face of volatile European carbon prices.

Table 5: Summary of the CCS landscape in DE

DE	Maturity status		
Supporting policies & regulations			
CCS target & emitting regulatory body	**CCS legal regulatory framework**	**CCS commercial framework**	**Cross border CO_2 shipping**
Not mentioned but explicitly supported by government, 2045 Net Zero target	Adaptation of the EU CCS Directive (The KPsG Act)	CCS Act	Envisaged ratification of London Protocol
Economic & Funding consideration			
Carbon pricing		EU ETS and carbon tax	
CCS Financials			
Funding scheme	CAPEX Funding Bundesförderung Industrie und Klimaschutz	CCfD Klimaschutzvertrage	
Scope	Support based on the cost difference between climate friendly process and conventional process	Infrastructure for the transport and storage of CO_2 will be made available under the same scheme. Maximum subsidized costs will represent 30% of total costs	Conditioned support for OPEX Condition: reimbursement to the government of the difference between decarbonized production and conventional production if more economically advantageous to decarbonize (double sided CCfD mechanism).
Support receiver	Emitter	T&S	Emitter
Duration of scheme	n/a	n/a	15 years
Specific CCS risk protection	Reduces upfront capital risk	n/a	Reduces revenue uncertainty during operation
Additional considerations	☑ Two-sided CfD-type subsidy for emitter ☑ Substantial OPEX subsidy budget available, albeit not dedicated to CCS ☑ Specific CCUS capex subsidy ☒ First funding rounds of capex subsidy still need to take place		

42 Energiewirtschaftliches Institut an der Universität zu Köln (EWI) (2022) CO_2-Infrastrukturen sind wichtig für ein klimaneutrales Deutschland (Policy Brief). EWI

2.2.6 Denmark

Denmark aims to establish itself as a carbon storage hub by offering a portion of its substantial geological CO_2 storage capacity to other European countries for their carbon storage needs. GEUS estimates this capacity at up to 22 Gt CO_2, far exceeding domestic needs of around 9 Mtpa. The Danish Energy Agency has launched a new tendering process under its CCS Fund (only Danish emitters are able to participate, as the origin of the CO_2 must be Danish) to promote CCS project development. The CCS Fund has a budget of DKK 28.7 billion (around €3.8–4.2 billion) and is designed to secure around 2.3 $MtCO_2$ per year from 2030. As of February 2026, the Danish Energy Agency received two final binding bids (BAFO) by the extended deadline of February 3, following pre-qualification of 10 projects in May 2025 and initial bids from eight. Contracts are expected to be awarded around April 2026, pending EU state aid approval, with facilities required to commission by December 2029 for full operations in 2030.

The Danish CCUS roadmap 2024[43] outlines the status and the future of CCUS development in Denmark. All Danish Energy Agency implementation scenarios involve significant amounts of CO_2 capture from point sources (biogenic & fossil) ranging from ~2 to 5.5 $MtCO_2$pa in 2030 and from ~4.5 to 8 $MtCO_2$pa in 2050. The Danish Energy Agency obliges producers to submit detailed plans with means and milestones to achieve their CCS targets. The incorporation of CCS within a wider green technology framework reflects a comprehensive strategy for reducing emissions. The two key projects, Bifrost and Greensand, are both dedicated to facilitating permanent geological storage of CO_2 in the Danish North Sea. Together, these projects have the potential to achieve a combined annual CO_2 storage capacity of up to 24 Mt[44]. Greensand received its first full-scale commercial storage license in December 2025 (up to 2.4 Mtpa over 30 years, operations mid-2026); Bifrost retains EU PCI status. The CCUS Fund, NECCS Fund and CCS Fund are the main governmental funds that support CCS development[45]. Ørsted has won the first CCS tender; however, participation in the biogas-focused NECCS (biogas-focused) was also launched, but participation was limited, and costs remained very high.

Greensand and Bifrost represent early offshore developments, while several onshore storage licenses have been tendered to major players including INEOS and Equinor. These initiatives position Denmark to emerge as a regional CO_2 storage hub, thanks to its extensive geological capacity, which is estimated to be approximately twenty times greater than its domestic storage requirements. However, most projects remain pre-FID, and progress depends on resolving timing

mismatches, creating stronger integration across the CCS value chain and either reducing the cost of the entire value chain or generating more revenue, through subsidies or CDR credits.

Denmark's CCS market is progressing but remains characterised by excessive costs, and fragmented coordination and regulatory support. The government has shown strong willingness to invest, primarily through large-scale subsidy tenders, but the approach has so far been funding-driven rather than strategic. The state provides no risk-sharing, leaving developers fully liable for delivery failures under subsidy contracts. This has discouraged broad participation, with some emitters withdrawing from the ongoing funding round. Overall, Denmark's CCS environment is defined by generous funding and liberalised infrastructure regulation (any developer can develop CO_2 infrastructure; it is not restricted to a state-owned TSO), yet hindered by insufficient coordination, uncertainty around storage readiness, and dependence on the Norwegian Northern Lights project as a near-term storage option.

43 INNO CCUS (2024) Danish CCUS Roadmap 2024

44 Carbon Gap (no date) Carbon removal policy in Denmark (Accessed: 20 February 2026)

45 Bellona (2025) NECP assessments

Focus and specific risks

- Huge storage capacity positions Denmark as a potential regional CO_2 storage hub (e.g., serving Germany & Sweden).
- Government strategy is perceived as merely allocating investment instead of developing a cohesive market framework.
- All project-on-project risks are pushed onto the market. Bidders (emitters) must manage the full CCS value chain, and because no transport or storage provider is willing to take on these risks, subsidy contracts place heavy liabilities on emitters. As a result, many emitters are withdrawing from the funds.
- Substantial penalties exist for non-delivery of stored CO_2 under the CCS tender, which need to be backed up by financial guarantees from the bidders (emitters).
- Many bidders are municipally owned, so politicians must decide whether the municipality will back the required financial guarantees. This could create governance challenges, as newly appointed boards may be reluctant to issue guarantees.
- Most bidders have not yet obtained permitting; although the CCS tender provides some flexibility, permitting remains a major barrier for many.
- There is ongoing discussion on local versus cross-border storage, and the use of Danish taxpayer funds to store CO_2 abroad. (e.g., DK-based emitter Ørsted will send CO_2 to Northern Lights storage basin in Norway).
- NECCS (biogas-focused) was launched, but overall low competition and high bid prices observed.

Likely policy asks

- Adopt a cluster-based model, coordinate emitters, pipelines, and storage hubs.
- Address project-on-project risk, ensure aligned timelines and liability/risk coverage.
- Move beyond ad-hoc subsidies, create a strategic roadmap integrating capture, transport, and storage.

Best practices and lessons learned

Denmark is one of just several EU member states (Sweden, Netherlands) to have active deployment incentives for CDR. The country has allocated public funding for various CDR approaches, with tenders currently being conducted under the NECCS Fund

The CCS, CCUS, and NECCS funds serve as targeted subsidies for CCS and CDR, each offering long-term contracts to financially support a select number of projects. The NECCS fund operates as a "technology-neutral" subsidy, concentrating on capturing CO_2 from biogenic sources and developing a value chain for negative emissions. With a budget of DKK 2.5 billion (approximately €330 million), the fund aims to capture 0.5 $MtCO_2$pa, starting in 2025.[44]

Table 6: Summary of the CCS landscape in DK

DK	Maturity status		
Supporting policies & regulations			
CCS target & emitting regulatory body	**CCS legal regulatory framework**	**CCS commercial framework**	**Cross border CO_2 shipping**
Danish CCUS roadmap 2024 projects CO_2 capture from ~2-5.5Mtpa in 2030 and from ~4.5-8Mtp in 2050	Adaptation of the EU CCS Directive	All players can bid for subsidy as long as they can prove that they have control of the CO_2 throughout the value chain	Ratification of London Protocol Article 6 and bilateral agreements with BE/FL/FR etc.
Economic & Funding consideration			
Carbon pricing		EU ETS and Danish carbon tax	
CCS Financials			
Funding scheme	CCUS Fund	NECCS	CCS
Scope	Administrated by the Danish Energy Agency for CCS deployment, budget of 8bln DKK. Eligible CO_2: Fossil, Process, biogenic	Supports capture and storage of biogenic CO_2 (incl DACCS), budget of 2.6bln DKK Eligible CO_2: Biogenic, atmospheric	Supports capture and storage of fossil and biogenic CO_2, budget of 26.8bln DKK Eligible CO_2: Fossil, process, biogenic, atmospheric
Support receiver	Emitter, T&S	Emitter, T&S	Emitter, T&S
Duration of scheme	24 years	7 years	15 years
Specific CCS risk protection	Reduces the cost for first-movers in establishing full CCS chains	Reduces the cost for first-movers in establishing full CCS chains for biogenic CO_2	Reduces the cost for first-movers in establishing full CCS chains
Additional considerations	☑ Competitive tender subsidy with indexed payments for emitter, transport & storage companies ☑ CCS dedicated subsidy fund ☒ Alignment of value chain required ☒ Additional complexity of subsidy award criteria		

2.2.7 France

The French CCS approach is highly centralised and government-driven, focused on industrial clusters and stepwise infrastructure development from coastal hubs toward inland emitters. France divides CCS deployment in three phases. The initial phase, running from 2025 to 2030, focuses on capturing 4 to 8 $MtCO_2$pa primarily from industry sites located in key industrial-port areas like Le Havre, Dunkerque, Saint-Nazaire, and the Rhône axis. The subsequent phase, from 2030 to 2040, will significantly expand these efforts, aiming for 12 to 20 $MtCO_2$pa. This growth will be driven by new CCS network development, EU carbon market changes, and extending capture to sectors like waste incineration and biogenic emissions. Finally, the third phase, covering 2040 to 2050, will be crucial for achieving deep industrial decarbonisation and climate neutrality, necessitating the capture of 30 to 50 $MtCO_2$pa, with biogenic CO_2 representing approximatively 60% of that amount. This final target requires capturing all residual emissions from sites belonging to hard-to-abate industries and developing new sources, such as biorefining or DAC.[46]

To support the first major projects, the state provides financial assistance (similar to CCfD) to emitters[47]. This aid covers CCS costs while factoring in savings from avoided EU-ETS costs. The funding is designed to provide sufficient investment incentives over long periods (up to 15 years), encouraging private investment in CCS infrastructure. In addition, funding is available to support upstream (TRL 1-4) industrial

decarbonisation research, including CCS. France established a clustering approach for a first phase of projects in 4 zones, and 6 zones in the second stage. Through the national call for projects and part of the France 2030 plan, these "Zones Industrielles Bas Carbone" (ZIBaC) will be able to receive funding linked to CCS. To build out the CCS network, France's aims to call for expressions of interest from emitters through public consultations.

In the short to medium term, France is dependent on non-domestic offshore storage sites in the North Sea and the Mediterranean, which are facilitated through bilateral agreements and international cooperation. In the longer term, France aims to develop its own national storage capacity; however, permitting is a blocking factor to, a.o. onshore storage.

Focus and specific risks

- A clustering approach is key to France's CCS strategy, with steps to growing the network.
- Private banking has not yet been mobilised for CCUS projects, as calls for interest are limited at this stage.
- There is a lack of aligned times between emitters and infrastructure.
- There is not yet a dedicated and fully operational CO_2 regulator regime (the Commission de régulation de l'énergie (CRE) has published analyses and recommendations on the regulatory framework for hydrogen and CO_2 infrastructure and is positioned to play a role in regulating CO_2 transport tariffs).
- A move toward regulated, open-access CO_2 infrastructure is anticipated post-2030.
- It is unclear where CO_2 quality management and responsibility for venting or leakage sits between emitters, pipeline, terminals, and storage.
- Permitting for onshore storage projects remains a blocking factor.

Likely policy asks

- The shift toward a regulated infrastructure model with intertemporal cost allocation and government support is essential to attract financing and ensure scalability.

46 Ministère de l'économie des finances et de la souveraineté industrielles et numérique (2024) Etat des lieux et perspéctives de déploiement du CCUS en France

47 Global CCS Institute (2025) Carbon Contracts for Differences (CCfDs) in Europe

Table 7: Summary of the CCS landscape in FR

FR	Maturity status
Supporting policies & regulations	
CCS target & emitting regulatory body	Clear NCEP with targets andmentioning of CCUS (stratégie nationale bas-carbone). Guiding CCUS targets established in État des lieux et perspectives de déploiment du CCUS en France. 2025-2030: 4 - 8 $MtCO_2$/year; 2030-2040: 12-20 $MtCO_2$/year; 2040-2050 30-50 $MtCO_2$/year.
CCS legal regulatory framework	Adaptation of the EU CCS Directive
CCS commercial framework	*N/A - due to projects being mostly run through the government*
Cross border CO_2 shipping	Provisional application of London Protocol Article 6
Economic & Funding consideration	
Carbon pricing	EU ETS
CCS Financials	
Funding scheme	A scheme similar to CCfDs is mentioned in the CCUS strategy and approved by the EU commission
	ZibaC funding scheme for clusters for Studies, coordination, planning, collective governance
	SPLEEN funding for Upstream Research and Development (R&D)
Scope	It acts as a long-term contract (typically 15 years) where the State covers the financial gap between the actual high cost of operating the CO_2 capture technology and the fluctuating price of the ETS
	Provides grants (subsidies) to groups of industrial and local stakeholders to perform the necessary studies, coordination, and engineering to design shared, cost-effective infrastructure. This includes planning the collective CO_2 transport network (pipelines) needed to link multiple emitters to an export terminal or storage site
	Typically aimed at Technology Readiness Levels (TRL) 1 to 4
Support receiver	Emitter
	Emitter, T&S
	N/A
Duration of scheme	15 years
	N/A
	–
Specific CCS risk protection	Provides long term operational revenue certainty
	Mitigates the cross value chain risks and initial permitting risks
	N/A
Additional considerations	N/A

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2.2.8 Belgium

Belgium is actively constructing the legal and infrastructure foundations necessary to launch a robust CCS value chain, supported by strong regional and industrial agreements. While the National Energy and Climate Plan (2021-2030) acknowledges the status of CCS projects, it lacks clear national targets for deployment[48]. Both the Flemish and Walloon governments established comprehensive regional legal frameworks in 2024 covering the entire CCS value chain. Specifically, the Flemish decree set a precedent by establishing a legal framework for CO_2 pipeline transport, liquefaction, and reuse - extending beyond the EU's CCS Directive - with the Walloon government adopting an equivalent decree in the same year.

Fluxys c-grid, a subsidiary of Fluxys, has been appointed by both the Flemish and Walloon governments as the CO_2 network operator for both regions[49]. This entity is currently developing the long-term vision for an open-access CO_2 network. This network involves CO_2 pipelines connecting the nation's main emitter hubs to designated CO_2 exit hubs. A key export hub under development is Antwerp@C in the Port of Antwerp-Bruges, which will provide open-access infrastructure for the transport, liquefaction, and shipping of CO_2 for offshore storage[50]. Directly integrated with this hub, as a first phase, is Kairos@C, a crucial emitter-side project, which clusters major industrial CO_2[51]. To accelerate the development of CCS infrastructure, in November 2025, the Flemish and Walloon governments, alongside seventeen major industrial companies, signed the Declaration of Mons, committing to urgently implementing CCS.[52]

Belgium is reliant on cross-border infrastructure for storage, and is positioning itself as a transit country, notably for CO_2 captured in Germany. The federal government is actively engaged in international efforts on CO_2 T&S, including signing bilateral agreements with Denmark and the Netherlands[53]. Projects such as the CO_2 highway to a storage portfolio in Norway, show a clear collaboration between Equinor and Fluxys in Belgium and other international companies[21]. Also, Carbon Connect is a planned cross-border CO_2 pipeline network linking the UK and Belgium. The project has recently received Project of Mutual Interest (PMI) status from the European Commission and once built, it will connect Zeebrugge to CO_2 storage sites in the UK's Southern North Sea.

Larger CCS projects are typically funded through a bespoke funding mechanism. A pilot for a CCfD tool has been deployed and has a budget of €70 million over 10 years, however CCS is not yet in scope[54]. In addition, Flanders is allocating €400 million between 2020 and 2040 to advance innovation technologies related to decarbonisation, including CCS and CCU. This funding is primarily aimed at pushing the boundaries of regional technology and is not aimed at industrial scale deployment[55]. Flanders, due to its regional responsibility for CO_2 networks, has played a key role in co-signing these agreements.

Focus and specific risks

- Fragmented financial support for CCS projects through bespoke funding mechanisms.
- Cluster approach for CCS projects.

Likely policy asks

- Establish more structural public funding for CCS projects such as CCfDs and coordination between regions.
- Protect initial investments in transport infrastructure and leverage the cross-border opportunities.
- Policy coordination and cooperation between regions and countries

48 Belgium government (2025) Nationaal Energie & Klimaatplan (2021-2030)
49 Fluxys (2025) Fluxys c-grid appointed as "CO_2 Network Operator" in Flanders
50 Fluxys (2026) Antwerp@C Export Hub (Accessed: 20 February 2026)
51 Air Liquide (no date) Kairos@C (Accessed: 20 Feb 2026)
52 Vlaams netwerk van ondernemingen (2025) CCS as a lever for a strong and sustainable industry
53 Service public de Wallonie (2024) Décret relatif au transport de dioxyde de carbone par canalisations
54 Benelux Business Roundtable (2024) Memorandum on cross border Hydrogen and CCS Value Chains
55 Flanders Industry Innovation Moonshot (unknown) About moonshot Flanders (Accessed: 20 February 2026)

Table 8: Summary of the CCS landscape in BE

BE	Maturity status
Supporting policies & regulations	
CCS target & emitting regulatory body	National Energy and Climate Plan (2021-2030) in which the current state of CC(U)S projects in Belgium is mentioned, but no clear targets are set
CCS legal regulatory framework	Adaptation of the EU CCS Directive
CCS commercial framework	*N/A - due to projects being mostly run through the government*
Cross border CO_2 shipping	Provisional application of London Protocol Article 6
Economic & Funding consideration	
Carbon pricing	EU ETS
CCS Financials	
Funding scheme	CCfD tool (pilot-not applicable ot CCS)
	"Made to measure" funding for CCS projects
Scope	Region of Flanders has deployed a CCfD approach which had been tested through a pilot project
	Larger projects can get tailored "Made-to-measure" funding. This however is a lengthy process that needs to be approved by many instances
Support receiver	Emitter
	Emitter, T&S
Duration of scheme	N/A
	N/A
Specific CCS risk protection	Provides long term operational revenue certainty.
	N/A
Additional considerations	N/A

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2.2.9 Italy

Italy's National Energy and Climate plan (NECP) for the period of 2021 to 2030 officially recognises CCS, alongside BECCS and DACCS, as essential technologies for achieving climate neutrality. In alignment with the EU Net Zero Industry Act, Italy has also committed to the collective EU target of 50 $MtCO_2$pa injected by 2030[56], introducing a national target of 4 $MtCO_2$pa by 2030.

Italy has significant CO_2 storage capacity within its territory, enabling the permanent storage of substantial volumes of captured CO_2. An assessment of this storage potential has been undertaken, concentrating on depleted oil and gas fields, particularly those within Eni's portfolio of mining rights. This evaluation has estimated a storage capacity of around 750Mt across both offshore and onshore depleted oil and gas sites.

Italy's CCS deployment strategy is largely anchored in the development of the onshore and offshore infrastructure associated with the Ravenna CCS project. With its integrated transport, reception, compression, and storage capabilities, Ravenna CCS also serves as the core of Italy's broader cross-border cooperation with France within the PCI Callisto Mediterranean CO_2 Network (eligible for CEF, although Italy has not so far received funding). This initiative aims to integrate Italy into a wider Southern European system for CO_2 capture, transport, and storage, positioning the country as a CO_2 emitter, storage provider, and receiver. Several emitters across the EU Mediterranean basin have already expressed interest in delivering CO_2 to the Ravenna CCS storage sites. Ravenna CCS is formed by the co-venture of Eni and SNAM and aims to store up to 515 $MtCO_2$ in a modular phased approach. The emissions targeted will include CO_2 from a wide range of industries in Italy as well as from imported CO_2 sources across the Mediterranean region. This will be enabled by the multimodal Ravenna CCS infrastructure, which envisages pipeline transport, CO_2 shipping and other non-pipeline transport (NPT) solutions.

Italy has demonstrated recent commitment to CCS deployment through institutional and legal updates. The existing legal framework for geological CO_2 storage was significantly updated in 2023, providing a clearer path for permitting and operations. To ensure deployment is managed effectively, the government also created a dedicated CCS Committee and Technical Secretariat within the Ministry of Environment and Energy Securit.[57]

In February 2024, the Ministry of Environment and Energy Security set up a multidisciplinary task force involving regulators, research centres, industry associations, energy operators, universities, and key players across the industrial and technology value chain. This effort led to the publication, in August

2025, of the "CCUS Study - Technical, Economic and Regulatory Analysis for the Development of the CCUS Value Chain." The study is a cornerstone for building Italy's CCUS sector, essential to achieving national decarbonisation targets. It outlines a regulated model for T&S infrastructure, ensuring transparent and non-discriminatory access, and envisages incentives, support mechanisms, and guarantees for stakeholders. The document provides a technical and strategic foundation for future legislation and reinforces CCS as a key enabler for decarbonising hard-to-abate sectors, positioning Ravenna as the reference geological hub for CO_2 storage in the Mediterranean.

At the international level, the Mediterranean CCS Plan, formalised through an agreement in March 2023 and updated in December 2024, signed with France and Greece, underscores Italy's leadership in building a regional regulatory coalition to promote cross-border

56 European Commission (no date) The EU's 2030 Carbon storage target (Accessed: 20 February 2026)

57 Slaughter and May (2024) From vision to reality: a regulatory guide to carbon capture, usage and storage in Europe

CCS deployment. These actions demonstrate the Italian government's strong commitment to CCS through a clear policy direction, a robust legislative framework, and active international cooperation. However, regulatory progress remains to be made in order to fully support CCS deployment, (e.g. Italy must still ratify amendments to the London Protocol concerning CO_2 cross-border transport, and domestic projects are generally still in the early stages).

It is expected that a CCS regulatory framework will be implemented in 2026, comprising CfD-style support for Italian emitters and a RAB-style regime for T&S infrastructure.

Focus and specific risks

- Prioritise public funding for high climate value CCS applications.[58]
- Ensure robust assessment of CCS projects based on whole life cycle analysis in order to ensure their climate positive impact.
- Need for completion of the regulatory framework, permitting to be sped up, uncertain cross-border legal framework.

Likely policy asks

- Develop an implementation plan for CCS deployment.
- Conduct strict monitoring, reporting and verification accounting for direct and indirect GHG emissions as well as national and international GHG.
- Early-stage support for both operators and emitters to cover funding gaps, definition of the business model with clear regulatory indications.
- Expectations that a CCS regulatory framework will be implemented in 2026, including CfD-type support to Italian emitters and a regulated RAB-type regime for the T&S infrastructure.

Table 9: Summary of the CCS landscape in IT

IT	Maturity status
Supporting policies & regulations	
CCS target & emitting regulatory body	4Mt of CO_2 injection capacity is projected to be developed by 2030 as stated in the National Energy and Climate Plan revision of 2024. Awaiting regulatory body further definition by 2025/early 2026
CCS legal regulatory framework	Adaptation of the EU CCS Directive
CCS commercial framework	N/A
Cross border CO_2 shipping	No revision yet of the London Protocol, reported intention to file a formal declaration for CO_2 transport with France and Greece
Economic & Funding consideration	
Carbon pricing	EU ETS
CCS Financials	
Funding scheme	CCUS Study released in August 2025, it highlights the need for supporting incentives and a total financial allocation of 1B€ (Capex upfront) + €300–350 million per year (Opex) to initiate the CCS supply chain in Italy. Under considerarion.
Scope	N/A
Support receiver	N/A
Duration of scheme	N/A
Specific CCS risk protection	N/A
Additional considerations	The CCUS study is a cornerstone for building Italy's CCUS sector, essential to achieving national decarbonization targets. It assists CCUS deployment as such: ☑ It outlines a regulated model for transport and storage infrastructure, ensuring transparent and non-discriminatory access ☑ It envisages incentives, support mechanisms, and guarantees for stakeholders.

58 Bellona (2024) NECP assessment Italy (Accessed: 20 February 2026)

2.2.10 Romania

Romania possesses significant strengths and potential for CCS development, which could position the country as a key contributor to Europe's decarbonisation efforts.[59]

This potential is driven by the combination of substantial storage capacity and major industrial emitters, although a recent decline in industrial production has been witnessed nationally. Key sectors include cement (5.80 $MtCO_2pa$), iron and steel (1.42 $MtCO_2pa$), chemicals (0.45 $MtCO_2pa$), paper and pulp (0.29 $MtCO_2pa$), and downstream oil and gas (2.16 $MtCO_2pa$), collectively accounting for 38% of national emissions[45]. In addition, the already established industrial clusters in the power/heat, and cement/lime sectors further consolidate CCS opportunities in Romania[60]. As Romania's largest emitter, the cement sector offers significant CCS potential, coupled with the opportunity to develop low-carbon cement products which could potentially align with EU market interests.

Romania's large underground storage potential (estimated at 22.6 Gt of CO_2), comprised of saline aquifers and depleted hydrocarbon fields, creates a strong foundation for CCS deployment both in Romania and in other European countries[45]. However, more detailed geological and economic investigation is needed to ensure realistic storage estimates. Nevertheless, this theoretical storage capacity is fragmented into numerous small onshore reservoirs and a limited number of large offshore sites. Ultimately, the effective CCS implementation will depend on transporting liquid CO_2 to offshore storage facilities, making this approach critical for viability and impact.

Romania benefits from extensive European Union financing opportunities including access to the EU Modernisation Fund, EU Innovation Fund, EU Regional Development Fund and EU Cohesion Fund with a total budget of €6.75Bn allocated solely to Romania's green transition[61]. Between 2021 and 2030, Romania is eligible for more than almost 12% of the total budget from the EU Modernisation Fund.[62]

Romania's National Energy and Climate Plan (NECP) establishes a target to reduce national GHG emissions by 85% by 2030 compared to 1990 levels, including a specific CO_2 capture target of 50% of emissions from the cement and lime sector by 2050. Achieving these targets will depend on the timely development of storage sites. Despite sufficient theoretical capacity, delays in opening these sites could create a bottleneck on the storage side.


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Strong institutional interest in CCS was historically demonstrated with the Getica project in 2011, one of Europe's earliest CCS initiatives, though it was put on hold in 2012 due to a lack of governmental support. Currently, Romania counts two key projects. The first announced project is the OMV Petrom demonstration project, which aims to capture CO_2 emissions at the Petrobrazi refinery and is being delivered in collaboration with 19 research institutes.[63]

The second project, announced in November 2025, is the Carmeuse and Holcim Carbon Hub CPT 01 project, which aims to capture emissions from Holcim's cement plant in Câmpulung and which is supported by a grant from the EU Innovation Fund, leveraging EU ETS auction revenues. This project is currently (February 2026) at the commercial stage and has not yet reached FID.

Despite positive developments, significant challenges still need to be overcome in order for CCS deployment to be unlocked at scale at the national level.

Funding overall remains insufficient and points to a clear gap for Romanian industries between eligibility for EU funding mechanisms and ability to access the schemes.

59 Carbon free Europe (2025) Powering Europe's Clean Future: Romania's Role in Hydrogen and Carbon Capture and Storage Infrastructure
60 CATF (2025) The Carbon Capture and Storage Opportunity for Romania
61 European Commission (2025) €31.5 billion for Romania's economic, social and territorial cohesion, competitiveness and green and digital transition in 2021-2027
62 European Union (no date) Modernisation Fund (Accessed: 20 February 2026)
63 Energynomics (2024) OMV Petrom will test an innovative CCS facility at Petrobrazi

This challenge stems from a generally underdeveloped research and innovation capacity due to divided public organisations and persistent gaps in policy compared to other European Member States.[64]

In addition to funding issues, Romania reports the current absence of private-sector investments and enablers for large-scale CCS, while permitting regulations are in place and the CO_2 transportation regulations are currently under assessment by ANRE. Moreover, Romanian petroleum law allows the operators to directly store CO_2 (without exploration), but applicable to the reservoirs that are qualified with the required attributes. Romania transposed the EU CCS directive into the emergency government ordinance 64/2011 (CCS Directive transposing act); however, a country-wide lack of administrative and procedural details for large commercial CO_2 projects has been reported.

Finally, aging infrastructure, low public acceptance and under researched CO_2 storage areas have also been highlighted in recent publications as obstacles Romania must overcome to leverage its full CCS potential.

Focus and specific risks

- Establish third-party access to the CO_2 transport network, if pipeline transport is deemed.[65]
- Address cross-border CO_2 transportation and cooperation, by ratifying amendment on the London Protocol to allow the international transport of CO_2 for under-seabed geological storage.[57]
- Conduct further studies on national non pipeline transport.[57]
- Create partnerships between academic and private institutions to develop research opportunities.[57]
- Transposed the EU CCS Directive into national law (EGO 64/2011), which was amended in 2024 through Emergency Governmental Ordinance No.139/2024 ("EGO 139/2024"), to allow storage permits to be issued directly to existing oil and gas titleholders (in alignment with NZIA targets).[66]
- Direct funds to research to fully explore storage potential in Romania.[67]
- Highlight more CCS in the national strategies.[67]

Likely policy asks

- Refer to Phase 0 policies

Table 10: Summary of the CCS landscape in RO

RO	Maturity status		
Supporting policies & regulations			
CCS target & emitting regulatory body	**CCS legal regulatory framework**	**CCS commercial framework**	**Cross border CO_2 shipping**
Not mentionned but officially recognised as a key technology for decarbonisation in the National Energy and Climate Plan revision of 2024	Significant progress on the adaptation of the EU CCS Directive	N/A	Yet to ratify an amendment to the London Protocol to allow the international transport of CO_2 for under-seabed geological storage
Economic & Funding consideration			
Carbon pricing		EU ETS	
CCS Financials			
Funding scheme	No nationally driven funding mechanism. But, access to many EU funding. Romania's updated NECP highlights the plan to develop dedicated support schemes for carbon capture projects, including the mobilisation of EU ETS revenues.		
Scope	N/A		
Support receiver	N/A		
Duration of scheme	N/A		
Specific CCS risk protection	N/A		
Additional considerations	N/A		

64 Carbon Free Europe (2025) Powering Europe's Clean Future: Romania's Role in Hydrogen and Carbon Capture and Storage Infrastructure

65 Iceland Liechtenstein Norway (2022) Building momentum for the long-term CCS Deployment in the CEE region: CCS National Roadmap Romania

66 AMCHAM (2026) EU mandates operational CO_2 injection capacity by 2030 – creating a new market with Romania at the centre

67 Bellona (2024) NECP Assessment Romania

2.2.11 Poland

The Polish Energy Strategy (PEP 2040) and the updated 2024 Polish National Energy and Climate Plan (NECP) both recognise CCS as a potential technology for meeting the country's decarbonisation goals[68]. According to the draft of the Polish NECP (2025), Poland will prepare a strategy for the development of CO_2 capture, transport, storage and use in the economy, although no specific timeline is provided for this initiative.[69]

Significant projects are currently underway, including the ECO$_2$CEE project, which is part of the second PCI/PMI list, and the GO4ECO Planet project, supported by the EU Innovation Fund and aiming to capture 1.0 MtCO$_2$pa by 2030.


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As a lower-income EU member state, Poland qualifies for support from the EU Modernisation Fund, although it is not currently supporting and CCS projects in the country.

Recent regulatory developments have begun to establish a foundation for CCS deployment in Poland. At a national level, an amendment to the Polish Mining Law permits the geological storage of CO_2, although stakeholders still report gaps, especially regarding CO_2 T&S[70]. On a more positive note, relevant legislative files are now being revised to allow for new storage locations, especially onshore, thereby providing a legal basis for CCS projects.

At the transnational level, the ratification of the London Protocol, which is critical for enabling cross-border CO_2 transport, has not yet been done or planned[71]. Moreover, Poland is one of the contracting parties to the Helsinki Convention ("HELCOM'), a multilateral agreement between countries in the Baltic Sea Area to prevent and eliminate marine pollution, which generally prohibits the "deliberate disposal at sea or into the seabed of wastes". Unlike the London Protocol, the HELCOM was never amended to specifically allow for the geological storage of CO_2 under the seabed, and many contracting parties interpret the term "seabed" to include the subsurface, which would make CO_2 injection prohibited. Poland, Denmark and Sweden have initiated discussions within HELCOM to clarify or amend the Convention, as current restrictions block potential offshore storage projects in their exclusive economic zones.

Table 11: Summary of the CCS landscape in PL

PL	Maturity status
Supporting policies & regulations	
CCS target & emitting regulatory body	Not mentionned but highlighted for further assessment regarding potential in the National Energy and Climate Plan
CCS legal regulatory framework	Transposed the CCS Directive into national law with the Geological and Mining Law and other legal acts
CCS commercial framework	N/A
Cross border CO_2 shipping	Yet to ratify an amendment to Article 6 of the London Protocol allowing the international transport of CO_2 for under-seabed CO_2 storage
Economic & Funding consideration	
Carbon pricing	EU ETS
CCS Financials	
Funding scheme	No nationally driven funding mechanism
Scope	N/A
Support receiver	N/A
Duration of scheme	N/A
Specific CCS risk protection	N/A
Additional considerations	N/A

68 Ministry of Climate (2019) National Plan in the field of Energy and Climate by 2030

69 Ministry of Energy (2025) Draft of National Energy and Climate Plan for 2030, with a perspective until 2040

70 Pop Biznes (2025) Orlen energy believes CCS technology in Poland needs legal changes and separate strategy

71 HELCOM (no date) Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention) (1974)

2.2.12 Greece

Greece's National Energy and Climate Plan (NECP)[72] establishes CCUS as a key strategic pillar, especially for hard-to-abate industries, and confirms that a comprehensive regulatory framework for the entire CCS value chain is currently being developed as a reform of the REPowerEU chapter of the Greek National Recovery and Resilience Plan.

Greece's projections estimate capturing CO_2 from industrial processes at 3.3 $MtCO_2pa$ by 2030, increasing to 3.9 $MtCO_2pa$ by 2050, with several capture projects currently in development. Regarding CO_2 storage, forecasts indicate the availability of geological storage for commercial use, alongside ongoing plans to further explore subsurface options. The Prinos CO_2 storage project is presently underway. For CO_2 transport, a pipeline network plan is being developed collaboratively by the Hellenic Hydrocarbons and Energy Resources Management Company (HEREMA) and the Hellenic Gas Transmission System Operator (DESFA).

CCS projects are extensively utilising funding mechanisms such us the EU Innovation Fund and the Connecting Europe Facility with the latest being ApolloCO_2, awarded €169.3 million under the EU's Innovation Fund[73]. The project is led by ECOLOG and DESFA, and the funding will support the development of a floating liquefaction and storage unit with an initial liquefaction capacity of 3 $MtCO_2pa$, expandable to 10 $MtCO_2pa$[73]. The project's terminal will assist both large and small emitters in Southern Greece to decarbonise their operations. National funding is available through the Recovery and Resilience Fund, which is co-financing the Prinos project, Greece has also announced that potential support mechanisms, similar to CCfDs, will be made available for CCUS projects by 2030. Overall, the government foresees that investment requirements for CCS amount to €1Bn for the 2025-2030 period and around €14.4Bn for the period of 2031-2050.

The country is progressing with its inaugural CO_2 storage project in Prinos, aiming to store 3 Mt by 2030. Plans are also underway to identify additional storage sites and establish volume targets for CCS for 2050. The exploration of geological storage capacities is advancing under the supervision of the Hellenic Hydrocarbons and Energy Resources Management Company (HEREMA), which has served as the competent authority for CO_2 storage since 2022. The volume of CO_2 captured is projected to rise from 3.3 $MtCO_2pa$ by 2030 to 8.4 $MtCO_2pa$ by 2050, with industry expected to account for approximately 4 $MtCO_2pa$, while direct air capture (DAC) is anticipated to contribute 4.5 $MtCO_2pa$ by 2050.

In late 2025, Greece's Ministry of Environment and Energy submitted a bill to the national Parliament establishing an environmentally innovative framework of rules for the safe capture, use, T&S of CO_2 in geological formations. The legislative proposal addresses the key issues for licensing the sector and the conditions for access to storage facilities, and

72 European Commission (2025) Ministry of Environment and Energy: National Energy and Climate Plan - Revised Edition. Athens, Avgoustos (2024)
73 DESFA (2025) DESFA Secures €169.3 Million EU Innovation Fund Grant for APOLLOCO_2, advancing Greece's First Large-Scale CCS Midstream Infrastructure

also provides for compensatory measures for the areas where storage will take place[74]. Furthermore, Greece announced on their NEPC 2025 that a national framework for a voluntary carbon market is under development to enable the trading of carbon credits for offsetting emissions.[72]

Focus and specific risks

- Launch formal national CCS strategy adopt clear targets and implement roadmap.
- Lack of EU ETS price volatility support mechanism.
- Lack of cohesive coordination and commercial model for storage options in Mediterranean (cross-border collaboration required).
- Public awareness is limited.
- A gap identified in the existing regulatory framework is that the process for issuing an exploration permit does not define the duration of the exploration permit.

Likely policy asks

- Refer to Phase 0 policy analysis
- Organise regulated access and pricing for transport and storage, given the limited storage options in the Mediterranean.
- Obtain a strong state role as orchestrator of the value chain.
- Consider CCS strategies for hard-to-abate sectors such as the fertilizer industry and waste incineration, which are currently lacking concrete plans, alongside concrete planning for cement and refineries.[75]
- Involve civil society organisations in stakeholder consultations on CO_2 storage & transport network development to ensure environmental integrity and enhance public trust.
- Set a clear duration for exploration permits.

Table 12: Summary of the CCS landscape in GR

GR	Maturity status
Supporting policies & regulations	
CCS target & emitting regulatory body	Not yet clearly defined, but projection of capture CO_2 from industrial processes at 3.3 Mtpa by 2030 and 3.9 Mtpa by 2050
CCS legal regulatory framework	Adaptation of the EU CCS Directive
CCS commercial framework	N/A Under development
Cross border CO_2 shipping	Ratified the London Convention, but not the London Protocol HEREMA signed a Memorandum of Understanding (MoU) with the Cyprus & Egypt promoting cross-border collaboration
Economic & Funding consideration	
Carbon pricing	EU ETS
CCS Financials	
Funding scheme	Intention to launch a supportive scheme similar to CCfDs, but has not been implemented yet. (through the National Recovery and Resilience Plan Greece 2.0.)
Scope	Commitment to establishment a support scheme similar to CCfDs with a "clawback" mechanism, linked to the EU Emissions Trading System, but it has not been launched yet.
Support receiver	N/A
Duration of scheme	N/A
Specific CCS risk protection	N/A
Additional considerations	N/A

74 Ministry of Environment and Energy (2025) "Regulations for the capture, use, transport and storage of carbon dioxide - Incorporation of Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC and 2008/1/EC of the European Parliament and of the Council, and Regulation (EC) 1013/2006 (L 140)"

75 Bellona (2024) NECP Assessment Greece

2.3 Conclusion – Country lessons (to inform phased roadmap & actions)

How national best practices and maturity gaps informed the Section 1 framework, pathways and "no-regret" priorities

The country-by-country assessment in Section 2 directly informed the maturity framework and the phased approach in Section 1. It shows that Europe does not face a single CCUS "deployment problem", but a set of recurring system constraints: legal readiness, funding design, cross-chain risk allocation, infrastructure sequencing, and cross-border operability, that appear in different combinations depending on each Member State's institutional legacy, industrial geography, societal preferences, and storage endowment. The phased roadmap and the corresponding actions in Section 1 are therefore grounded in observed best practices and lessons learned across leading countries, while also reflecting the realities and gaps identified in a wider set of Member States assessed in this report.

Phase 0 lessons: national readiness is the gating condition

Across the country analysis, the strongest differentiator of near-term delivery is not ambition but national readiness: a clear strategic direction, a functioning legal basis, and competent authorities that can permit and oversee projects at pace. Where these foundations are in place (or rapidly emerging), projects can progress to FEED and FID; where they are missing, the value chain stalls before bankability is even assessed. This is the central rationale behind the definition of Phase 0 and Actions 1–3 in Section 1.

Countries illustrate the range of starting points and activities. **Belgium** has moved quickly on legal and governance foundations through regional decrees covering transport and CO_2 handling, and through the designation of Fluxys as network operator, yet still faces a structural reliance on cross-border storage and fragmented funding tools. **Greece** is building its regulatory and licensing framework and has mobilised major EU funding, but still needs a cohesive national roadmap, detailed permitting definitions (e.g., exploration permits), and a clear commercial model. **Poland** and **Romania** show how gaps in strategy, administrative procedures, and transport/storage regulations can prevent otherwise material industrial and geological potential from translating into investable pipelines of projects. These findings reinforce the report's emphasis that Phase 0 is foundational and country-specific, and a precondition for meaningful participation in EU-wide corridors.

Phase 1 lessons: FOAKs require deliberate risk allocation and credible de-risking

The most mature early movers demonstrate that FOAK delivery depends on three "make-or-break" conditions that Section 1 translates into Phase 1 actions and pathways:

1) Regulation and bankable business models must be made explicit early.

The UK illustrates a highly structured approach: a cluster strategy combined with long-term business models (CCfDs for capture; RAB/ERR-style arrangements for T&S) and an overarching Government Support Package to cover residual risks. This layered approach has strengthened bankability and accelerated FOAK progress, while also raising a longer-term question about how easily a heavily regulated system transitions toward a self-sustaining market. At the other end of the spectrum, **the Netherlands** shows a more pragmatic approach, where state-owned entities (Gasunie, EBN) play an increasingly central infrastructure role while emitters rely on competitive operational support (SDE++) and a tax exemption for captured emissions. The Aramis experience in particular illustrates a recurring lesson for Phase 1: where private actors struggle to reach FID for shared infrastructure under open-access assumptions, the state often needs to step in to protect system build-out and early underutilisation exposure.

2) Public funding must be designed to bridge CAPEX/DEVEX/OPEX gaps, and to adapt project realities.

Across countries, effective support is rarely a single instrument; it is a stack. **The UK** combines early-stage capital support (e.g., pre-FEED/CIF-type mechanisms) with long-term revenue stabilisation for both capture and T&S. **The Netherlands** uses SDE++ as an OPEX-bridging tool that efficiently allocates support but may structurally disadvantage higher-cost FOAKs. **Germany's** model centres on CCfDs as a market-aligned de-risking mechanism (subject to state-aid approval), paired with strict climate-integrity guardrails on scope. **Denmark** demonstrates strong willingness to fund, but also highlights a pitfall: if the tender model pushes project-on-project risks and delivery liabilities too far onto emitters, participation can narrow and delivery can slow.

3) Underutilisation and cross-chain dependency risks are structurally decisive in FOAK markets.

The early European market has limited liquidity and limited optionality; when something is disrupted in one segment, there are few alternative routes. Country experience repeatedly shows that market participants struggle to absorb: (i) ramp-up risk (slow emitter connection), (ii) oversized infrastructure exposure, and (iii) counterparty and outage risks. **The UK** addresses this through regulated revenue constructs, government backstops and its cluster strategy; **the Netherlands** has increasingly acknowledged ramp-up risk (including through the state's role in Aramis); **Denmark's** approach shows the consequences when the state funds but does not share key chain risks. These observations directly underpin Section 1's Phase 1 emphasis on guarantees, utilisation backstops, and clearer cross-chain governance.

Phase 2 lessons: cross-border operability becomes the success factor

As the market moves from clusters to corridors, the country analysis converges on one message: cross-border operability is not optional; it is the scaling mechanism, particularly for Member States with limited or no domestic storage.

Norway provides the clearest reference for a cross-border, shipping-enabled system built around storage as a service. The Longship/Northern Lights project demonstrates how a state-backed model can create a credible international offering (with the commercial upside dependent on future tariff-paying customers), while also highlighting the governance complexity that comes with cross-border transport: temporary frameworks under the London Protocol, and the need for bilateral agreements to enable cross-border CO_2 movements. This directly reinforces the Section 1 Phase 2 focus on harmonising cross-border liability and regulatory treatment, aligning accounting and MRV expectations, and embedding cross-border corridors in EU strategic instruments and funding windows.

The Netherlands' CO_2next terminal and the Delta Rhine Corridor project illustrate the infrastructure side of cross-border scaling (shipping and pipeline links), while **Belgium's** positioning as a transit country (and the PMI status of projects like Carbon Connect) illustrates how interconnection can expand accessible storage beyond national constraints. **Germany's** likely structural reliance on non-domestic storage, driven by offshore-only constraints and capacity uncertainty, further underlines why Phase 2 must treat corridors, terminals, and cross-border alignment as core market infrastructure rather than project-by-project exceptions.

Phase 3 lesson: transitioning away from heavy public support requires demand and credible market signals

A consistent theme across the country analysis is that public support has been essential to unlock early projects, but that the path to a mature market depends on whether demand-side conditions and market signals evolve fast enough to reduce heavy reliance on subsidies and public support.

The UK analysis explicitly raises the question of whether ETS dynamics and free allocation can provide a sufficiently strong long-term signal to replace the current large-scale financial support from the UK government, and notes the importance of measures that unlock cost reduction (competition for access, cross-border transport, product standards, and public procurement requirements). **Germany's** approach illustrates how political and societal preferences can shape the "social licence" for CCUS through strict scope boundaries (e.g., excluding coal power) and a focus on unavoidable industrial emissions. **Norway's** experience reinforces that long-term

scalability requires not just infrastructure, but credible frameworks that enable broader customer participation and cost reductions through scale, supply chain learning, and standardisation.

These lessons link directly to Section 1's Phase 3 North Star: a market where risks progressively sit with the market because (i) frameworks are stable, (ii) networks are connected, (iii) insurance and finance deepen, and (iv) demand-pull for low-carbon products becomes strong enough that CCUS is driven by competitiveness rather than permanent public risk absorption.

Linking back to Section 1: what the country assessment validates

Overall, the Section 2 country analysis supports three core design choices in Section 1:

- A phased approach is necessary because the constraints evolve: Phase 0 is national readiness; Phase 1 is FOAK bankability and cross-chain risk allocation; Phase 2 is corridor-scale interoperability; Phase 3 is market maturation and tapering of public support.
- Some actions are "no-regret" across all contexts (e.g., establishing the legal basis, competent authorities, permitting capacity, liability clarity, aligned funding sequencing, and infrastructure acceleration).
- Other actions have multiple pathways because countries inherit different institutional path-dependence, social and political constraints (e.g., more regulated vs lighter-touch models; tender vs administratively set support; early vs delayed open access; state vs market bearing of utilisation risk).
- Public leadership first, markets later: ownership shifts as scale and confidence grow with clear roles over time: Member States with EU coordination, Industry led delivery.

Finally, while this conclusion highlights a subset of countries to illustrate distinct best practices and lessons, the same maturity logic applies across the wider set of Member States assessed. Many countries are progressing unevenly across the value chain, for example strong on capture ambition but weak on storage readiness; active on EU funding but lacking permitting capacity; advanced on infrastructure concepts but not yet anchored in national legal mandates. This reinforces the report's central message: Europe's CCUS success will be determined by whether countries can close their Phase 0 readiness gaps quickly, deliver Phase 1 FOAK risk allocation and de-risking credibly, and then scale through Phase 2 networks and cross-border corridors without losing investor confidence or market integrity.

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Appendix A: Risks & mitigation measures

Cross chain risks

Overarching risks, defined by their systemic scope, touch upon different risk categories:

- **Cross-chain alignment and dependency risk:** The CCS chain is a system of dependent links. In the absence of a mature, flexible market, a failure or delay in one segment (e.g. transport infrastructure) will immediately disrupt the entire value chain. The nature of the CCS value chain requires complex coordination across multiple actors, yet there is often unclear or unbalanced risk and liability allocation, and no single risk bearer, which complicates financing and insurance.
- **Lack of (domestic) storage capacity and landlocked emitters:** Many countries lack domestic CO_2 storage options and are therefore dependent on cross-border solutions. This increases both regulatory and logistical complexity, potentially slowing down the CCS rollout by requiring cross border coordination. For landlocked emitters, connecting to the value chain is particularly complex and costly due to the distance to limited available infrastructure.
- **Skilled CCS labour force availability:** Limited access to experienced technical personnel across the CCS value chain can delay project delivery and increase costs, as competition for talent spans multiple energy sectors and countries.
- **Coordination risk of CO_2 specifications:** Coordinating CO_2 specification requirements across the value chain remains challenging as each segment (capture, transport, and storage) has different operational challenges. These diverging needs make it difficult to establish uniform rules that work for all actors. The specific objectives and constraints of each part of the value chain are described in the respective sections.

Regulatory risks: Risks related to stability of the governing policy, the legal framework, and the overall compliance burdens are critical as they impact the viability of CCS projects.

- **Policy instability:** CCS projects are highly sensitive to the stability of the long-term policy environment. A key concern is the risk of policy reversals, which undermines long-term confidence in developing and financing CCS projects.
- **Regulatory fragmentation:** Regulatory complexity often stems from fragmentation, specifically

the differences in national transpositions of EU directives. Such discrepancies create varied regulatory frameworks that could significantly hinder the cross-border transport of CO_2 due to a fundamental lack of harmonisation.

- **Over-regulation:** Overregulation, such as strict unbundling rules, can further complicate project financing and the integrated planning of capture, transport, and storage infrastructure. However, the absence of regulatory framework for CCS, for example missing "Rights of Way" for pipelines can delay permitting. Additionally, the lack of strong governmental commitment and clear strategies fails to instil confidence.
- **Permitting, delays and capacity gaps:** The risk of lengthy and fragmented permitting processes is a driver of delays to project timelines and FIDs. This risk is often further enhanced by limited support capacity or lack of expertise in national and regional bodies which can significantly delay FID and discourage crucial partnerships.
- **Public opposition:** While local communities often support CCS projects due to employment and regional development benefits, broader public perception and NGO opposition can still pose legal challenges and reputational risks (e.g., Pycasso project in France[76]).

Economic risks: Risks related to financing and market mechanisms are critical to the commercial viability of CCS projects.

- **High upfront CAPEX:** CCS projects are characterised by high upfront CAPEX and long payback periods, which presents a barrier to financing.
- **Ticket size, liquidity and credit risks:** Large project costs exceeding the lending capacity of individual commercial banks lead to complex financing mechanisms for CCS projects. This also involves the risk of project counterparties (emitters, infrastructure operators, or governments) being unable to meet their financial obligations, which, in turn, creates credit risk for banks and investors relying on those long-term payments.
- **Limited lender appetite for first-of-a-kind projects:** Lenders generally have a limited appetite for untested business models or projects lacking robust government backing. Some have indicated reluctance to invest in technologies below TRL 8.
- **Fragmented and oversubscribed subsidy schemes:** Fragmented financial support creates systemic risk in the CCS value chain and competition between projects for funding streams. The Innovation Fund (IF) is not designed to fund the full infrastructure, risking stranded assets by funding individual inland emitters without guaranteed T&S alignment. Furthermore, the Connecting Europe Facility (CEF), which targets large cross-border projects, provides only an observed 15–25% of the necessary CAPEX, significantly short of aspirational coverage. This insufficient EU-level de-risking forces reliance on varied national funding, which reinforces political and geographic fragmentation instead of building a cohesive pan-European network. At the same time, national schemes are often insufficient to fully support CCS projects, this is especially true for countries lacking a CCfD mechanism, leaving an important unresolved OPEX gap.

Capture risks

Economic risks

- **Stringent CO_2 specifications:** Emitters are often confronted with stringent CO_2 specifications that significantly elevate capture costs. Compliance with these strict CO_2 requirements often necessitates advanced purification technologies (particularly relevant in flexible processes or inconsistent feedstock like waste incineration), with the associated CAPEX potentially exceeding 50% of the total investment. Some emitters have indicated that purification CAPEX can even reach up to 80% of overall investment costs.
- **ETS price volatility:** The volatility of the ETS price is an important challenge, as it directly undermines the long-term revenue visibility needed for bankable projects. Uncertainty on benchmarks causes unpredictability for emitters, further increasing this risk.
- **Lack of demand-side uptake mechanisms:** The absence of a standardised demand uptake mechanism hinders capital mobilisation; the lack of clear demand signals for low-carbon products can refrain discourage industrial emitters from making final investment decisions.

76 Frontier Economics (2024) Success factors for the ramp-up of ccs value chains in Germany

- **Energy affordability and price volatility:** Carbon capture is an energy intensive process which is vulnerable to high volatility of energy prices.
- **Grid access and security of supply:** Reliable electricity grid access is essential for emitters but remains a major challenge, particularly when located outside established industrial or CCS clusters. In addition, depending on the local context, grid reinforcements need to be reserved years in advance and come with substantial upfront costs.
- **Double burden risk:** This risk occurs when a capture facility is operational but is forced to vent the CO_2 due to transport infrastructure failure, delays, a lack of available storage capacity, or CO_2 that is out of agreed upon spec. The risk of a "double burden" arises as emitters and operators who invest in carbon reduction infrastructure are nevertheless held liable for EU ETS compliance costs associated with those unintended emissions beyond their control.
- **Early volume / T&S underutilisation risk:** T&S infrastructure must often be oversized early on to anticipate future demand. This leads to low initial utilisation and significant cashflow gaps in the ramp-up period. Transport operators are heavily exposed, finding it difficult to recover costs without government support or regulated tariffs.

Infrastructure risks:

- **Performance burden:** When a capture facility underperforms compared to its contracted or expected capture rate, the emitter must surrender ETS allowances for uncaptured CO_2 and may face contractual penalties for failing to deliver to the T&S operators (ship-or-pay), reducing revenue predictability and potentially undermining the project's overall bankability (e.g. the double burden risk could for instance be triggered by plant underperformance).
- **Technology and EPC risk:** Many CCS projects involve first-of-a-kind technology deployments (e.g., advanced capture methods). Engineering, Procurement, and Construction (EPC) firms are often reluctant to offer full turnkey contracts or substantial Liquidated Damages (LDs) without shared guarantees, increasing the risk borne by project developers and financiers.

Transport & storage risk

Economic risks

- **Contract termination risk:** Under some legal frameworks, CO_2 transport contracts can be terminated if tariffs change. This creates profound uncertainty for long-term project revenues and bankability, especially for transport infrastructure that requires decades of predictable revenue.
- **Tariff uncertainty:** A lack of clarity and long-term certainty regarding T&S tariffs undermines the financial models of both capture and T&S operators.

Infrastructure risks:

- **Infrastructure risk linked to CO_2 specifications:** When streams fail to meet the required transport and storageT&S specifications (e.g., maximum allowed water content, hydrogen sulfidesulphide, or oxygen content), it can lead to pipeline corrosion and material failure, increased operational and maintenance costs, and compromised safety. Critically, storage operators require stringent CO_2 stream specifications that are dictated by the geological characteristics of the reservoir to guarantee long-term containment and avoid adverse physicochemical reactions.
- **Long-term storage liability risk:** Clear allocation of long-term responsibility for stored CO_2 is paramount for securing investor and insurer confidence. There is a divergence in models – e.g., the UK-style state assumption of liability after a certain period versus the EU framework, which tends to favour long-term operator retention of liability.
- **Leakage risk:** Potential CO_2 leakage from pipelines or storage sites due to well integrity failure, caprock breaches, or faults. Even minor leaks can undermine project credibility and climate integrity, requiring robust monitoring and remediation plans.
- **Pressure transfer risk:** Injection activities can cause pressure migration between adjacent storage sites or geological formations, potentially affecting neighbouring licences or inducing seismicity.

MITIGATIONS

EU-level mitigation actions

Cross value-chain

- **Cross-border EU-wide liability framework:** Clarify legal and financial responsibility for CO_2 at each point across the value chain, thereby de-risking long-term and short-term cross-border infrastructure investment and enabling a single CO_2 market.
- **Clear risk allocation framework:** Implement a clear risk allocation framework at the European level to explicitly define the transfer points and responsibilities for CO_2 throughout the CCS chain, including across national borders. To enable industry development, it is also essential to have a mitigation owner or mechanism capable of underwriting the associated risks. This will provide the legal certainty required for project finance and accelerate final investment decisions.

Capture

- **Mandates for green products:** Establish guaranteed demand for low-carbon materials though mechanisms such as public procurement requirements for specific sectors. This will create a clear business case, allowing emitters to monetise their capture investments and accelerate the decarbonisation of industrial supply chains.
- **Sliding performance scale for public funding:** To mitigate the high risk of complete loss of public funding caused by binary capture targets, public support could be linked to a proportional performance scale. This ensures that even if an emitter fails to meet the maximum CO_2 capture goal, the emitter still receives a predictable percentage of funding corresponding to their actual verified performance.

T&S

- **Standardised CO_2 specifications:** Accelerate the creation of standardised CO_2 specifications across the EU for CO_2 entering the T&S network. This will guarantee interoperability between all segments of the CCS value chain, facilitate third-party access, and lower system-wide infrastructure costs.

Member State–level mitigation actions

Capture

- **Carbon Contracts for Difference:** Deploy Carbon Contracts for Difference (CCfDs) to provide a guaranteed floor price for captured CO_2. This will de-risk CO_2 capture investments for industrial players by guaranteeing revenue stability, independent of short-term ETS price movements.

T&S

- **Regulated Asset Base (RAB) model:** Adopt this mechanism to provide T&S investors with stable, predictable, and regulated revenue streams, significantly lowering the cost of capital and de-risking the development of essential networks.

Mitigation actions requiring EU coordination but – Member State implementation

Cross value-chain

- **EU-MS coordination platform:** Establish an EU-Member States coordination platform to align national CCS roadmaps with EU-wide infrastructure needs.
- **Transparent policy roadmap/grandfathering:** Publish a transparent policy roadmap that can include grandfathering clauses (i.e., assurance that key rules or subsidy levels will be maintained) for projects reaching FID. This will provide long-term regulatory predictability to unlock private capital.
- **Regulatory sandboxing:** Implement regulatory sandboxing mechanisms to allow real-world CCS projects to operate under a temporary, closely monitored, and simplified regulatory framework.

T&S

- **State-backed guarantees:** The EU and Member States can establish state-backed guarantees, such as financial support in the case of early underutilisation. Furthermore, Member States can provide direct government support for T&S infrastructure through funding mechanisms or by facilitating the involvement of (partially) state-owned enterprises.
- **Clear liability transfer:** Implement a clear regulatory process for liability transfer to the specific part of the value chain considering the EU wide liability framework.
- **State assumption of long-term liability:** Establish a framework for state assumption of long-term liability following successful storage site closure and a defined post-closure monitoring period.
- **Public insurance/liability funds:** Create public insurance / liability funds to cover remediation costs post-liability transfer, or in case of a major, early-stage incident. This will provide a necessary financial backstop to complement private insurance and address residual long-term risk.
- **Facilitate necessary infrastructure for T&S:** The EU and Member States can facilitate the necessary infrastructure for T&S, specifically for cross-border infrastructure. This can be done through assigning projects as strategic and of common interest (IPCEI, NZIA strategic projects) to facilitate state aid funding and fast track permitting.

Mitigation actions for industry

Cross value-chain

- **Contract standardisation:** The industry's primary responsibility is to create standard operating procedures for the sector and ensure alignment with stakeholders. Industry players can initiate the standardisation of contracts across the value chain, with a key mitigation need being the creation of a contract blueprint and a standard risk allocation framework.
- **Interact with policy makers:** Share challenges, barriers and best practices as well as needs to ensure policy and regulations are grounded in industrial reality, futureproof and fit for purpose.
- **Communicate with the public:** Inform the general public on the importance of CCS, sharing success stories and addressing concerns and misconceptions.

Capture

- **Effective governance models:** On the capture side, industries can organise themselves to create effective governance models (e.g., Joint Ventures or clusters) to share costs and risks, an approach which should include securing early contractor involvement for CCS projects.
- **Hedge against energy price with volatility PPAs and other long-term contracts:** Emitters can mitigate the financial risk associated with volatile energy prices by securing long-term Power Purchase Agreements (PPA) or other long-term supply contracts.

Mitigation actions for insurers and private investors

Cross value-chain

- **Long term financial products:** Insurance providers and private investors could develop suitable financial products essential for the further financing of CCS projects. This includes creating blended finance models to mitigate liquidity risks and employing portfolio approaches to storage investment. At the capture stage, finance providers can offer products that help industries guard against energy price volatility.

Capture

- **Hedge against price volatility:** The insurance sector can develop and offer hedging products specifically designed to protect industries against sharp and unpredictable fluctuations in energy input costs

Appendix B: Key concepts and abbreviations

Multi-emitter
Currently, CCfDs are only available per single emitter.

Volume backstop
Government-backed mechanism that guarantees a minimum volume of demand (or payment) for the T&S network. It functions by transferring the utilisation risk from private developers and investors to the state, thereby enabling projects to secure the massive financing needed for construction.

Credit fault
A delay in one part of the chain (e.g., the T&S network is not ready) causes the emitter to incur costs (e.g., continuing to pay EU ETS allowances). The fund (or a state-backed contract) provides compensation payments to the suffering party to cover these additional costs and keep them solvent.

Termination/offtake
The emitter closes their plant or fails to deliver the committed CO_2 volume, leaving the T&S operator with a revenue shortfall and potentially a stranded asset. The fund, often through a Revenue Support Agreement RSA, provides top-up payments to the T&S operator to cover their regulated costs and return on investment, thereby shielding them from demand-side failure.

Reopeners
Clauses allowing regulators or parties to revisit tariffs or contracts when costs, inflation, or policy conditions change significantly.

Step-in
allow a public authority, lender, or regulator, to temporarily take control of a project if the private operator fails to meet contractual, technical, or financial obligations.

MSR
Market Stability Reserve, a mechanism under the EU ETS that regulates the supply of emission allowances to keep carbon prices stable and reflective of market conditions. Tool to adjust allowance supply to stabilise carbon prices and strengthen the long-term CCS investment signals.

Rome I/II
Regulation referring to two EU regulations that define which country's law applies to cross-border contracts or disputes. These disputes can come up when CCS projects involve multiple jurisdictions.

Grandfathering
Keeping existing rights or standards for early projects when new rules come in. It gives investors' confidence that regulations will not retroactively change.

Durability Compacts
Long-term public-private commitments ensuring stored CO_2 remains securely contained. It clarifies liability, monitoring, and remediation responsibilities over decades.

European Committee for Standardization (CEN)
Develops technical standards for CO_2 measurement, purity, transport, and storage. It is essential to ensure interoperability and safety across countries.

Open access / Third-Party Access (TPA)
Rules requiring CO_2 T&S networks to be non-discriminatory and open to multiple emitters. It prevents monopolies and improves cost sharing.

MOUs
Memorandum of understanding.

WACC Transparency
Making the Weighted Average Cost of Capital assumptions public ensures fair and consistent regulation. It reduces disputes and lowers investor risk.

Opt-in
Allow emitters, regions, or assets to voluntarily join a regulatory or funding framework (e.g., CO_2 storage permitting) before it becomes mandatory. Particularly useful to scale pilots.

Deal Architect
The "Deal Architect" is a designated role (often an independent entity or a dedicated team within a coordinating authority) whose function is to actively manage and resolve the inherent complexity of a CCS cluster.

NSIP
Nationally Significant Infrastructure Project, UK planning designation that fast-tracks approval for major projects (like CO_2 pipelines or storage) under a single national process instead of multiple local ones.

Trans-European Energy Networks Regulation (TEN-E)
The Rome regulation is a set of EU legal instruments that set rules for cross-border energy infrastructure, including CO_2 networks. It defines eligibility for EU support and permitting facilitation. The Rome regulation arises when a legal dispute has an element connected to more than one country, and you need

rules to determine which country's laws apply to resolve the dispute. The Rome I regulation defines a default rule when countries fail to reach an agreement based on a dispute arising from a contract. The Rome II regulation contains specific rules when the issue arises from physical damage. The Rome regulation applies to all countries of the European Union except Denmark who opted out of it.

Valleys
Inspiration from H2 Valleys EU, “Hydrogen Valleys” fund integrated low-carbon ecosystems; CCUS can piggyback by using shared infrastructure, funding models, and regional clusters for CO_2 handling.

Right-of-way
Legal right to build and operate infrastructure across private or public land. It is essential for laying CO_2 pipelines and reducing project delays.

UK Crown Estate Manages
In the UK, the Crown Estate and Crown Estate Scotland manage seabed rights and offshore leases; coordination with ports and developers ensures efficient use of coastal and storage areas.

Statutory time clocks
Establishing legally binding deadlines (time limits) for regulatory bodies to complete their review stages and grant permits. If the deadline is missed, mechanisms like "tacit approval" or automatic progression can be triggered. Injects certainty and discipline into the process, preventing indefinite delays and making the project timeline predictable for investors.

First-of-a-kind (FOAK)
Refers to the first commercial-scale implementation of a new technology or a new configuration of existing technologies. These projects are crucial for moving innovations from the lab or pilot phase to commercial reality, helping to de-risk the technology and establish proof of concept.

EPC
Engineering, Procurement, and Construction.

T&S
Transport and storage

CEF
Connecting Europe Facility fund is an EU funding program designed to support the development of cross-border infrastructure in energy, transport, and digital sectors.

Project-of-Common-Interest (PCI)
Label under TEN-E for strategic, cross-border projects that benefit more than one Member State grants faster permitting and access to EU funding.

FEED
Front-End Engineering Design

EU
European Union

CCS
Carbon Capture and Storage

CCUS
Carbon Capture Utilisation and Storage

PCI
Projects of Common Interest

SAOK
Second of a kind

EU
European Union

MS
Member States

TPA
Third Party Access

SME
Small and Medium Enterprise

IPCEI
Important Projects of Common European Interest

$MtCO_2pa$
Million tonnes of CO_2 per year

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74. Ministry of Environment and Energy (2025) "Regulations for the capture, use, transport and storage of carbon dioxide - Incorporation of Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC and 2008/1/EC of the European Parliament and of the Council, and Regulation (EC) 1013/2006 (L 140)"
75. Bellona (2024) NECP Assessment Greece
76. Frontier Economics (2024) Success factors for the ramp-up of ccs value chains in Germany

Appendix D: Comments

a: NZE = Net Zero Emissions by 2050 Scenario. Includes large-scale projects with a capture capacity over 100 000 t per year (1000t per year for DAC). Capture projects for CO_2 use are included as long as CO_2 is used in fuels, chemicals, polymers, building materials, or for yield boosting. Within planned CCUS industrial hubs, only identified CO_2 capture projects are included (not the full potential capture capacity of industrial hubs for which capture sources are not specified).

b: Long term storage liability is addressed in the CCS Directive, framework leaves significant discretion to MS on key parameters such as the exact length of the post closure period, the level and form of financial security, and the size of the long-term contribution.

c: A target for storage applicable to all at the same time is not pragmatic. Trading of capacity is necessary. The wider the pool, the more optimal is the target implementation.

d: A core design principle at this stage is to provide legal certainty without over-regulating a nascent market. To support innovation and allow the value chain to mature, MS can use regulatory sandboxes or adaptive regulatory approaches. These mechanisms give developers clarity on what is permissible while avoiding rigid rules that could constrain early business models or delay FOAK deployment. The aim is neither under-regulate nor over-regulate, but to offer a stable framework with enough flexibility for learning, iteration and market formation.

e: Shipping-based CCS models enables flexible, bilateral contracting - not rigid, tariff-regulated pipeline infrastructure. Shipping-based CO_2 transport behaves more like a commercial logistics service than a regulated utility.

f: The UK model has been first designed for a domestic, point-to-point pipeline system, not for an open, international CO_2 shipping market:

- The UK model assumes a national regulator with full jurisdiction over the T&S system while cross-border flow requires multi-jurisdictional oversight.
- The RAB framework relies on predictable domestic tariffs suited for pipeline networks while cross-border shipping is a competitive, fluid, international logistics market.
- State-backed guarantees are tied to UK taxpayers. DESNZ's support package cannot legally or politically extend to foreign emitters shipping CO_2 to the UK, cross-border contractual disputes, liabilities arising in non-jurisdictions.
- UK long-term liability transfer rules are incompatible with EU ETS and EU storage rules

The model was built for early domestic clusters and infrastructure, it does not provide mechanisms for cross-border access rules, tariff harmonisation, mutualised risk across countries, or shared booking systems or TPA across jurisdictions.

g: The UK T&S model is fully regulated, investors returns are capped at an allowed rate or return set by the regulator (Ofgem). This means revenues are stable and de-risked, but upside is fixed.

h: A Utilisation Backstop is a financial guarantee provided by the state (or a designated public entity) to infrastructure operators (e.g., T&S network providers) to mitigate "demand-side" risk during the initial ramp-up phase of a CCS cluster. The mechanism establishes a guaranteed minimum revenue floor by compensating the operator for shortfalls in CO_2 throughput volumes below a pre-agreed threshold.

i: Addressing supply-chain interruption risk ("double burden"): Stakeholders highlighted a critical risk for FOAK emitters linked to CCS supply-chain disruptions. If transport or storage infrastructure is temporarily unavailable, emitters may be forced to vent captured CO_2 while still facing full ETS compliance costs, resulting in a double financial burden. This risk is particularly acute in early phases, when alternative routing options do not exist, and contractual structures are rigid.

Emitters stressed that this exposure remains a major barrier to taking long-term capture commitments and reaching FID. While EU institutions recognise the issue, progress at EU level is constrained by concerns around preserving ETS integrity and avoiding any perception of weakening carbon price signals. As a result, stakeholders called for clear mandates enabling Member States to implement temporary, targeted mitigation measures, with EU guidance defining

acceptable design principles, and only upon verifiable exceptional operational circumstances

Such measures could provide short-term relief for verified, non-fault supply-chain interruptions, while remaining strictly neutral to the ETS market, limited in scope and duration, and subject to monitoring and verification. Stakeholders emphasised that without a credible solution to this risk in Phase 1, early movers face disproportionate exposure, undermining confidence in FOAK CCS investments and delaying FIDs across the value chain.

j: Tapering refers to the gradual decrease over time.

k: Northern Lights is responsible for developing and operating the CO_2 transport and offshore storage (in North Sea seabed) facilities, as part of Longship project.

l: Gassnova was established by the Norwegian authorities in 2005 and is fully owned by the state, has been closely involved in the development of the full-scale CCS project in Norway, Longship.

m: Germany has tabled legislation to ratify the 2009 London Protocol amendment and apply it provisionally (LP.5(14) 2019), plus amend the Hohe-See-Einbringungsgesetz (HSEG) so that CO_2 exports for sub-seabed storage are permitted under strict conditions. As of November 2025, Germany has not yet ratified the amendment but has signalled intent and is working on enabling legislation. In November 2023, Germany (North Rhine-Westphalia) and the Netherlands signed a Joint Declaration of Intent to cooperate on the cross-border pipeline infrastructure for CO_2 and hydrogen as part of the Delta Rhine Corridor.

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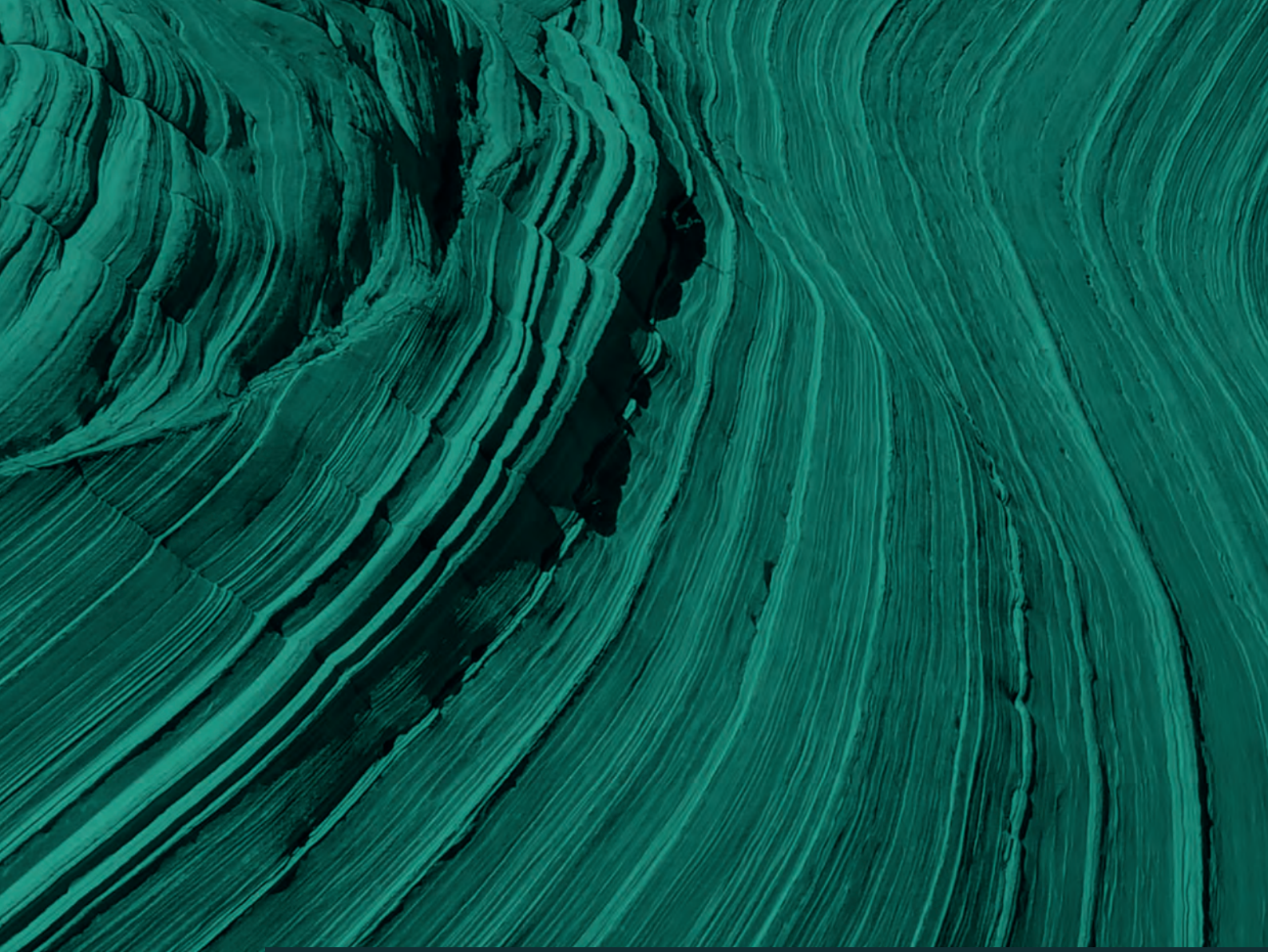

CCSA

The Carbon Capture and Storage Association (CCSA) is the lead European trade association focused on accelerating the commercial deployment of carbon capture, utilisation and storage (CCUS).

We work with our members, governments and other organisations to ensure CCUS is developed and deployed at the pace and scale necessary to meet net zero goals and deliver sustainable growth across regions and nations.

The CCSA has over 120 member companies that are active in exploring and developing different applications of carbon capture, CO_2 transportation by pipeline, ship and rail, utilisation, geological storage, and other permanent storage solutions, end-users of the technology and those in the supply chain, as well as members from management, legal and financial consulting sectors.

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