



Technical and Policy considerations for the development of CO₂ Transport and Storage infrastructure in Europe

(January 2026)

Supporting material to the CCSA response to the Public Consultation on a Legislative Initiative for CO₂ Transportation Infrastructure and Markets.

The Carbon Capture and Storage Association (CCSA) welcomes the opportunity to respond to the European Commission's Consultation on the [Legislative initiative on CO₂ transportation infrastructure and markets](#). We fully support the Commission's ambition to create a functioning, integrated and competitive CO₂ market as part of the broader Industrial Carbon Management Strategy. In light of the EU's 2040 Climate Target and Net-Zero Industry Act (NZIA), this initiative is not only timely but critical to delivering an effective and equitable decarbonisation pathway for European industry.

The CCSA represents a broad coalition of industry, technology providers, infrastructure developers, and stakeholders committed to advancing CCUS deployment in Europe and internationally. Our mission is to ensure CCUS becomes a central pillar of industrial decarbonisation, supporting Europe's climate goals while strengthening energy security. With over 120 member organisations spanning the energy, industrial, finance, and technology sectors, the CCSA provides a collective voice for the development of CO₂ transport and storage networks and enabling policies. We therefore welcome the opportunity to engage with the Commission on this important revision.

The responses provided by the CCSA reflect the diversity of business models, project maturity levels, geographic contexts and roles across the CCS value chain. Storage developers, transport operators and emitters may face different challenges, just as early movers differ from later adopters and regional conditions vary across Europe.

This diversity underlines the need for a regulatory framework that is pragmatic, flexible, stable and predictable, rather than overly prescriptive. Early deployment should not be constrained by assumptions about future market structures. Regulation should enable learning, collaboration and scale-up over time, ensuring that today's solutions do not limit tomorrow's opportunities.

1. Regulatory framework

The CCSA considers that early regulatory development should prioritise essential enablers, clear permitting, technical standards, monitoring rules, and practical de-risking measures, rather than attempting to define a harmonised economic framework at this stage. Member States require flexibility to adopt approaches suited to their local circumstances and market maturity, avoiding premature regulation that could burden early projects or constrain innovation.

A robust, fit-for-purpose EU framework should establish high-level regulatory principles while enabling a smooth transition for existing and early projects as the CCS value chain develops. This includes providing clarity on access and service-provision criteria, deploying dedicated instruments that facilitate anticipatory infrastructure investment across the entire CCS chain.

Investors also require a credible long-term view from the outset. Even within a light-touch, phased approach, regulatory stability and predictable evolution are essential to support investment decisions and early market formation. Over time, as operational experience grows, the EU may consider whether additional common rules are appropriate.

The CCSA supports harmonisation only where it directly enhances clarity and safety; specifically technical standards, permitting coordination and monitoring tools, to support cross-border compatibility.

2. Barriers to development of CO₂ infrastructure and network planning

The CCSA identifies several systemic barriers holding back CO₂ infrastructure deployment. Regulatory uncertainty fragmented permitting processes and inconsistent cross-border rules delay investment decisions and increase project risk. Visibility of capture volumes, transport demand and storage availability remains poor, limiting the ability of infrastructure developers to size capacity efficiently.

Carbon price signals remain inconsistent. Free allocations under the ETS reduce incentives for industrial emitters to invest in CCS, as noted by the European Court of Auditors (ECA, 2018; 2024). Furthermore, misalignment between the EU ETS and non-EU ETS systems complicates cross-border CCS routes, adding contractual and regulatory uncertainty.

Cross-border permitting remains slow and inconsistent. While TEN-E and NZIA have introduced improvements, neither yet provides a comprehensive permitting pathway tailored to CO₂ transport and storage. A lack of dedicated, coordinated processes slows down early infrastructure projects.

Addressing these barriers requires:

- Predictable long-term frameworks
- Risk-sharing instruments
- Accelerated permitting
- Improved visibility of capture–transport–storage chain
- Technology- and mode-neutral design

3. Network planning

The CCSA supports an EU-wide CO₂ information platform that links actors across the value chain builds on the progress of first-moving industrial clusters. Information on the parties across the value chain could facilitate anticipatory capacity development, including opportunities to repurpose suitable oil and gas assets where technically and economically feasible, while ensuring that advanced projects are not delayed by long-term planning cycles or future network blueprints.

Effective coordination must cover the entire CO₂ value chain. An emission-hub approach, integrating capture, transport and storage within regional hubs, provides the most efficient starting point for expansion and interconnection. CCS clusters can serve as early anchors that could later, if needed and duly justified, form the backbone of a wider European CO₂ network.

Non-pipeline transport modes such as shipping, rail and road should be treated on a level playing field to pipeline infrastructure. It must be acknowledged that CO₂ can be transported in gaseous and dense phase through pipelines. They are not separate systems but essential components that enhance flexibility, connect dispersed emitters and underpin cross-border flows, particularly in the early market phase.

The CCSA considers that timely CO₂ infrastructure deployment requires a practical, staged planning approach rather than an immediate shift to fully integrated EU-wide network planning. Early development should build from industrial clusters and regional cooperation, which often provide the most efficient and realistic starting point for rapid roll-out. Oversizing of early assets must be permitted to capture scale efficiencies and facilitate future expansion as far as it is duly justified and does not constitute an overburden or a financial barrier.

Coordination with existing planning instruments such as TEN-E and NZIA is valuable, but planning cycles must not slow down frontrunner projects, particularly in Member States where national CO₂ network planning has not yet begun. Europe cannot wait for all countries to develop full national plans before infrastructure moves ahead. In many cases, regional coordination between neighbouring Member States or along shared corridors will be sufficient in the early stages.

Planning tools:

- **Planning by each infrastructure operator:** valuable for near-term delivery but insufficient alone for long-range optimisation.
- **National network plans:** help link planning to permitting and funding processes but cannot become a bottleneck for countries not yet ready.
- **Coordinated national and EU-level plans:** useful for shaping future cross-border flows and identifying long-distance corridors.
- **Coordinated EU-level network plan:** ultimately useful for system-wide optimisation, but appropriate only in the mid to long term and must not delay early projects or limit oversizing.

This approach balances early progress with long-term alignment, ensuring infrastructure can scale while preserving flexibility for Member States and project developers.

4. Permitting

Permitting for CCUS projects remains lengthy and fragmented, often delaying infrastructure that is critical for industrial decarbonisation. Planning, permitting and construction procedures must actively facilitate, not hinder, the rapid development of transport networks, multimodal hubs and storage infrastructure. While TEN-E and NZIA introduce some useful simplifications, more explicit and targeted support for CO₂ infrastructure must be incorporated into the Grids Package.

The forthcoming Industrial Accelerator Act (IAA) is expected to introduce tools such as tacit approvals or acceleration areas where national law permits. Similar measures would significantly benefit CCS, especially within a cluster-based development model, which has proven effective in the UK for enabling rapid build-out of integrated capture, transport and storage systems.

Member States should establish clear national regulatory frameworks enabling CO₂ transport networks, with aligned implementation of TEN-E to avoid discrepancies. A coordinated EU Single Point of Contact for CCS permitting (covering all infrastructure, not only PCI/PMI projects) would improve consistency, guide operators, and support Member States during this early phase. Standardised application documents across the permitting chain would further streamline procedures.

Finally, CCUS projects face competition for funding against electricity and gas infrastructure under existing PCI/PMI programmes. A dedicated EU funding window for CO₂ transport and storage would provide greater visibility, accelerate permitting prioritisation, and support Europe's green transition objectives.

5. Cross-Border

The UK and Norway will be indispensable partners for Europe's early CO₂ storage needs, given their large, well-characterised offshore storage capacity and the maturity of their CCUS projects. Cooperation should also be explored with North African countries such as Egypt, Tunisia and Algeria, where both storage potential and industrial decarbonisation opportunities may support future cross-regional value chains.

Beyond international cooperation, natural synergies between neighbouring EU Member States will be essential to scale CCS efficiently. Cross-border routes such as DE-NL, DE-BE, GR-IT, DE-DK, FR-IT, and ES-FR illustrate practical opportunities where geographic proximity, shared industrial hubs and existing maritime or pipeline corridors enable simpler, faster projects. The market is best placed to develop these connections organically, particularly in early stages when cooperation structures are straightforward and initial investments can be lower due to reduced complexity and aligned interests.

This cooperation can be implemented with a combination of pipeline and shipping solutions, according to the geography and distances.

A comprehensive approach to cooperation should therefore cover:

- Shipping-enabled CO₂ transport routes, terminals and intermediate storage
- Pipeline corridors
- Harmonised safety, monitoring and permitting principles
- Coordination of investment frameworks
- Compatibility of cross-border contractual and regulatory arrangements

This multimodal, partnership-based framework ensures that Europe's CO₂ transport and storage system can develop rapidly and remain open to key third countries across multiple geographies.

6. Standards & specifications

A key technical barrier stems from the current uncertainty in CO₂ stream specifications, particularly regarding corrosion risks. Progress in the European standardisation committee is constrained by a lack of experimental evidence on acid formation, precipitation, and materials compatibility. Until this data gap is addressed, stakeholders are forced to adopt cluster-specific CO₂ quality specifications to manage project-level risk.

While understandable, this mix approach risks market compartmentalisation, higher costs, and reduced interoperability between hubs. To prevent long-term fragmentation, the EU should facilitate systematic cooperation, joint testing and data sharing among projects to accelerate the development of robust, evidence-based technical standards.

Any emerging CO₂ quality or technical standard must be an enabler, not a barrier, tailored to real project needs and proportional to market maturity. Standardisation should support deployment rather than impose constraints that slow early investment. Therefore, Europe should aim for minimum, consistent requirements across jurisdictions, avoiding unnecessary divergence while preserving flexibility where uncertainties persist.

A proportionate, coordinated approach to both cost allocation and technical standardisation (combined with targeted research efforts) will reduce fragmentation, improve interoperability and support efficient scaling of CO₂ transport networks across Europe.

CO₂ quality requirements should follow a performance-based approach, setting clear limits on corrosive and toxic impurities while allowing flexibility in how operators meet them. Complementary measures, such as blending management, mass balance, batch tracing and periodic testing; are essential to ensure safe and reliable operations across multimodal transport chains.

Overly restrictive or prescriptive specifications at this early-stage risk increasing costs for industrial emitters without clear environmental benefit and reinforcing hub-by-hub market fragmentation. This concern is heightened by the current corrosion data gap identified in the European standardisation process. Without sufficient experimental evidence on acid formation, precipitation and material interactions, fully harmonised CO₂ quality rules cannot yet be finalised. As a result, many clusters rely on their own interim specifications to manage technical risk.

To avoid long-term compartmentalisation, the EU should support operator-led coordination, shared testing programmes and data exchange, enabling the progressive development of robust specifications grounded in real-world evidence. Standards must act as enablers rather than barriers, tailored to actual project needs and aligned with market maturity.

Given these uncertainties, any harmonisation efforts should focus initially on principles and performance thresholds, leaving infrastructure operators and clusters to refine operational specifications collaboratively. This approach maintains safety, supports interoperability over time, and protects early project viability.

7. Financing and De-Risking

The early development of CO₂ transport and storage infrastructure requires targeted financial support and effective risk-mitigation instruments, rather than premature economic regulation or harmonised tariff models. Multiple authoritative reports identify capital intensity, counterparty risk and sequencing risk as key obstacles to CCS deployment (IEA, *CO₂ Transport and Storage*, 2023; GCCSI, 2023).

The current investment environment is characterised by asymmetric risks across the value chain:

- Emitters face long-term cost exposure and uncertain storage availability
- Transport operators face utilisation risk due to uncertain capture volumes

- Storage developers face long lead times and liability risk

These risks create a “coordination gap” that prevents projects from reaching FID without public de-risking.

A cluster-first, anticipatory investment model

International best practice demonstrates that CCS deployment is most efficient when organised around industrial clusters, where shared pipeline and shipping infrastructure connects multiple emitters to common storage hubs. This reduces unit costs, spreads risk, enables anticipatory investment, and accelerates deployment.

EU-level financial tools must remain flexible

To support early development, the EU should mobilise targeted tools such as:

- **EU-backed guarantees** to mitigate counterparty and utilisation risk
- **First-loss facilities and risk-sharing tools** through the Innovation Fund or EIB
- **Grants for common-user transport and storage infrastructure**
- **Funding for storage appraisal and characterisation**, which represent a major share of upfront project cost
- **Support for anticipatory investment of transport infrastructure**, including repurposing suitable oil and gas assets when possible.

These instruments should enable commercial parties to reach agreements, not define or constrain the structure of those agreements. Flexibility in risk allocation, contract length, tariff design and investment sequencing is essential during the early phase.

Framework conditions, not prescriptive economic rules

The EU’s role should be to establish long-term stability and high-level principles:

- Predictable access and service criteria
- Clarity on liabilities and long-term stewardship
- Compatibility of monitoring and reporting
- Cross-border legal certainty
- Recognition of multimodal transport
- Support for mature and emerging storage basins

Premature introduction of harmonised tariffs or rigid economic frameworks would risk slowing early infrastructure development and discouraging investment.

Any future adjustments to the financial or regulatory framework should be based on a cost benefit analysis and evidence-based, responding to observed market behaviour rather than presupposing outcomes.

A flexible financing framework anchored in targeted de-risking and commercial freedom provides the most effective path for scaling Europe’s CO₂ transport and storage network.

8. Conclusions

This document outlines an evidence-based, flexible and pragmatic pathway for scaling **CO₂ transport and storage infrastructure in Europe, in addition to the CCSA reply to the consultation questions**. The recommended approach:

- Accelerates early deployment through cluster development
- Ensures interoperability while avoiding premature prescriptive harmonisation
- Supports all transport modes on a level playing field
- Strengthens cross-border cooperation
- Establishes proportionate, risk-aware financing tools
- Preserves commercial flexibility
- Avoids overregulation in the early stage
- Aligns with credible international assessments
- Aligns ETS with voluntary carbon markets
- Enables blending and mass-balance attribution mechanisms
- Acknowledges projects with final storage outside the EU as eligible for simplified permitting procedures and funding
- Supports the EU's industrial decarbonisation and climate objectives