2026

A Well-Functioning, Competitive and Fair European CO_2 Market for Climate

BELLONA REPORT

Address

Rue Breydel 42,
1040, Brussels, Belgium

Online

Email : europa@bellona.org
Website : eu.bellona.org

BELLONA EUROPA

DISCLAIMER

Author:

Behnam Lot

Co-Authors:

Andrea Spignoli

Lina Strandvåg Nagell

Tom Mikunda

Design and Editing:

Alissia Bourguignon

Rebecka Larsson

Co-funded by the European Union

Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

Executive Summary

To reach climate neutrality by 2050, society will require CO_2 transport and storage services to be available at scale in a functioning internal European market. This will be crucial, as parts of European industry cannot be fully decarbonised through material and energy efficiency or electrification alone. For harder-to-abate industries, decarbonisation through Carbon Capture and Storage (CCS) depends on full value chains that allow emitters to capture, transport and store CO_2. Yet there are several challenges standing in the way of a well-functioning CO_2 market, and structural weaknesses that must be addressed in the market's development. The carbon price included in the EU-ETS is important, but not sufficient on its own to deliver timely deployment of the CCS value chain. This due to volatility, uncertainty and price levels that may not cover the costs and risks of building out transport and storage at scale.

Some of the necessary building blocks for a well-functioning market already exist at EU level, and several Member States are moving ahead with national regimes. However, if these measures continue to evolve without a harmonised and coherent framework, the EU risks a patchwork of unaligned national markets, higher transaction costs for cross-border projects, and slower, more expensive CCS deployment. This is the context in which the Commission has announced its intention to propose a new EU legislation on CO_2 markets and infrastructure. This report describes the current market and regulatory landscape, identifies the main barriers to a well-functioning CO_2 market, and sets out regulatory options the EU should consider for the upcoming CO_2 Markets & Infrastructure Regulation. This executive summary outlines each of the different chapters in the report and their main recommendations for the upcoming legislation.

Ensuring Functional Governance and Market Organisation: Today, CO_2 infrastructure supervision is largely national and exercised under a patchwork of legal bases and designated authorities with differing mandates and practices. Key tasks such as access supervision, tariff oversight, and cross-border coordination are only loosely defined. In parallel, efficient scale-up requires foresightful network planning that sizes and routes long-lived assets with future volumes in mind and in alignment with the wider European energy system. Governance also needs practical coordination instruments that reduce transaction costs for market participants.

Recommendations for the EU:

- Define governance objectives and minimum regulatory functions and require Member States to assign competent authorities with clear powers for technical oversight, access and tariff supervision, transparency requirements, and time-bound complaint and dispute procedures.
- Give an EU-level authority a formal role in coordinating national regulators and acting as arbiter for cross-border cases where national authorities cannot reach common solutions.
- Establish a dedicated EU-level joint body of CO_2 network operators (ENTSO-C) to draw up EU-wide network development plans and scenarios across transport modes.

- create a mandatory EU-level CO_2 aggregation platform as a regulated data hub, with standardised reporting on location, timing, volumes and stream quality for all supported and regulated projects, operated potentially by an ENTSO-C-type body.
- In a second step, develop an interoperable capacity-booking and secondary trading platform with harmonised, transferable capacity products, so that emitters can pool demand and reallocate unused capacity.
- Define EU-wide principles for capacity allocation and congestion management, including open-season procedures and measures to return persistently unused capacity to the market. Monitor outcomes across sectors to ensure alignment with climate objectives.

Maintaining Competitiveness and Fairness in Face of Market Power : In an early CO_2 transport and storage market, a limited number of corridors, terminals, and storage sites can translate into gatekeeper positions. With few alternatives available, first movers can gain bargaining power over pricing, access conditions, and expansion decisions, and emitters may face discriminatory terms, delayed connections, or arbitrary business practices, especially while spare capacity and competing options remain scarce. These risks can also be prevalent in the long-term when linked to structural features of the sector. They can concentrate market power and create incentives for self-preferencing where ownership is integrated across parts of the value chain. EU-level rules that ensure access conditions and tariffs are transparent and fair are needed to ensure not only a timely development of the market, but a market that functions well in the long-term.

Recommendations for the EU:

- Oblige transport and storage operators to publish pricing and access conditions to ensure transparency.
- Enable national regulators to request information from operators on cost data, capacity use and access requests, and empower them to intervene in commercial agreements to ensure objectivity, transparency, and cost-reflectiveness of tariffs.
- require ownership unbundling for open-access, multi-node CO_2 networks so that transport and storage operators cannot use a market-dominant position to distort competition.
- allow narrowly defined exemptions for point-to-point value chains where not deemed a threat to market competition and function.

Overcoming Legal Barriers to Cross-Border Transport through Unified Legal Interpretation: Cross-border CO_2 transport and storage still face legal uncertainty that translates into investment risk. A key issue is the London Protocol framework: while amendments allow sub-seabed sequestration and, in principle, the export of CO_2 for sequestration, the 2009 export amendment has not entered into force due to insufficient ratification, leaving projects to rely on the 2019 provisional application approach and bilateral arrangements. This keeps legal treatment dependent on case-by-case solutions and creates administrative burden. Beyond that, regional seas conventions add another layer, since OSPAR has been amended to permit CO_2 storage but other regional regimes have not been aligned in the same way. A unified EU legal interpretation would reduce these cross-border legal uncertainties and resulting investment risks.

Recommendations for the EU:

- explicitly establish the legal permissibility of cross-border offshore CO_2 transport & storage in a legal act, in alignment with the London Protocol.
- actively encourage ratification of the 2009 London Protocol amendment within the EU and beyond to facilitate an international CO_2 market.
- lead processes to adapt regional seas conventions, clarifying that CO_2 transport and storage should not be treated as hazardous waste.

Closing the Finance Gap and Reducing Investment Risks: CO_2 transport and storage infrastructure faces a bankability gap because it combines very high upfront capex and long asset lives with uncertain early utilisation and strong interdependence across the value chain. Revenues depend on whether sufficient volumes materialise on time and on decisions taken by multiple counterparties. Developers have to deal with timing mismatches and high initial per-tonne charges. Outages and disruptions can also cascade into significant business-interruption and compliance-related costs. The regulatory response needs to strengthen the investment case by stabilising early revenues, enabling smoother cost recovery over time, and addressing cross-chain risk exposure that emerges as networks interconnect.

Recommendations for the EU:

- set principles for cross-border interactions of national support schemes.
- introduce targeted public support schemes where current instruments do not provide sufficient support to segments of transport and storage.
- introduce targeted revenue stabilisation instruments so that early transport and storage projects can cover operating cost gaps while the market scales up.
- establish a common framework for how revenue limits are set and how costs for CO_2 networks are recovered over time.
- support the creation of an EU-wide, layered risk-spreading scheme on-top of or in support of commercial insurance to mutualise cross-chain outage and business-interruption risks. The scheme should include contributions or buy-in from EU, national and all actors along the value chain to spread risk while keeping accountability and without risking moral hazard behaviour.

Seamless Flow through Technical Standards and Harmonisation: Captured CO_2 streams differ by source and capture process, including varying levels of impurities. If projects and Member States apply divergent CO_2 quality thresholds, metering rules, and operating practices, interoperability and commingling become costly, unpredictable, or unsafe. Binding EU-wide rules or guidelines are currently missing, while project-by-project specifications are emerging in parallel. Overly strict limits can drive unnecessary purification cost, while evidence on impurity impacts is still developing. There is need for a harmonised approach that protects safety and integrity while allowing learning and adjustment as operating data accumulates.

Recommendations for the EU:

- elaborate EU-wide harmonised and transport mode-specific standards for stream composition and metering, set interim specification ranges for interconnection points, and require operators to share operational data so that these standards can evolve as experience accumulates.

- adopt a CO_2 interoperability network code and define minimum duties for national regulators.

Enabling Cross-Border Storage by Linking Carbon Pricing Schemes: An impactful regulatory decision will be whether the EU ETS allows EU installations to deduct CO_2 that is transported to storage in non-EU jurisdictions, most notably the UK with its large storage potential. Currently, CO_2 exported to the UK would still count as emitted under the EU ETS. A targeted approach is to separate the recognition of storage sites from wider linkage of the EU- and UK-ETS. The CO_2 Markets & Infrastructure Regulation could initiate amendments to the EU ETS and the MRR to allow deductions for CO_2 stored in third countries where the Commission has adopted an equivalence decision for the storage permitting and MRV framework.

Recommendations for the EU:

- Swiftly agree with the UK through a dedicated working group on mutual recognition of storage sites and aligned accounting rules.
- Promote technical and regulatory harmonisation on chain of custody, transfer points, leakage liability, and dispute resolution.

Table of Contents

Table of Figures

Abbreviations

ACER	Agency for the Cooperation of Energy Regulators
AIB	Association of Issuing Bodies
Bamako Convention	Bamako Convention on the Ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa
CCfD	Carbon Contract for Difference
CCS	Carbon Capture and Storage
CCU	Carbon Capture and Utilisation
CEF	Connecting Europe Facility
CEF-E	Connecting Europe Facility – Energy
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CO_2	Carbon dioxide
CRCF	Carbon Removal Certification Framework
DVGW	Deutscher Verein des Gas- und Wasserfaches
ECJ	European Court of Justice
EEA	European Economic Area
EECS	European Energy Certificate System
EIB	European Investment Bank
ENTSO-E	European Network of Transmission System Operators for Electricity
ENTSOG	European Network of Transmission System Operators for Gas
ENNOH	European Network of Network Operators for Hydrogen
ENTSO-C	European Network of CO_2 Transport Operators (proposed)
ERGaR	European Renewable Gas Registry
ETS / EU-ETS	EU Emissions Trading System
EU	European Union
HNS Convention	International Convention on Hazardous and Noxious Substances
H_2S	Hydrogen Sulfide
ICM	Industrial Carbon Management
IDB	Industrial Decarbonisation Bank

IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
KfW	Kreditanstalt für Wiederaufbau (*Credit Institute for Reconstruction*)
London Protocol	1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972
LNG	Liquefied natural gas
MRR	Monitoring and Reporting Regulation
MRV	Monitoring, Reporting and Verification
mtpa	million tonnes per annum
NECP	National Energy and Climate Plan
NO_x	Nitric/Nitrogen oxides
OECD	Organisation for Economic Co-operation and Development
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PCI	Project of Common Interest
PMI	Project of Mutual Interest
RED	Renewable Energy Directive
RRF	Recovery and Resilience Facility
SDE++	Stimulering Duurzame Energieproductie en Klimaattransitie (*Support Sustainable Energy Production and Climate Transition*)
SO_x	Sulfur oxides
spec	specification
TC	Technical Committee
TEN-E	Trans-European Networks for Energy
TSO	Transmission System Operator
UK	United Kingdom
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

1. The Need for a Regulation on CO_2 Markets and Infrastructure

The EU is committed to reaching climate neutrality by 2050. One essential piece of this effort will be the establishment of a **well-functioning market for CO_2**.

Many harder-to-abate industries cannot be fully decarbonised through material & energy efficiency or electrification alone. While direct electrification and renewable energy are the primary drivers of the energy transition, Carbon Capture and Storage (CCS) is indispensable for decarbonising Europe's industry. In the cement, lime, and chemical industries, for example, a large share of CO_2 is released during the breakdown of raw materials, so-called process emissions. These emissions remain even after a total switch to clean energy. By capturing the CO_2 before it is emitted and sequestering it deep under the ground, CCS technology can help meet a necessary condition for Europe's harder-to-abate industry to continue operating amidst decarbonisation obligations. The decarbonisation through CCS depends on a full value-chain approach for emitters to capture, transport and store their CO_2 in a cost-effective manner. Building the infrastructure and ensuring a well-functioning market for CO_2 in Europe is a demanding task, but a necessary one well within Europe's capabilities. Europe has already built extensive networks and ensured well-functioning markets in situations where there is a clear public benefit identified. Examples, to name a few, are electricity, gas, telecommunications, or railways. **CO_2 networks will require a concerted effort across Europe**, with the clearly identified **benefit of providing European industry with a pathway to decarbonise** and move towards a net-zero world.

A European market for CO_2 has its own particular features and vulnerabilities. Decarbonising harder-to-abate industry and enabling it to stay in Europe as opposed to moving to regions with less ambitious climate regulation is a necessity to reach net-zero and to keep a just and green transition, benefitting all of society, well beyond those making use of the technology. The negative externality of releasing CO_2 into the atmosphere is something which is currently only priced by our markets through political intervention. The EU Emissions Trading System (EU-ETS) seeks to correct the imbalance by putting a price on emissions, the so-called carbon price. This carbon price has proven to be invaluable, but not sufficient on its own to drive the deployment and scale of a well-functioning market for CO_2 in Europe. This is largely **due to unpredictability, volatility and price levels falling short of covering the cost of developing a full CCS value chain**.

Creating a European CO_2 market is a complex policy puzzle. This report will present Bellona Europa's recommendations for an upcoming EU CO_2 market and infrastructure regulation, building and expanding on our already published Brief "*Building blocks for a well-functioning market for CO_2*". This report is one part of a wider "analysis of regulatory frameworks for cross-border CO_2 transport and storage infrastructure development" expected to be published at the end of September 2026 through the COREu project. This chapter of the report has been released ahead of the report so it can contribute to the political process surrounding the CO_2 market and infrastructure legislation, ongoing throughout 2026. The aim of this report is therefore to inform and provide Bellona's views on the ongoing discussion, as well as collect input and feedback for the final COREu report.

The following chapters **analyse the regulatory situation in the EU and propose changes required for establishing a well-functioning and integrated European CO_2 market**. Each section identifies specific barriers to development of such a market and outlines how the upcoming EU legislation can address them.

Chapter 2 maps the **market's current near-term prospects**: activity concentrated in a handful of hubs, uneven service availability across Member States, and a system that is beginning to commercialise without yet having the characteristics of a connected European network. It explains why cross-border chain development remains fundamentally difficult even where capture ambition is rising.

Chapter 3 examines how early corridor formation can translate into **gatekeeper positions** and why this matters for industrial competitiveness and **fairness**. It highlights the risks that arise when pricing, access conditions, and expansion decisions are influenced by concentrated ownership structures or incentives stemming from vertical integration, particularly while alternatives are limited and markets are still nascent.

Chapter 4 explains why **legal uncertainty** can become a project risk in its own right. It traces how differing interpretations and interactions of international and regional legal treaties can complicate cross-border CO_2 movement, and why legal clarity is a practical precondition for investment and contracting across jurisdictions.

Chapter 5 focuses on what makes CO_2 infrastructure difficult to finance at scale: high upfront capex, long-lived assets, and **high integration requirements** between capture, transport, and storage. It frames how risk is present and transmitted along the value chain and why current policy signals and support tools fall short when investors face timing mismatches, volume uncertainty, and exposure to counterparty performance.

Chapter 6 addresses the engineering layer that can either enable or block interconnection. It sets out how divergent **requirements on stream quality, metering, monitoring**, and operations can raise connection costs, limit commingling, and reduce interoperability, and it anticipates the need for common approaches that maintain safety and integrity while avoiding unnecessary barriers.

Chapter 7 turns to how the system is run. It outlines why clear **allocation of supervisory responsibilities, effective cross-border coordination, and reliable planning** and information arrangements become more important as isolated projects turn into shared corridors with multiple users and operators, and as decisions in one jurisdiction begin to affect entire value chains.

Chapter 8 examines rules on how **CO_2 movement across borders** is accounted for, and highlights why coherent approaches are needed so that accounting frameworks support efficient system buildout while safeguarding environmental integrity, including where storage occurs outside the EU.

The EU stands at a critical crossroad. In its Industrial Carbon Management Strategy, the European Commission has announced its intention to propose new EU-level legislation on the CO_2 market and infrastructure. Decisions taken over the next few years will shape not only where infrastructure is built, but also who controls it, who can access it on what terms, and how the costs and benefits of CCS are shared across society. This report is written to inform those decisions by providing a coherent framework for an EU CO_2 transport and market regulation that gives industry the confidence to invest in the emission reduction measures needed to reach the EU's climate targets.

2. Current Situation: Fragmented Schemes in Need of Alignment

This chapter describes the current state of the CO_2 transport and storage market and the fragmented support landscape that has emerged across Member States, showing why a dedicated EU framework is needed.

While the EU CO_2 transport and storage market is moving from concept and pilots towards early commercial buildout, its transformation into a comprehensive network has not started yet. **Most activity today is concentrated around a limited number of emerging corridors and hubs**, with the North Sea region leading on project development and storage appraisal. Across much of the EU, by contrast, CO_2 handling services will still not be available at scale in the near term, and many industrial emitters remain unable for the time being to translate capture ambitions into bankable end-to-end value chains.[1]

Some pieces of the regulatory and policy puzzle already exist at the EU level. The EU's CO_2 Storage Directive defines environmental safeguards and market principles, and the Net-Zero Industry Act sets ambitious targets for commercial storage development. But these policies do **not yet amount to a coherent framework** that can organise an internal market for CO_2 handling services across borders and across transport modes.

At the same time, Member States are moving ahead at different speeds and with different approaches. Several Member States, particularly around the North Sea, have started to introduce national regimes for CO_2 transport and storage. Approaches to issues such as market organisation and financial support already differ significantly and many issues are still left unaddressed. Thus, it is crucial that national measures and regulations are in line with basic principles at the EU level to ensure harmonisation across the Union. This would reduce barriers of a cross-border nature related to significantly differing regulatory regimes. If substantial divergence continues, the EU could risk ending up with a **patchwork of unaligned national markets, higher transaction costs for cross-border projects**, and a slower and more expensive CCS deployment process.

2.1. The Rationale for Support

Work on enhancing and aligning frameworks and support schemes is needed to ensure that **CCS can serve society at large**. The public interest in CCS, and in particular in shared CO_2 transport and storage services, is not automatically aligned with the incentives that individual market participants have. The public would benefit from a well-functioning CCS sector, but the current regulatory framework does not yet create the right conditions that would allow such an industry to develop and operate. In a market-based economy, private actors will invest where they can earn a return. They are not expected to provide and sustain services that make losses, even if such services would deliver value for society. **For CCS to scale, the difference**

between the incentives that today's market offers, and what is required to reach profitability, need to be covered.[a]

Subsidies are public support instruments that close financing gaps. Commercial activities that would otherwise happen too late, or not happen at all, are made viable this way. Governments have different options at their disposal: investment support that lowers the initial capital expenditure required to start building CCS facilities, operating support that reduces the costs of running CCS-related activities, and risk mitigation mechanisms that decrease risk exposure. Public actors can choose which parts of the value chain to support, on what terms and for how long. This way, they can aim to influence decisions of private actors towards early deployment, network build-out and more even participation across regions. Support can then be phased out as the CO_2 market matures. The success of such tools ultimately remains dependent on a range of factors, and the use of such tools in Europe today varies between the different levels of governance and countries – unaddressed gaps still remain.

2.2. EU-level Support Schemes and their Blind Spots

The EU has put funding programmes in place to kick-start the development of the market, first and foremost the Innovation Fund (see Table 1**Error! Reference source not found.**)[2] The programme is financed from EU-ETS auction revenues and provides grants of up to 250 million euros, covering up to 60% of capital costs for selected cleantech projects that fulfil certain criteria of innovativeness. As CCS has been designated a key technology to be supported, the Innovation Fund has served as central enabler for first-mover projects. With the latest round in 2025, the total CO_2 capture volume of projects supported through the Fund could amount to nearly half of the EU's 50 mtpa CO_2 injection capacity target for 2030.[3] In addition, CO_2 transport projects with status as Projects of Common Interest (PCI) under the Trans-European Networks for Energy (TEN-E) framework enjoy priority status and are eligible for funding through the Connecting Europe Facility – Energy (CEF-E). CEF-E is a grant programme financed from the EU budget and aimed at supporting infrastructure projects with a cross-border dimension that contribute to internal market integration and climate goals. By 2025, it had committed to support 28 CO_2 projects along the transport chain with close to 1 billion euros.[4]

[a] The challenges that the CO_2 market faces in its task to fulfil a public need and the potential solutions to tackle them are described in detail in the Bellona article *What's Blocking the CO_2 Market? Unpacking Potential Market Failures*.

Table 1: List of available funding mechanisms with EU support

Funding Mechanism	Source	Description
Innovation Fund	EU-ETS revenues	Investment grants for innovative low-carbon projects
Connecting Europe Facility-Energy	EU budget	Investment grants for transport infrastructure with cross-border impact
Horizon Europe	EU budget	Funding for research and innovation; mostly pilots and early demonstrations for CCS
Various national state aid schemes (e.g. *SDE++, Danish CCS Fund*)	Member states' budgets; partly through national shares of EU-ETS revenues; EU support possible via *Recovery and Resilience Facility* grants & loans	Various schemes (investment support, CCfDs, fixed premiums etc.); Compliance with EU rules on state aid determined via *Guidelines on State aid for climate, environmental protection and energy*, and *Clean Industrial Deal State Aid Framework*

Complementary to these instruments, which mainly focus on capital expenditure, the Commission launched the Clean Industrial Deal in 2025.[5] It includes a proposal for an Industrial Decarbonisation Bank (IDB) designed to close the operating cost gap that still prevents industrial decarbonisation projects from becoming commercially viable, with details on the concrete functioning of the scheme still emerging. While a pilot auction run for industrial process heat will work with a fixed premium, an invariable performance-based subsidy for each tonne of CO_2 abated, the Commission stresses that this is not necessarily indicative of the final design of the IDB's future auctions.[6]

Despite the EU already mobilising up to several hundred million euros for CCS projects, funding remains insufficient in many cases. The Innovation Fund is usually oversubscribed and concentrates its support on first-of-a-kind projects, thus being unavailable for the general roll-out of CCS projects that may not be innovative yet still necessary. Ultimately, **the EU's budgetary capacities are too limited and constrained**. A large share of the financing burden of ramping up CCS will have to be carried by national support schemes. Therefore, EU state aid rules become a decisive lever in the funding landscape, as they define how and to which extent member states can financially support their industries.

The 2022 Climate, Energy and Environmental Aid Guidelines are the main reference for assessing the compatibility of climate- and energy-related subsidies with internal market rules. They explicitly allow aid for CCS projects and for dedicated infrastructure, provided a strict set of conditions are met.[7] Building on this, the 2025 Clean Industrial Deal State Aid Framework (CISAF) creates a faster track with less consulting and reporting obligations for aid to decarbonisation investments.[8] It allows for investment and operating support for CO_2 capture at industrial sites, yet does not extend this to CO_2 transport infrastructure. In addition, CCS projects that are financed via private capital can be supported through loans or guarantees under the European Investment Bank (EIB) and the guarantee programme InvestEU, subject to sustainability screening against the EU Sustainable Finance Taxonomy and the internal policies of the EIB and InvestEU.

2.3. Diverging National-Level Support Schemes

Countries with strong political will and fiscal capacity have moved ahead with generous CCS support schemes, aimed at de-risking through revenue stabilisation. **Such national subsidies are supporting CCS development nationally and could have the unintended effect of tilting the playing field among member states**. Since most Eastern and Southern countries have no funding programmes for CCS, early CO_2 infrastructure will likely cluster in a few regions, particularly around the North Sea, where most CCS activities in Europe are currently planned. Industries in less wealthy states risk falling behind, which further exacerbates regional disparities and could undermine the EU's goal of establishing a comprehensive and well-functioning internal CO_2 market.

Different national subsidy schemes can also create coordination challenges for cross-border projects. As **national subsidy schemes are not streamlined across the EU**, complex projects spanning multiple countries have to patch together different national subsidies, which could complicate business models and bankability. If one government's support programme has a shorter timeframe or expires earlier, timelines can become misaligned. For example, an emitter in one country might only have a guarantee of subsidy until 2035, while the storage operator in another country might need contractual commitments till 2040 to refinance the capital investments.

The Netherlands was first to introduce Carbon Contracts for Difference (CCfDs) with their SDE++ scheme (Stimuleringsregeling Duurzame Energieproductie en Klimaattransitie)[9]: long-term contracts with emitters that provide a subsidy for each tonne of abated CO_2, paying the difference between a pre-agreed strike price and the concurrent ETS price (see Figure 1;[b]). By abating their emissions, emitters reduce their operating costs, as they are relieved of their obligation to purchase and surrender emission certificates. The SDE++ scheme's strike price is the pre-agreed revenue per tonne of CO_2 that emitters requested for their projects to break even and thus become commercially viable over their lifetime. Whenever the ETS price lies

[b]CCfDs provides stability by ensuring emitters will receive a fixed benefit per ton of abated CO_2 (€190 in the exemplary illustration "Figure 1**Error! Reference source not found.**"). This benefit is composed of the savings on ETS compliance costs that are not due anymore (green area), equivalent to the respective CO_2 price, meaning the price of an ETS emission allowance (black graph), and a subsidy in monetary form topping up that amount of savings to reach the fixed benefit (blue area).
The top-up will thus vary based on ETS price fluctuations: If the CO_2 price increases (e.g. 2030 onwards), the top-up that is necessary to reach the fixed benefit decreases. If the CO_2 price rises above the amount of the fixed benefit (e.g. past 2039), no subsidies will be granted, as the savings made on ETS compliance costs already exceed the amount of the fixed benefit (no blue area visible anymore). In the Dutch SDE++, support falls to and stays at zero when the CO_2 price exceeds the awarded amount, whereas Germany's Klimaschutzverträge are conceived as two-sided contracts with a clawback mechanism. When the CO_2 price exceeds the fixed benefit, repayments to the state equivalent to the positive difference between the CO_2 price and the fixed benefit can be required.
If, in turn, the CO_2 price decreases (2029 to 2030), the top-up must grow accordingly so to guarantee that the fixed benefit is still achieved. Additionally, there is a cap on the maximum top-up the subsidy can reach. If the CO_2 price drops below a certain price floor (€80 in the illustration), no additional subsidies are granted (blue area does not grow any further), thus containing the costs for the public.

below this strike price, the CCfD scheme pays out a per-tonne subsidy equal to that gap. As the ETS price increases and reaches the strike price, subsidies will decrease down to zero.

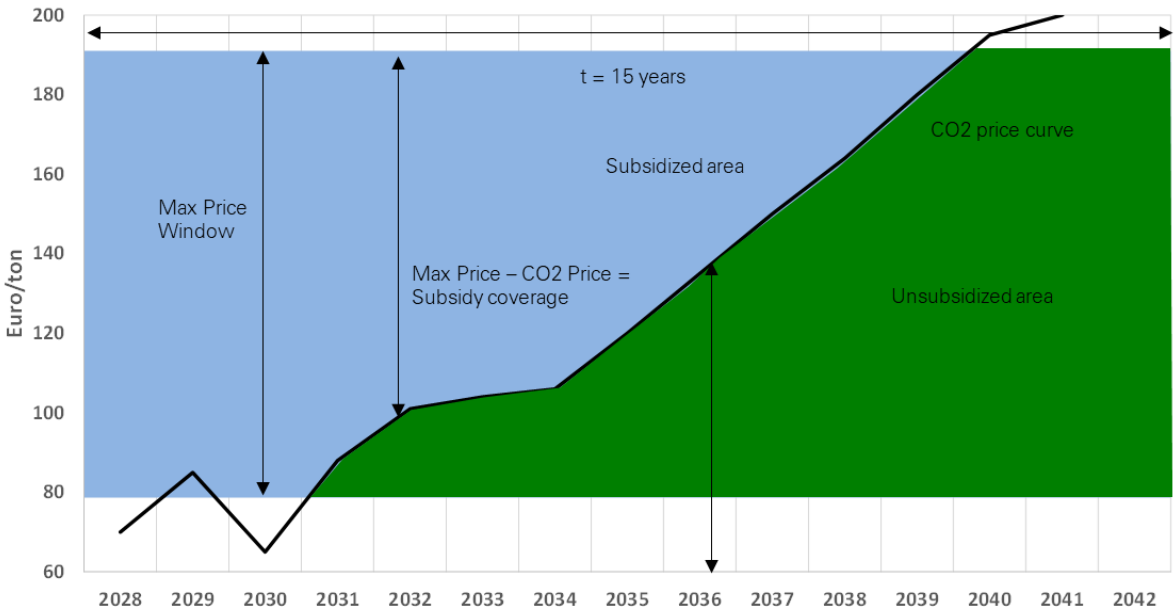


Figure 1: Hypothetical price development at the example of Dutch SDE++ CCfD scheme

The assumption underlying the scheme is that the subsidies that emitters receive will indirectly flow on to transport & storage operators through payments for their service. However, as the emitters are the sole recipients of the subsidies, transport and storage operators are left exposed to cross-chain risk: In SDE++ auctions, emitters have to bid for subsidies by proposing their requested strike price, which puts them under pressure to present favourable cost calculations in order to win. Experience has shown that capture projects won subsidies without firm transport & storage contracts in place[10] and based on optimistic cost estimates. Some projects later struggled when actual CO_2 transport fees turned out higher than assumed, causing delays or cancellations.[c] This experience demonstrates that **policy support needs to take a holistic approach**, and focus on the full value chain. Germany's CCfD scheme, the Klimaschutzverträge (*climate protection contracts*), follows a comparable logic as the SDE++ in that support is paid to the industrial emitter.[11] While the draft directive requires that access to the necessary CO_2 transport and storage infrastructure is sufficiently secured, it does not specify what form that proof must take.

Denmark takes a different approach to CCfDs, by only awarding subsidies to projects that cover the entire value chain from capture to storage.[12] The operator is responsible for achieving the CO_2 emission reductions and may rely on subcontractors for individual chain elements. This forces early alignment across the value chain, rather than assuming that transport and storage will fall into place.

Sweden's subsidy auction, in contrast, grants fixed premiums per tonne of CO_2 stored, independent from ETS price fluctuation.[13] The scheme is only available for the capturing of

[c] Conclusions from conversations between Bellona and individual emitters.

biogenic CO_2 emissions, which are not subject to ETS obligations and thus not driven by ETS compliance incentives. In this case, controlling for the benefit of avoided ETS compliance cost through a CCfD is not necessary. Support is allocated via so-called reverse auctions, where bidders compete on the amount of support per tonne stored. The projects with the lowest bid receive long-term support at the level of their bid.

2.4. Shortcomings and the Need for Alignment

The current funding and regulatory landscape has succeeded in accelerating a limited number of first-mover projects, especially in countries the North Sea, but it also reveals structural gaps. EU programmes such as the Innovation Fund and CEF-E can catalyse early investments, yet they are capacity-constrained and do not, by themselves, align timelines, allocation of risk, or market rules across borders. At the same time, national subsidy models differ in who receives support, which parts of the value chain are covered, and how long revenue certainty lasts, which can create coordination problems for cross-border chains and lead to uneven regional participation.

The CO_2 Markets & Infrastructure regulation should address this by complementing the existing support landscape: It should make national approaches more compatible and harmonised by **setting EU-level principles for how support schemes should interact across borders**, **and it should close gaps where current instruments do not provide sufficient support to the infrastructure** that is required for a well-functioning internal market.

3. Ensuring Functional Governance and Market Organisation

A well-functioning EU CO_2 transport and storage market requires both clear governance and practical coordination tools. **The CO_2 Markets & Infrastructure Regulation can strengthen market performance by assigning minimum supervisory tasks and powers to national authorities, establishing an EU-level coordination role for cross-border cases, and enabling EU-wide network planning through an operator cooperation body that aligns CO_2 infrastructure development with system-wide energy needs**. In parallel, it can reduce transaction costs and improve project visibility through an EU data hub for reliable project information, interoperable capacity booking arrangements, and common rules for allocation and congestion management as capacity becomes scarce. These elements can support predictable access, efficient infrastructure buildout, and outcomes consistent with the climate purpose of CCS.

Recommendations for the EU:

- Define governance objectives and minimum regulatory functions and require Member States to assign competent authorities with clear powers for technical oversight, access and tariff supervision, transparency requirements, and time-bound complaint and dispute procedures.
- Give an EU-level authority a formal role in coordinating national regulators and acting as arbiter for cross-border cases where national authorities cannot reach common solutions.
- Establish a dedicated EU-level joint body of CO_2 network operators (ENTSO-C) to draw up EU-wide network development plans and scenarios across transport modes, integrated into joint scenario work with other infrastructures.
- Create a mandatory EU-level CO_2 aggregation platform as a regulated data hub, with standardised reporting on location, timing, volumes and stream quality for all projects, operated by an ENTSO-C-type body.
- In a second step, develop an interoperable capacity-booking and secondary trading platform with harmonised, transferable capacity products, so that emitters can pool demand and reallocate unused capacity.
- Define EU-wide principles for capacity allocation and congestion management, including open-season procedures and measures to return persistently unused capacity to the market.
- Monitor outcomes across sectors to ensure alignment with climate goals.

3.1. The Role of Central Oversight and Coordination for Efficient Market Function

As CCS projects scale up, transport routes should ideally grow in coordination to form a comprehensive network providing sufficient coverage, rather than as a patchwork of isolated projects. Corridors would be sized with future demand in mind and aligned with other network infrastructures so to make the most efficient use of scarce capital. Once CO_2 pipelines and terminals start linking clusters and countries, keeping track of flows becomes increasingly important. If governance remains fragmented and responsibilities unclear, there is a risk of inconsistent technical rules, divergent tariff and access decisions, and delays in resolving problems that affect entire value chains. In a well-functioning CO_2 market, however, technical and market rules are effectively enforced. Market participants know who they are accountable to and how to seek recourse in case of disputes. This chapter therefore examines the institutional side of the CO_2 market. It sets out what core functions regulatory authorities should cover, how these can be distributed between national and EU level, and how network planning can be organised so that CO_2 transport infrastructure develops in a coherent, future-proof way across Europe. A way to manage these challenges effectively is by organising. The CO_2 markets & infrastructure regulation should therefore foresee the formation of an EU-level joint body of operators alongside strengthened regulatory coordination.

3.1.1. Assigning Regulatory Responsibilities and Structuring Oversight

An internal market for CO_2 transport and storage is impeded in its proper functioning if regulatory oversight is fragmented and responsibilities are unclear. The upcoming legislation on CO_2 market and infrastructure could greatly contribute to **clarifying a split of such responsibilities and determine the role of a potential EU regulatory authority in this context**.

Today, supervision of CO_2 infrastructure is exercised almost entirely at national level, based on a patchwork of mining, energy and environmental laws, and on varying competent authorities designated under the CO_2 Storage Directive.[14] Their mandates and practices differ between Member States, and the Directive leaves key tasks, such as access supervision and cross-border coordination, only loosely defined.[d] Project developers may face inconsistent requirements, access and tariff-related oversight procedures may be handled differently across borders, and disputes in cross-border value chains are hard to resolve. **No single central EU regulator for CO_2 exists**.

The upcoming legislation on the CO_2 market and infrastructure cannot stop at just setting technical and market rules: it must also define clear governance objectives and allocate responsibilities between EU-level and national authorities, so that important regulatory functions like technical oversight, market supervision and dispute resolution are carried out in a coherent and reliable way across the Union.

To address these risks, the upcoming CO_2 markets & infrastructure regulation should make explicit what regulatory authorities are supposed to achieve. CO_2 networks must operate safely

[d] Bellona has protocolled the member states' implementation of the Net-Zero Act's provisions on CO_2 storage, including the designation of responsible authorities, in its article: Article 23 Member State Tracker

as well as offer access on transparent and non-discriminatory terms. In practice, this implies a small set of core functions that any authority set-up must cover:

- setting and enforcing **technical rules** for system integrity, CO_2 quality, metering and monitoring
- **supervising access conditions** and tariffs, including transparency and reporting duties, ensuring fairness
- **handling complaints** and imposing corrective measures and sanctions where rules are breached, and
- **coordinating** decisions that affect **cross-border value chains** so that projects are not stalled by divergent interpretations.

The next step is to determine which of these functions should sit with national regulators, which of these require EU-level coordination, and where a joint or central body is needed rather than ad hoc coordination between Member States: At the EU level, the key role should be to set common frameworks about binding principles for technical standards, minimum transparency and reporting rules, general criteria for non-discriminatory access and tariff oversight, and procedures for handling cross-border issues. National regulatory authorities would then be mandated to implement and enforce these frameworks in their jurisdictions: licensing and supervising CO_2 network operators, supervising contractual agreements and checking compliance of tariffs and access conditions with market principles, verifying that operators establish and follow technical rules, and ensuring that incident detection and emergency protocols are in place. Day-to-day complaints about refused access or contested tariffs would be handled by national regulators under time-bound procedures, with powers to order corrective action and apply sanctions where necessary. For conflicts that affect projects in several Member States, however, coordination cannot depend only on voluntary consultation. Here, the CO_2 markets & infrastructure **regulation should foresee structured cooperation between national regulators** and assign a clear role to an EU-level authority to mediate and, where needed, issue guidance, ensuring uninterrupted cross-border operations.

3.1.2. Enabling Foresightful Network Planning across Infrastructures

Network planning for CO_2 transport is central to whether CCS can scale efficiently. Pipelines, terminals and connections to storage will operate for decades and need to be routed and sized with future capture volumes and storage options in mind, not only today's projects. A framework for planning could ensure industrial clusters are connected across borders, avoid stranded or underused assets and reduce inefficiencies, instead of leaving each project to optimise only its own part of the chain.

However, a dedicated EU-wide system for planning CO_2 transport infrastructure is missing. Indeed, **efforts remain mostly fragmented at national or project level**: individual industrial clusters and operators plan CO_2 pipelines or shipping routes on a case-by-case basis, which risks inefficiencies and missed synergies. In the absence of coordination, siloed regional or national projects would arise, duplicative corridors or poorly sized pipelines that could lock in insufficient capacity, while also not exploiting the full potential for collaboration. A short overview of the existing EU instrument on CO_2 transport network planning will show what is still missing.

The first such EU-level act happened with the inclusion of CO_2 pipeline transport in the Trans-European Networks for Energy (TEN-E) framework, the EU's instrument for identifying and supporting essential cross-border energy infrastructure.[15] The 2022 TEN-E recast widened and strengthened support for CO_2 transport by explicitly recognising the fixed installations needed to load, unload, liquefy and buffer CO_2 for onward transport and storage as eligible infrastructure.[16] Within TEN-E, Projects of Common Interest (PCIs) and Projects of Mutual Interest (PMIs) are priority projects with cross-border relevance that benefit from streamlined permitting and, where eligible, access to EU funding through the Connecting Europe Facility (CEF). CO_2 transport infrastructure has been within scope since 2013, and the first European CO_2 projects were selected as PCIs in 2017, with a significant increase from 2023 onwards.[17] Yet**,** TEN-E remains focused on individual projects and does not amount to a comprehensive plan for how CO_2 corridors should evolve over time. In its Industrial Carbon Management Strategy, the Commission further announced it would work towards proposing an EU-wide CO_2 transport infrastructure planning mechanism.[18] The ambition is there, but the concrete measures still need to be worked out.

What would propel these efforts is establishing a joint body for European CO_2 transport operators, hereafter called **ENTSO-C**. With a mandate to develop EU-wide CO_2 network development plans and scenarios, ENTSO-C would facilitate data sharing through operating a CO_2 aggregation platform[e] and make recommendations on infrastructure needs, also taking different modes of transport into consideration. While it should work closely with ENTSOG, ENTSO-E, and ENNOH to align planning and scenario-setting, leaving it **institutionally independent** would avoid conflicts of interest. Most gas pipelines viable for repurposing are owned by incumbent gas transmission system operators and oil and gas companies, who still have to take their existing and more profitable fossil-based business in consideration. Decisions made by these actors may thus be influenced by diverging business interests and at risk of skewing in a different direction than the one leading to an efficient and future-proof CO_2 network. Analyses have claimed that ENTSOG's network development scenarios used gas demand projections that were both higher than the realised gas consumption and in conflict with EU climate targets, and thus structurally favoured continued gas use and new gas infrastructure.[19] Establishing an independent body could reduce the risk that CO_2 planning is driven by legacy gas interest instead of decarbonisation needs.

3.1.2.1. Future-Proof Capacity Planning for Infrastructure Networks

An ENTSO-C could play a central role in ensuring future-proof capacity planning, so that new CO_2 infrastructure is sized and routed in line with expected demand growth and climate targets rather than short-term commercial incentives. While CO_2 pipelines are designed and built in the present, based on available information and future utilisation estimations, CO_2 capture volumes are expected to grow over time as climate policies tighten. If the infrastructure is designed to meet only the first wave of demand, increases in CO_2 capture could lead to a bottleneck later, hence requiring expensive upgrades or renovations. On the other hand, there

[e] The concept of aggregation platforms is explained in detail in the subchapter "3.2.1. Aggregating Demand to Help Projects Coordinate"

is a risk of **stranding assets** (i.e. devaluation) if infrastructure is intentionally oversized but expected capture projects do not materialise on schedule.

Generally, strategic oversizing to some degree is well advised where future demand is much higher than present, as has been done with Norway's Northern Lights project: while the project calculated a transport volume of 1.5 mtpa in its first phase of operations, pipelines were already sized to accommodate a capacity of 5 mtpa.[20] In 2025, an agreement with Stockholm Exergi triggered expansion of capacity for the second phase.[21] Such foresight can save money in the long term, compared to laying a second pipeline later. Operators will need to weigh higher up-front costs versus the risk of capacity shortfalls later. Without credible planning to rely on and accompanying support schemes, private developers may have no other choice than to err on the side of smaller, cheaper pipelines that meet only near-term needs, as they would not be guaranteed to recover the cost of unused capacity. Coordinated network planning will thus be necessary to achieve future-proof transport network routing and size.

By **preparing common scenarios and identifying corridors where demand is expected to grow**, ENTSO-C can indicate where oversizing makes sense and should be supported. The CO_2 markets & infrastructure regulation can then link input from network plans to support schemes, for example, by allowing deferred cost recovery for forward-looking capacity in the regulated asset base and targeting EU funding instruments at those priority corridors.

3.1.2.2. Alignment of Network Plans across Energy Systems

Potential systemic impacts on the wider energy infrastructure need to be taken into account as well, since CO_2 transport infrastructure assets do not exist in a vacuum. **A coordinated planning approach must ensure that CO_2 networks develop in synergy rather than in conflict with other networks**, given the strong potential both for competition between the systems as well as cooperation. For most industries, CCS represents only one of several CO_2 abatement options, alongside alternatives such as hydrogen use, whether locally produced or imported, or direct electrification. Since the expansion of CO_2 and hydrogen pipelines and electricity grids requires substantial investment, careful foresight is needed to prevent redundant spending on climate infrastructures. In any case, CO_2 capture from industrial activities will already require significant electricity input and thus power grid access. Low-carbon hydrogen production sites could become pivots connecting CO_2, hydrogen, and gas infrastructure, and therefore merit special attention in planning efforts. At the same time, hydrogen infrastructure planning may compete with CO_2 transport for access to existing assets. As Europe's natural gas consumption is expected to decline over the coming decades, new opportunities to repurpose existing gas pipelines for either hydrogen or CO_2 transport will arise. Likewise, potential competition may arise over onshore subsurface use, where CO_2 storage could conflict with hydrogen salt-cavern storage or geothermal energy production.

Such strategic decisions will require structured dialogue: Routine coordination between the European Network of Transmission System Operators for Gas (ENTSOG), electricity (ENTSO-E), hydrogen (ENNOH), and a future EU entity for CO_2 networks will be essential. The Commission has already begun requiring the Ten-Year Network Development Plans for electricity, gas, and hydrogen to use joint scenarios based on energy system-wide cost-benefit analyses.[22] In the future, the upcoming CO_2 markets & infrastructure regulation should ensure that the representation of CO_2 infrastructure in the TYNDP is improved, and that ENTSO-C's network development plan is under appropriate scrutiny, including through independent assessment of its scenarios and project lists and recommendations of adjustment (see exemplary task distribution in Figure 2).

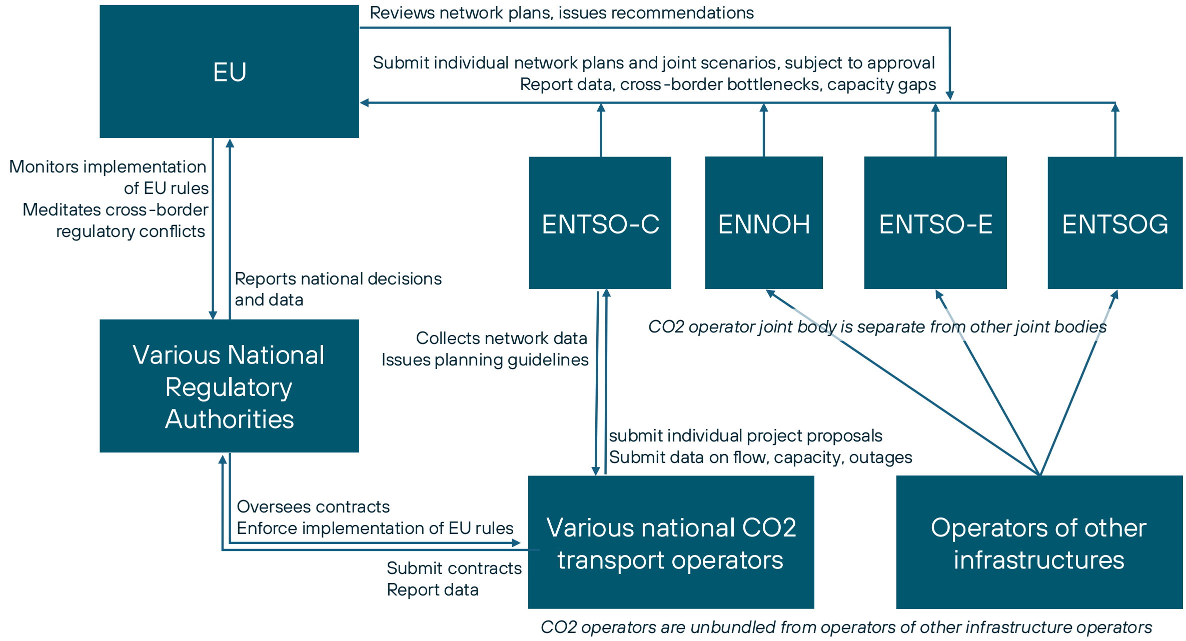


Figure 2: Illustration of exemplary competence and task distribution organigram

3.2. Tools to Optimise Matchmaking and Market Clearing

Having set out how regulatory oversight and system planning can be organised at EU and national levels, the next step is to translate this governance into **practical coordination instruments** that ENTSO-C could potentially operate to reduce transaction costs for market participants. The EU has already announced that it is working on similar tools, such as the aggregation platform. The following section therefore focuses on how such platforms for **information sharing, demand aggregation, and capacity booking** should be designed to operationalise the planning and oversight functions described above.

3.2.1. Aggregating Demand to Help Projects Coordinate

Capture projects do not always line up neatly with transport routes and storage sites on their own, and often benefit from structured support to identify viable counterparts and connections. A lack of communication among market actors can itself be a barrier to progressing CCS projects across value chains with the synchronisation that is needed. Many emitters' volumes are too small to justify dedicated pipelines, and their capture projects will only proceed if there is a viable transport solution at reasonable cost. **Without structured information exchange and in absence of coordination mechanisms, each emitter must find a transport and storage option individually**, which is inefficient and may leave smaller players stranded. As a result, transport and storage operators may forego capacity expansions due to missing demand signals. The challenge of matching demand and supply becomes even more complex once the cross-border dimension comes into play, as market actors could be scattered across different constituencies, without institutionalised communication channels, subject to different regulatory frameworks.

A viable remedy for these problems is an **EU-level platform for sharing of information on market demands and offers, aggregating demand by pooling the needs of buyers and matching them with available supply**. Parallels exist with platforms with different such functions in the gas market. ENTSOG's Transparency Platform obliges gas transmission system operators to publish standardised data on capacity, flows, and outages.[23] Aggregate EU allows companies to express interest, pool demand and match with suppliers, based on which they can then voluntarily sign contracts outside the platform.[24] The Hydrogen Mechanism, the Commission's upcoming demand-aggregation tool for hydrogen, will function in a comparable way.[25] Capacity booking is fragmented across three different platforms with limited regional coverage: PRISMA, the GSA Platform, and the Regional Booking Platform, used by transmission system operators to auction primary capacity at interconnection points.[26]

In its Industrial Carbon Management Strategy, the Commission announced to work on establishing a CO_2 aggregation platform to facilitate the matching of storage demand and storage availability.[18] Such a platform should primarily act as a centralised and regulated data hub for the entire European CO_2 value chain: It **should collect, standardise, and publish reliable information on capture, transport, and storage projects across the EU**. The platform should use a harmonised reporting template that includes the location, capacity, project maturity, expected timelines, and CO_2 stream characteristics of each project. This **would allow emitters to identify realistic storage and transport options, while giving investors and operators a clear view of where aggregated demand exists or is expected to arise**.

To ensure coverage and reliability, participation must be mandatory for CO_2 projects. Voluntary submissions would risk fragmented or incomplete datasets, which would undermine its usefulness. Reported data should be regularly updated and independently verified, following a common data model to make entries comparable across member states and project types. Governance-wise, **the platform could be operated by an EU-level entity or ENTSO-C**. Embedding the platform within ENTSO-C's remit would ensure that the data feeds directly into system planning, the identification of bottlenecks, and the coordination of cross-border flows. This data layer reduces search costs and uncertainty, and it also provides the basis for more standardised capacity booking and reallocation tools discussed next.

3.2.2. Enable Capacity Booking and Secondary Trading to Help Projects Connect Efficiently

While the aggregation platform should remain a data hub, efficient market operation will ultimately require a booking platform where capacity rights can be traded. Such a capacity-booking platform can be built at a later point to interoperate with the aggregation platform. It should host standardised, transferable capacity products for pipelines, ship loading and unloading windows, terminal buffer, and storage injection slots. Ideally, it would be **centralised, have EU-wide coverage, and provide exclusive access to capacity rights**, so that fragmentation as seen in the gas market can be prevented.

Facilitating secondary capacity trading on such a platform could prove particularly useful in reducing investor hesitancy. As of now, emitters are faced with risky decisions over long-term contractual commitments while the transport and storage landscape is still evolving. Closer CO_2 storage spaces might open up in the future, and some emitters may prefer waiting for more favourable conditions. That hesitation delays capture projects and could leave transport infrastructure underused in the ramp-up phase. If booked capacity cannot be reassigned, geographically suboptimal matches between storage supply and demand could be locked in, viable capacity may be left unused, while newcomers wait for access. **By enabling secondary capacity trading on a capacity booking platform, the efficiency of the CO_2 market could be significantly improved**. Mandating the standardisation of capacity rights as transferable products and allowing for contractual flexibility would allow the trade of capacity between emitters. This way, early movers could move ahead with CO_2 supply commitments, comforted by the fact that they could easily trade their current capacity rights if more geographically convenient arrangements were to arise in the future. Capacity holders would be able to list unused capacity rights for defined periods and quantities, and eligible buyers could acquire them wholly or partially under standard terms. Transfers would be approved by the operator, and the same technical and quality obligations would be passed through from the initial capacity rights holder to the purchaser on a back-to-back basis.

3.2.3. How to Ensure Fair Capacity Allocation and Congestion Management

Despite measures for optimised matchmaking, **available supply will not always exactly match demand in volume**. In the course of the development of the market, some CO_2 pipelines, terminals and storage sites could potentially be tight. Without common EU rules, ad hoc first-come-first-served and bilateral deals can leave smaller emitters stranded and create incentives to game the system. This section evaluates tools the EU can mandate to allocate scarce capacity while staying aligned with the climate purpose of the market.

Since demand for transport & storage capacity could outgrow supply in the course of the CO_2 market ramp-up[27], first-come-first-served may not deliver satisfactory outcomes any longer, and more sophisticated decision rules for capacity allocation and congestion management could become necessary. **Open seasons**, for instance, are a practical approach to sizing infrastructure and allocating new capacity. The operator publishes an invitation that is open to any market participant, emitters submit requests within a fixed window, the so-called season, and the operator assesses whether the aggregate demand justifies the investment. Regulators typically have to approve the result and terms to ensure transparency and fairness. This is how Belgium and France are already proceeding.[28]

Since scarce capacity also creates incentives for anti-competitive business practices such as capacity hoarding with the goal of locking out rivals, **anti-hoarding tools may be needed** to complement voluntary secondary capacity trading. If indicative tests show that capacity is reserved but persistently unused despite demand from third parties, operators should be empowered to have it **clawed back and reoffered in the regular allocation process**, as is common practice in the gas market.[29] This way, emitters would not be able to reserve transport & storage capacity indefinitely.[f]

The gas market further uses a variety of auction formats to allocate unbooked capacity, thus relying on shippers' willingness and ability to pay as the decisive criterion in bidding processes. It must be acknowledged, though, that the CO_2 market is fundamentally different from the gas market in the purpose it shall serve, which is delivering a climate benefit. The climate value that CCS delivers, in turn, varies between different CCS applications.[30] When demand for transport capacity exceeds supply, measures for selecting winners among interested parties become necessary. Purely price-based methods risk sidelining sectors that are most reliant on CCS for their decarbonisation plans, yet have the lowest revenue per tonne of CO_2 emitted. A cement or lime plant, for instance, with no abatement alternative can be outbid by emitters with higher margins that could more effectively rely on other decarbonisation options.

Reconciling the principle of equal treatment of emitters across different sectors with the goal of maximising climate benefit is a highly complex endeavour. Although there is no straightforward and fully satisfactory solution, the discussion still needs to be had. Consequently, the CO_2 markets & infrastructure regulation should mandate the use of open-season procedures and congestion-management measures that prevent long-term hoarding and reallocate unused bookings. It should further monitor the success of different sectors in accessing transport capacity. If persistent evidence shows that certain harder-to-abate sectors are being priced out in auctions, this assessment can feed into decision processes over **targeted support measures** for such sectors. These allocation and congestion-management measures would help ensure that tightening capacity is handled transparently and predictably, while keeping the market aligned with its climate purpose.

[f] Capacity hoarding constitutes a form of market power abuse that can become particularly attractive in the case of vertical integration, as described in the chapter "4.2 To Bundle or Unbundle: Conflict of Interest and Mitigation through Ownership Unbundling**Error! Reference source not found.**".

4. Maintaining Competitiveness and Fairness in Face of Market Power

A CO_2 market that serves the climate must be designed to maximise emission reduction potential. This requires ensuring a level playing field and healthy competition in access for emitters to transport and storage infrastructure. There is a risk that without appropriate regulation, the public's interest in the CO_2 market, namely its climate impact, could be in conflict with the commercial incentive of private infrastructure operators to maximise profit. In the beginning of the market's development, as can already be observed, infrastructure is likely to be concentrated on few hands. This is driven by high upfront capital requirements, long lead times for permitting and construction. The emitters typically depend on access to specific corridors and injection sites for their capture projects. Where there are few or no alternatives, operators may be able to set access conditions and tariffs based on the capacity and willingness to pay of emitters under pressure. In the ramp-up phase, this risk is even higher because alternative service providers and spare capacity are limited. This can lead to unduly high barriers or tariffs and higher overall decarbonisation costs, directly in opposition to the public interest that justifies supporting the development of CCS in the first place.

It could also be attractive for operators to extend control over several segments of the value chain. Such integration concentrates market power even further and weakens competition, making it easier for a few actors to shape access conditions and expansion decisions in ways that suit their own portfolio and incentives rather than decarbonisation targets. The EU's CO_2 Storage Directive may seek to uphold principles of open, fair, transparent and equal access, but an appropriate framework for ensuring sufficient principles and compliance is lacking. It is therefore regulators' responsibility to ensure that the rules of the game curtail arbitrary business practices and safeguard the market's development toward a situation where competition can increasingly be ensured by market participants themselves.

At the same time, CO_2 infrastructure markets differ from network sectors like electricity or gas in their maturity. Further, they are being built deliberately for the primary purpose of delivering a non-excludable public good in the form of climate mitigation, and face particular market failures in need of addressing. The regulation is justified in cases where such market failures are considerable and standing in the way of optimising the public good. When it comes to the market for CO_2 and how best to ensure fair competition, regulation therefore has to strike a balance. It should **prevent dominant actors from extracting profits** arising solely from scarcity or foreclosing access, suffocating an emerging market before it can grow. At the same time, the **Commission should be conscious of the deterrence effect of overregulation on first-mover investment** and any potential slow-down of the initial build-out the market still depends on. This balance should be complemented by measures that lower barriers to market entry and accelerate the emergence of a broader competitive field.

Therefore, this chapter discusses how unbalanced market power can arise in the transport and storage services landscape, and which commercial practices can result from market-dominant positions. It further compares emerging national approaches and assesses the main regulatory levers to contain these risks, focusing on access and tariff oversight as well as ownership models. With their CO_2 markets & infrastructure regulation, the EU should set enforceable requirements that **make access conditions verifiable as fair and transparent**, rather than merely emerging from potentially lopsided negotiations between individual market actors. It should further introduce proportionate rules on vertical ownership unbundling where infrastructure has gatekeeper characteristics. Such measures can **foster the development of a well-functioning, competitive EU-wide market in service of the climate, instead of entrenching early incumbents**.

Recommendations for the EU:

- Oblige transport and storage operators to publish pricing and access conditions to ensure transparency .
- Enable national regulators to request information from operators on cost data, capacity use and access requests, and empower regulators to intervene in commercial agreements to ensure objectivity, transparency, and cost-reflectiveness of tariffs.
- require ownership unbundling for open-access, multi-node CO_2 networks so that transport and storage operators cannot use their market-dominant position to distort competition.
- allow narrowly defined exemptions for point-to-point value chains where not deemed a threat to market competition and function.

4.1. Alleviating Monopolistic Tendencies of a Market in the Making

4.1.1. Risk Factors of Transport Infrastructure

Large CO_2 transport pipelines and liquefaction terminals are prone to monopolistic dynamics. As transport services rely on capital-intensive infrastructure assets that exhibit strong economies of scale, **the barriers to entering the market for transport services are high**. In practice, this means that a large share of costs is fixed and front-loaded, including route development, land rights, civil works etc. However, once this base infrastructure is in place, operating costs per extra tonne remain comparatively low.

Due to these high initial and low marginal costs, being the first to establish infrastructure comes with a significant competitive advantage, a so-called first-mover advantage. A single pipeline could likely serve connected regions more efficiently than multiple smaller, competing pipelines could: Once a CO_2 pipeline corridor is in place, the construction of additional pipelines competing for the same supply from a set of already connected emitters could be commercially unattractive and systemically inefficient, as the incumbent can serve additional volumes at far lower unit costs. This does not mean parallel infrastructure is never justified – when demand exceeds available capacity, additional lines can become necessary. But even then, the operator could retain a structural advantage by controlling established corridors and followingly exert significant bargaining power over users by deciding upon pricing and access.

Other transport modes (ship, truck etc.) generally do not exhibit the same monopolistic characteristics as pipelines. While the availability of such means of transport may also be limited in the beginning, the production of more units can react more flexibly to demand increase. However, if a pipeline is in place and operating, it will typically outcompete other modes on price.

In the early phase of the CO_2 market, when only a few such infrastructure assets exist and alternative transport modes are particularly scarce, such a structural advantage could be further amplified. A more meshed network makes it easier for emitters to switch between routes and storage sites, which increases contestability. Even if each individual pipeline remains locally monopolistic, the transport operators' practical scope for exercising market power can be reduced.

4.1.2. Risk Factors of Storage Infrastructure

For storage infrastructure, the dynamics determining market power are driven by scarcity of accessible storage sites. Market entry can be constrained by long lead times for appraisal, permitting, drilling, and monitoring, and by the fact that only some regions have suitable conditions in place. In the early phase of the CO_2 market, this could **concentrate commercially developed injection capacity among a small number of sites and operators**, which comes with a material risk of lacking competition.

The market power concentration on the storage market, however, may not stay rigid. It could potentially be reduced if market entry is facilitated. As more storage locations come online, pricing can become more comparable across providers, and the market power concentration may eventually be reduced. The Net-Zero Industry Act's target of reaching at least 50 million tonnes per year of CO_2 injection capacity by 2030 should bring multiple storage sites into the market across Member States. This would improve geographic spread and the diversification of storage options across the EU. **However, in regions with limited geology or limited transport connectivity, commercially developed storage space may remain structurally scarce**. For many emitters, especially those far from the North Sea, the set of feasible storage options can remain small, once distance and available transport connections are taken into account.

4.1.3. Avenues for Exploitation of Market Dominance

In markets with limited competition, the concern is not simply that a small number of operators exist, but the extent to which their control over essential assets allows them to determine access conditions and thus shape market outcomes. **Operators can use their leverage to shift value from users to themselves**, e.g. by setting prices artificially high and disconnecting them from the cost of providing the service. This can happen by taking advantage of asymmetrical or lacking information on market conditions to tailor prices to each counterparty's willingness to pay, or by indexing charges to market variables unrelated to costs.

As emitters may have nowhere else to go, they have no other choice than to accept the terms they are offered. Price discrimination in this way would transfer surplus rent from emitters to the operator without creating additional capacity, against the public interest of a CO_2 market in Europe.

One study by Brunsvold et al. (2011) demonstrates how it would be financially well-advised for CO_2 transport and storage operators to apply dynamic pricing tied to ETS-price fluctuations instead of incurred costs, so to increase the rent extracted from emitters.[31] There is thus incentive to add a surcharge to tariff baselines that rises with the market price of emission allowances, meaning the operator fully captures the extra value of each abated tonne at all times, even if it means that less emitters will take up the service. **Such models show how a CO_2 market with limited competition can both underserve socially valuable demand for abatement and channel an increasing share of the benefits of decarbonisation into private hands**. Further, operators can also decide who receives a connection and when. An operator could prioritise connections and injection slots of large anchor customers in geographically convenient positions while delaying or postponing less profitable connections, as they may not deliver the best return on investment. Due to the operators' gatekeeper position, emitters with less favourable connection conditions may be left empty-handed.

From a systems perspective, this constitutes a welfare loss: to reduce emissions, **infrastructure must expand to everywhere it is economically feasible and where there is a real need for it**, not only where it is most profitable for the operator. Indeed, several modelling exercises have shown that, without regulation, a transport operator seeking rent-maximising tariffs would service only a fraction of the socially optimal CO_2 volume and make far smaller investments in infrastructure.[32] [33] If access is left to unstructured commercial negotiation in a rigid market, operators could pick customers in ways that may be rational for them but harmful for economy-wide transition goals. This is particularly problematic when operators have benefitted from public subsidies for infrastructure development, or when emitters are dependent on subsidies for their transport and storage service charges: When taxpayers help finance the business model of transport & storage operators and thus have a stake in it, using that publicly supported position for business practices that limit network coverage or inflate costs for emitters (and thus support schemes) runs counter to climate objectives. Such use would be at odds with the public interest the subsidies were meant to serve in the first place. Followingly, these risks point to a need for enforceable oversight of tariff setting and access decisions. The following section sets out the main ways in which regulatory measures can curtail behaviours hindering the development of a well-functioning market for CO_2.

4.1.4. Forms of Market Regulation

Considering the concerns over preserving public interest in the CO_2 handling market, the question when designing a regulation is how and when to govern or regulate conditions such as pricing and access. To keep the pricing power of dominant operators in check, it becomes highly relevant how the following market principles, as laid out in EU regulation [14] [34] [18], can be upheld, and how compliance is ensured:

- Fairness / Non-Discrimination
- Transparency
- Competitiveness
- Openness / Open-Access

The integral regulatory design choice in the context of tariff review is whether contracts are subject to ex-ante or ex-post supervision. Ex-ante supervision means that the operator must propose tariffs or a methodology to the regulator, who approves them before they apply. This gives emitters more upfront protection against discrimination and excessive pricing, but requires more regulatory capacity from administrators to prevent processes from slowing down. It further limits the pricing autonomy of operators and reduces the profit upside they could reap. Ex-post supervision implies that tariffs can initially be set freely, but could later be challenged if they are in violation of regulatory principles. This allows for more commercial flexibility, but also postpones the correction of non-transparent and discriminatory pricing practices. Emitters would bear a greater burden of having to detect and contest violations, and may already incur financial damage in the meantime before violations are reversed. The best path forward may be somewhere in between these two options, generally allowing for ex-ante intervention without requiring it.

4.1.5. Emerging National Approaches to Market Regulation

While the EU's framework implicitly acknowledges aforementioned issues, it is not yet up to scratch when it comes to containing them. The status quo under the CO_2 Storage Directive is relatively high-level: Member States are mandated to ensure open, fair and non-discriminatory access, and may allow operators to refuse access only when technical incompatibilities and capacity limitations cannot be reasonably overcome.[14] This ensures that access to third parties has to be granted, but does not spell out how concretely this should be achieved. In the absence of detailed common rules, **member states have interpreted these obligations differently**. This divergence could potentially complicate business models development for cross-border transport & storage services.

In Flanders, the transport network operators must grant access based on published, ex-ante-approved tariffs and conditions, under the oversight of the Flemish Utility Regulator.[35] A negotiated access regime is granted only for liquefaction terminals and for closed industrial networks. The latter shall mostly serve the purpose of exchanging CO_2 between emitters and CO_2 consumers for CO_2 utilisation, and must be jointly owned by their own network's users.

The UK uses a fully regulated model, where transport & storage operators must hold a licence to operate, accept users through a government-led allocation process and may only charge approved tariffs. Denmark on the other hand requires operators to publish standard prices and connection conditions, but leaves the final agreement up for negotiation.[36] The Danish Utility Regulator reserves the right to order changes to prices and conditions ex-post if they are deemed unreasonable. Both in Flanders and Denmark, in case access is refused due to lack of capacity or connection, the operators must carry out capacity-increasing works if economically justified or if the user pays.

France will start out with a negotiated third-party access regime. However, France's national energy commission has recommended that it should be empowered to introduce a regulated third-party access regime and standard tariffs for naturally monopolistic infrastructure if it should come to the conclusion that profits are becoming excessive in the course of its market's development.[37]

In the Netherlands, contracts are currently bilaterally negotiated. The Ministry of Economic Affairs and Climate commissioned a scientific study to test whether the minimal intervention model in the Netherlands' Mining Act is adequate. That study raised concerns over information asymmetries and limited tariff transparency, and noted that ex-post supervision is comparatively less effective. In the short term, it therefore recommends temporary ex-ante supervision of tariffs and access conditions, given the market concentration around the Aramis transport & storage project.

4.1.6. Containing Market Power through Regulating Access Conditions

To address the aforementioned risks associated with dominant market positions, access to CO_2 networks should not be left to bargaining alone. For assets **where market power concentration is a concern, the CO_2 markets & infrastructure regulation must set clear rules for access regimes.** National regulators should have the legal authority to request information from operators on cost data, capacity use and access requests. They should be empowered to intervene in commercial agreements to ensure objectivity, transparency, and cost-reflectiveness of tariffs.

Connection procedures should follow standardised enforceable timelines, and capacity should be allocated according to transparent and non-discriminatory criteria. This does not mean regulators should concretely prescribe operators' profits. Rather, **the objective is to ensure that contracts remain fair, reasonable, and proportionate**. Tariffs should be anchored in transparent, cost-reflective methodologies enabling cost recovery and a fair return. In practice, this means that the same service under the same conditions usually results in the same price.[9]

This form of **ex-ante intervention with contracts should be possible for those assets where market power concentration is a concern**. This will generally include pipeline corridors and liquefaction terminals. For storage, strict oversight is particularly relevant in the early market while injection capacity is scarce and options are limited, but it could be designed to relax as the number of market entrants increases and substitutable sites become available. Such relaxation could be made dependent on specific benchmarks for market maturity that indicate that a certain level of choice and contestability among providers has been reached. In the meantime, other measures such as providing support for storage appraisal, streamlining permitting, and enabling new prospective operators to reach investment decisions, can support the increase in substitutable options for users and thereby reduce the leverage of dominant market actors.

Similarly to access regimes, national frameworks also diverge on how they treat vertical integration of market actors, necessitating EU-wide harmonisation. Such integration can be another major source of market power and incentives for discriminatory commercial practices, as explained in the following section.

4.2. To Bundle or Unbundle: Conflict of Interest and Mitigation through Ownership Unbundling

In a vertically integrated structure, a single company or group might own multiple segments of the value chain. For instance, an industrial emitter could capture CO_2 and also own the

[9] When tariffs are regulated, regulators can still provide investors with predictable cost recovery and returns through specific forms of loans and tax relief, which is explained in detail in the chapter "Improving Predictability through Deferred Cost Recovery & Revenue Stabilisation".

infrastructure transporting it, or a oil and gas producer might own both a transport network or terminal and a storage site.[28] **A vertically unbundled structure, in contrast, separates each segment among different independent entities**. Regulation on unbundling needs to take the specific conditions, needs and risks of different capture-to-storage connections into account. Regulatory options are:

- Accounting unbundling: Separate accounts for the regulated activity versus other activities of the company, meaning separate profit-and-loss / balance sheet reporting, reducing possibilities for cross-subsidisation.
- Legal unbundling: The regulated activity is placed in a legally separate entity, but the entity could potentially still be owned the same corporate group.
- Structural or full ownership unbundling: The regulated network asset and operator is owned and controlled by an entity that is fully independent, removing any incentive for self-preferencing.

4.2.1. Containing Market Power Through Unbundling Obligations

Integrated ownership carries significant risks of market power abuse. The owner of a CO_2 pipeline who also has interests in CO_2 capture or storage might be tempted to favour their own affiliates or projects over competitors. Yet even without deliberate discrimination, **vertical integration of assets with locally monopolistic characteristics, such as terminals and storage, is likely to result in higher prices in the absence of regulation**: integrated operators would set tariffs to maximise their own returns, meaning fewer emitters proceeding with CCS and thus less emission reductions overall compared to a system with unbundling of terminals and storage, and regulated tariffs.[38]

Self-preferencing by integrated actors can take many, sometimes subtle forms, such as:

- granting priority access or lower tariffs to its own/affiliated industries
- booking unneeded capacity or injection slots without plan or intent to use it, especially at congested assets, with the goal of crowding out competitors
- sizing and expanding pipeline or injection capacity only for their own needs despite potential interest from third parties, strategically disregarding the transport & storage needs of others
- delaying the processing of connection & access requests, overburdening applicants with excessive connection requirements, or outright denying access on illegitimate grounds.

Experience from the EU's gas and electricity market shows how anti-competitive business practices such as capacity hoarding, access denial, and strategic underinvestment in infrastructure were taking place when unbundling obligations were still weak.[39] [40] [41]

At the same time, vertical integration can undoubtedly offer advantages, particularly in the early phase of a market's development. When one entity controls multiple parts of the CO_2 chain, it can align investments and timelines across the capture, transport, and storage steps more efficiently. For example, a company that knows it will have guaranteed CO_2 volumes from its own capture project, will have one risk less to deal with when deciding upon investments into pipelines. Coordination is simplified and liability for the whole chain can be concentrated in one party. **A full-value chain approach thus offers greater bankability**, which is arguably important for kickstarting development when the market is still ramping up and dependent on anchor investments.[42]

The policy question is therefore how to preserve early investment incentives while limiting conflicts of interest. While general EU antitrust law does prohibit abuse of market dominance, enforcing it is a slow and complicated process. Ex post enforcement requires proving intent and harm, which is notoriously difficult due to information asymmetries and the subtle forms that discrimination can take.[43] Relying on case-by-case competition law enforcement can be considered inadequate, which is part of the reason why other networks like electricity grids and gas pipelines have been made subject to unbundling obligations.[44] [45] For these networks, the EU initially introduced legal and functional unbundling, meaning separate management but still within vertically integrated groups. However, it later acknowledged that this approach was not effective. In result, only **full ownership unbundling** was considered an effective and stable way to solve the inherent conflict of interests and to ensure the removal of the incentive for vertically integrated undertakings to discriminate.

To ensure that issues of market power and ownership do not hinder the scale-up of CO_2 infrastructure, a differentiated framework could be the way forward**.** Public open-access multi-mode CO_2 collection and transport networks with the intent to provide business services to third parties should ideally **require unbundling between capture, transport and storage operations**. Full ownership unbundling should be preferred, since legal or accounting separation alone may be insufficient for preventing subtle discrimination.

4.2.2. Emerging National Approaches to Unbundling Obligations

For CO_2 networks, there are a few examples of national legislation that have enacted legislation that introduces ownership restrictions, in effect leading to the unbundling of the CCS value chain. Others have chosen not to introduce ownership restrictions (see Table 2).

Table 2: Comparison of national unbundling provisions and plans

United Kingdom	Flanders	France	Germany	Netherlands	Denmark
Full unbundling of transport & storage from emitters, bundling of transport & storage	Legal unbundling of transport from emitters	Accounting separation recommended; unbundling of terminals and offshore storage considered	No unbundling foreseen	No unbundling foreseen	No unbundling foreseen; subsidy scheme only for full-value chain projects

The Flemish CO_2 pipeline legislation sets the most tightly regulated ownership regime for CO_2 networks in the EU so far.[35] It differentiates between local clusters and the national transport network, which have to be unbundled from each other in terms of internal accounting. Emitters are prohibited from operating any transport network, which constitutes vertical unbundling in legal form. However, they do not necessarily have to be unbundled from storage operations, which there are none of in Belgium. Belgium's designated CO_2 transport network operator

Fluxys has indeed established a new dedicated subsidiary.[46] The UK's ownership regime is even more strictly regulated.[42] Transport and storage services must be combined and can only be provided by licensed operators. The licence enforces legal and operational separation from any other business activities including emitters, places the business behind financial ring-fences, and explicitly bans cross-subsidisation between different business activities.[47] A recent call for evidence suggests that the UK's Department for Energy Security & Net Zero is gathering input on whether storage operations could be opened to competition in the future, which would imply unbundling of transport from storage.[48] France's national energy regulator recommends at least separate accounts for CO_2 pipeline transport, storage and liquefaction, with possible legal separation where a terminal operator would also control offshore storage.[37] In contrast, regulation on CO_2 pipelines in Denmark[36], the Mining Act in Netherlands[49], and the CO_2 storage law in Germany[50] do not include unbundling obligations. On top of that, Denmark is only providing grants from its CCUS Fund to projects with a full-value chain approach.[12] This variety in national approaches illustrates the complexity of building cross-border business cases, and how market actors could benefit from EU-wide regulatory minimum protections.

4.3. Special Considerations to Avoid Suffocating an Emerging Market

The CO_2 markets & infrastructure regulation should allow for conditional exceptions in specific cases: If a CO_2 storage site and pipeline is a closed link connecting a single emitter or a single cluster, sized only to their own needs with only little spare capacity, then **vertical integration could be permitted**. This would allow certain CCS projects to exploit the benefits of a full-value chain approach, such as improved efficiency. Such exemptions need to be determined on a case-by-case basis by a national competent authority and subject to periodic review. This approach has parallels with the concept of exemptions for isolated transport & storage chains as described by France's Energy Regulatory Commission. Such connections need to be geographically separated from larger transport networks in order to be exempt.[37]

This exemption would apply only to vertical unbundling requirements, but it would not exempt the operator from third-party access obligations if demand for access emerges in the future. If regulators observe discriminatory acts towards prospective third-party users with interest in connecting to those networks, the exemption should be revisited and possibly revoked in favour of unbundling.

Further consideration needs to be given to legacy contracts: Early CCS projects, often direct links between one emitter and one storage, may have contracts that were negotiated outside any regulatory framework, before any dedicated CO_2 market rules existed. They often rely on long-term, exclusive terms to secure financing. Imposing new constraints to access conditions could disrupt settled commercial expectations, or even throw the project's finance out of balance, rendering it unviable. A pragmatic approach could be to grant time-limited grandfathering of contracts: The CO_2 markets & infrastructure regulation should oblige new contracts to follow regulation on compliance with market principles form their start, while **existing contracts are allowed to continue their operations for a limited period of time under their original, initially negotiated terms**. The deadline for converting these legacy arrangements into regulated contracts could then be deferred accordingly. For instance, if regulation on third-party access was to come into effect from year 3 onwards, contracts concluded before year 2 could retain grandfathered status until year 4. This ensures that early investments, which often rely on long-term exclusive contracts for financing, are not unduly penalised, while market conditions are still converging towards a common standard for all market participants.

Together, access rules, unbundling provisions, targeted exemptions, and time-limited grandfathering can **protect early investment while keeping the market on a path towards open access and contestability**.

5. Overcoming Legal Barriers to Cross-Border Transport through Unified Legal Interpretation

There is still uncertainty over legal barriers standing in the way for the development of a well-functioning market for CO_2 in Europe. For a CO_2 market to be deployed and work well, there needs to be a similar or like treatment of CCS across Europe, and **clarity is needed when it comes to the movement of CO_2 across borders** in particular. Actors along the value chain are currently observing a high investment risk associated with such legal uncertainties, a clear barrier to market development.[51] [33] Despite the clearly identified benefits of using CCS technology in decarbonising industry, the legal framework is seen by some as lagging behind, and market participants are risking that CCS-related activities could be interpreted as illegal dumping. Such uncertainties could result in legal conflicts and an excessive administrative burden, thus constituting a hindrance to project development. For that reason, this chapter examines the unresolved legal matters on CO_2 transport & storage, stemming from international treaties, namely:

- The London Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter,
- The UNEP Regional Seas Conventions for the Protection of the Marine Environment, and

The aim of this section is to identify the extent to which these frameworks have already been adapted to accommodate CCS, where legal uncertainty remains, and what the EU can concretely do to remove potential barriers.

Recommendations for the EU:

- ➢ explicitly establish the legal permissibility of cross-border offshore CO_2 transport & storage in a legal act, in alignment with the London Protocol.
- ➢ actively encourage ratification of the 2009 London Protocol amendment within the EU and beyond to facilitate an international CO_2 market.
- ➢ lead processes to adapt regional seas conventions, clarifying that CO_2 transport and storage should not be treated as waste.

Table 3: Chronology of International Treaties

1972	London Convention: Ban on ocean dumping
1996	London Protocol: expansion of ban to any material not explicitly allowed and to storage in subsoil
2006	CO_2 sequestration allowed under London Protocol
2007	CO_2 sequestration allowed under OSPAR
2009	• CO_2 Storage Directive and amendment of EU-ETS Directive • London Protocol amendment to allow for maritime cross-border CO_2 transport (not in force)
2019	London Protocol resolution to allow for provisional application of 2009 amendment
2022	*European Commission's legal analysis of London Protocol compliance* (*no legal validity)*

5.1. London Protocol

The 1972 *London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter* is a global treaty under the International Maritime Organization (IMO) governing ocean dumping.[52] It was expanded by the 1996 London Protocol, which prohibits storage of any waste or other matter in the seabed and the subsoil thereof. This includes dumping or disposal from vessels, platforms or other man-made structures at sea, as well as any exports of such matter for the purpose of dumping.[53] [54] CO_2 initially was not on the Protocol's "reverse list" of allowed materials that may be dumped, which constituted a **major legal obstacle to cross-border CO_2 transport**. Therefore, when the discussion around the use of CCS technologies started to gain traction, the London Protocol was amended to allow for CO_2 destined for sequestration in 2006, and an additional amendment in 2009 explicitly allowed for the export of CO_2 for sequestration.[55] However, the 2009 amendment has not yet entered into force, as it has not yet been ratified by a minimum two-thirds of the treaty's parties as needed.

Recognising this stalemate, the parties agreed on a provisional application mechanism in 2019 as a preliminary solution. Based on this provision, any contracting party can opt in to provisionally apply the 2009 amendment by depositing a declaration and making **bilateral agreements** with other compliant parties.[56] In effect, the export of CO_2 only becomes permissible for those countries that proactively apply the amendment provisionally and form said agreements. In 2022, the European Commission issued an analysis on the conformity of EU law and the London Protocol, explaining how the EU's CO_2 Storage Directive and ETS Directive in combination should already be interpreted as a form of multilateral agreement between all member states for cross-border export inside the European Economic Area.[57] By being members of the EU and subject to EU law, all member states that are also signatories of the London Protocol have allegedly entered a multilateral agreement as required by the 2019 resolution. The Commission's analysis even stated that member states would not need to conclude bilateral agreements on issues already covered by EU law, yet did not explicitly clarify that CO_2 transport in general falls under this coverage.

Complementarily, the EU suggested to make bilateral agreements redundant by creating a public register of all the competent national authorities for CO_2 transport and storage across the EEA, serving as declaration / documentation of the multilateral agreement all EU member states are supposedly in, to be designed in coordination with the IMO Secretariat, and including info on:

- the respective competent authorities for CO_2 storage,
- ETS installations,
- UNFCCC inventories in each member state,
- single point of contact for CO_2 export,
- references to the relevant transposition of the CO_2 Storage Directive and ETS Directives, and,
- for the parties to the London Protocol, the date of deposit of the declaration of provisional application of the 2009 amendment.

In spite of that analysis, several EEA member states have developed bilateral agreements since 2022, namely Belgium, the Netherlands, Denmark, Norway, Sweden, and France,[58] and thus signalled that the **Commission's analysis was not deemed sufficient in providing legal certainty**. The EU cannot on its own change what the London Protocol requires. Providing an EU public register as a substitute for bilateral agreements would remain subject to the approval of the IMO Secretariat and could still be challenged by any of the other contracting parties.

Bellona therefore urges the EU to provide more legal clarity:. The upcoming CO_2 market and infrastructure regulation should resolve current legal barriers by establishing the legal permissibility of cross-border CO_2 transport in legislation in accordance with the London Protocol. The legislation should include wording explicitly stating that cross-border CO_2 transport is legal and that the requirements of an agreement, as outlined by the London Protocol's 2019 resolution, should be considered to be fulfilled for all intra-EEA transport of CO_2. The legislation could also, if deemed necessary, commit Member States to ratify the 2009 amendment of the London Protocol within a set time frame or encourage a council decision on the matter if deemed more appropriate.

In parallel, and as an interim path that aligns directly with the London Protocol, the EU could prepare **model clauses for bilateral agreements**. These templates would accelerate member state practice by standardising core contractual elements, and help any commitment to ratify in the legislation. The EU should further continue to **encourage ratification of the 2009 amendment**, both by third countries as well as its member states, so it becomes binding for all parties both in- and outside of the EU. Ratification still remains relevant for cross-border CO_2 transport beyond the EU's borders to and from third countries, even after legal clarification of intra-EU transport.[h]

[h] The European Court of Justice held that the EU may set a binding common position for its member states within bodies created by international agreements even where the EU is not a party, provided the subject of legislation falls within the EU's competence.[59,60] It has to be noted that these rulings do not automatically extend to obligations related to the international treaties themselves.

5.2. UNEP Regional Seas Programmes

Another layer of complexity is added by the rules on Europe's regional seas, covered by treaties under the United Nations Environment Programme Regional Seas Programme, such as the OSPAR Convention (North Sea and North-East Atlantic), the Helsinki Convention (Baltic Sea), the Barcelona Convention (Mediterranean Sea), and the Bucharest Convention (Black Sea). These regimes each protect specific seas and include their own rules against dumping and pollution, which thereby add onto the London Protocol. If CO_2 transport and storage activities are planned in any of the listed seas, the relevant regional sea programme will have to be amended accordingly for said activities to be approved, regardless of ratification or provisional application of the London Protocol.

OSPAR no longer poses a barrier to CCS in its respective area after its parties adopted an amendment to explicitly allow offshore CO_2 storage in subsoil geological formations in 2007.[63] In fact, the OSPAR region is where Europe's first offshore CCS projects (Sleipner, Snøhvit, and now Northern Lights) operate. This amendment can serve as an example for the other regional treaties, since the Helsinki, Barcelona, and Bucharest Conventions are still missing provisions for permitting CCS, although the Baltic Marine Environment Protection Commission has commissioned a legal review of compatibility of CCS activities with the Helsinki Convention in 2025.[64] The EU itself is party to the Helsinki[65] and Barcelona Conventions,[66] an observer to the Bucharest one[67], and has already set positions for amendments to the Conventions in the past.[68] Therefore, to resolve the remaining legal uncertainty, the EU can follow the OSPAR example and use its position in the regional conventions to initiate and steer processes for permitting CO_2 transport and sub-seabed storage under strict environmental conditions.

In sum, from a legal perspective, **the main hurdles for CO_2 transport across borders stem from international treaties that were not written with CO_2 storage in mind**. The London Protocol provides the core framework for controlling marine dumping and could, in principle, offer a solid basis for regulating cross-border offshore CO_2 transport, but its 2009 export amendment still lacks enough ratifications to enter into force, leaving projects dependent on provisional application. On top of this, regional seas conventions under the UNEP Regional Seas Programme add further layers of obligations that differ by basin. While OSPAR has already been adapted to permit offshore storage, the Helsinki, Barcelona and Bucharest regimes still need to be updated. **The EU's task is to actively shape these frameworks so they accommodate CCS**.

6. Closing the Finance Gap and Reducing Investment Risks

There are public benefits to all of society represented by CCS as an integral component of industrial decarbonisation efforts. Due to market failures and barriers hindering the development of a well-functioning market on its own, it has become clear that **public support mechanisms**, both financial and non-financial, are needed.

This chapter therefore looks at the current landscape of financing and de-risking instruments and where they fall short, examining investment risks specific to CCS value chains, reviewing European and national support instruments, and analysing how tariffs design and risk spreading instruments introduced through the upcoming CO_2 market and infrastructure legislation, can support the development of a **business case for CCS technologies**.

Recommendations for the EU:

- introduce targeted revenue stabilisation instruments so that early transport and storage projects can cover operating cost gaps while the market scales up.
- establish a common framework for how revenue limits are set and how costs for CO_2 networks are recovered over time.
- support the creation of an EU-wide, layered risk-spreading scheme on-top of or in support of commercial insurance to mutualise cross-chain outage and business-interruption risks. The scheme should include contributions or buy-in from EU, national and all actors along the value chain to spread risk while keeping accountability and without risking moral hazard behaviour.

6.1. Shortcomings of Carbon Pricing Systems as Economic Enablers for CCS

A functioning CO_2 market is one that enables economic service offers for capturing, transporting and subsequently storing CO_2. In this value chain, **stored CO_2 has no inherent standalone economic value**. **Its value is derived primarily from avoiding the cost exposure associated with emitting under the ETS**: the EU's primary tool for pricing CO_2 and incentivising decarbonisation by making emitters internalise the cost that their emissions cause to society. It is a market-based instrument with the goal of optimising how the public interest of emission reduction is reached through market dynamics.

In principle, the costs of emitting should incentivise investments in emission abatement measures such as efficiency improvements or a switch to clean energy. After cheaper decarbonisation strategies have been implemented, certain harder-to-abate emissions could only be avoided by capturing and storing the CO_2 instead. This effect should be amplified by the phase-out of free emission allowances by 2034: the increasing scarcity of allowances should, over time, raise the expected cost of continued emissions and make decarbonisation investments comparatively attractive. After the full cessation of allowance auctioning by 2039, continued emissions can no longer be part of a viable economic model, and decarbonisation effectively becomes a mandatory condition for continued industrial activity. Over time, this should strengthen the business case for CCS: From a certain point onwards, the ETS price signal should become sufficient for many applications to run CCS on a purely commercial basis, because the avoided cost of emitting covers the cost of CCS.

However, carbon pricing alone is unlikely to ensure bankability of building interconnected capture, transport and storage capacity, especially considering the uncertain initial utilisation at the required pace. While long-term investment commitments in such capital-intensive assets require **security of investment**, the risk of investing in the CCS industry is still perceived to be high.[69] ETS price fluctuations are influenced by macroeconomic conditions, energy markets, regulatory adjustments, and market sentiments. Even when expected future ETS prices could be sufficient to support CCS operations, investors and lenders must still take near- and medium-term cash-flow risk and the likelihood of underutilised assets in the ramp-up phase into consideration. For the time being, **the marginal operating costs of most industrial CCS applications still exceed typical ETS prices**.[70] These challenges directly impact the revenue certainty dearly needed.

The potential leverage of the ETS is also constrained due to its design: it primarily targets abatement decisions at installation level. It is therefore an insufficient instrument for kickstarting investments into initially oversized, multi-user networks such as CO_2 pipelines, shipping terminals, or storage sites. Such a large-scale infrastructure would deliver system-wide benefits that cannot be reaped by any single market actor, while the benefits also go beyond the obligations any individual emitter has to fulfil.

In addition to this, the cross-chain dependency of participants in the CO_2 market demonstrates how the coordination challenge it faces cannot be overcome with carbon pricing alone: CO_2 capture, transport and storage projects develop at different speeds, in different geographies and jurisdictions, and sometimes under different technical conditions. If capture capacity or infrastructure is built without sufficiently synchronised demand and supply, assets may be underutilised. Conversely, delaying network investment until all volumes are contracted would prevent backbone infrastructure from emerging at all.[i] Without targeted support now, the commercial challenges that are most acute at low volumes and high uncertainty will prevent the necessary assets from being built in time. In order to bridge the gap and thus enable a self-reliant market to materialise, **tailored support schemes are needed during a transitionary phase**. Given that the market is expected to become commercially self-sufficient as it matures, governments can expect to reduce and ultimately stop subsidies or support-schemes in the long-term that were granted from the future revenues a mature market will generate.

The next sections therefore focus on the implications of these shortcomings for the design of financing and de-risking support tools needed to complement the ETS and empower the carbon price signal to effectuate bankable CO_2 transport and storage investments. It sets out why early-phase projects face a combination of risks related to price and policy uncertainty,

---

[i] The Bellona article *What's Blocking the CO_2 Market? Unpacking Potential Market Failures* elaborates in detail on the specific market challenges an early CO_2 market has to overcome.

volume, cross-chain dependency and liability. These risks are difficult for individual first movers to absorb efficiently, and they can delay investments..

6.2. Cross-Chain Risks to Bankability and how to Mitigate them

Investments in CCS are exposed to a range of risks that hurt its bankability. Investors and lenders require predictable, long-term cash flows and risk allocation for assets with high upfront costs and multi-decade payback periods. In the current European market, these conditions are not yet met: revenues depend on uncertain future utilisation and on decisions taken by multiple counterparties across the value chain. Meanwhile, **interconnected networks also create exposure to operational disruptions and compensation liabilities** that commercial contracts and insurance markets cannot fully absorb. The CO_2 markets & infrastructure regulation should therefore include designs and mechanisms to **facilitate a de-risking framework that improves bankability through clearer risk allocation**, tools to **manage early-phase utilisation and counterparty risks**, and, where necessary, **risk-sharing arrangements that limit the system-wide impacts of low-probability, high-cost events**.

6.2.1. Alleviating Counterparty, Synchronisation and Utilisation Risk through Public Backstops

The revenue outlook for transport and storage depends on an array of market participants across the value chain that are entering a nascent market. Early adopters face disproportionately higher costs and risks, which discourages first-mover investment. At the same time, **capture, transport and storage capacity is being developed at different speeds**, while projects depend on other parts of the chain being available when needed. Uncertainty arises from different potential issues: Value chain segments may drop out or come online too late relative to other links, realised CO_2 flows may be lower than assumed, and key parts of the system may become temporarily unavailable due to operational disruptions (these types of risk are described in Table 4).

As long as this uncertainty is not addressed, actors will hold back on final investment decisions, which slows down the build-out of the capture capacity and infrastructure that is actually needed at scale. The absence of positive investment signals discourages emitters from committing to capture investments, thereby contributing to a negative feedback loop, which again impedes the whole value chain. The following section therefore outlines how a regulatory risk-mitigation tool such as **government-supported backstops can allow investment decisions to proceed** in face of coordination challenges.

Table 4: Types of Cross-Chain Risks from Different Sectoral Perspectives

Risk type	Description of cross-chain mechanism	Transport & storage operator perspective	Emitter perspective
Counterparty / default	One party of the chain fails financially or contractually, disrupting the rest of the chain.	Risk that emitters or shippers fail to deliver contracted volumes or default on ship-or-pay commitments.	Risk that T&S company fails to build, operate or maintain capacity as contracted, leaving capture assets underutilised or stranded after investing CAPEX.
Timing / synchronisation	Assets in different chain segments reach FID or start operation at different times.	Risk of transport and storage infrastructure being ready before a sufficient amount of emitters come online, causing prolonged under-utilisation and revenue gaps.	Risk of capture plant being ready before T&S, forcing curtailment or delay of operations and loss of support payments or CCfD revenues, while paying ETS.
Infrastructure capacity underutilisation	Actual CO_2 flow lower than what was assumed when assets were sized and financed.	Risk of lower aggregate volumes from emitters than forecast, lowering revenues and increasing unit tariffs or creating stranded capacity.	Risk to emitter limited, unless T&S cease operations due to financial loss, or pass on higher per-tonne capacity charge through dynamic pricing.
Operational downtime	Unplanned downtime in T&S due to faults, maintenance, force causing cascading chain effects.	Lost tariff revenue during downtime; repair costs; potential shortfalls if not fully covered by insurance, potential availability penalties.	Forced venting triggers ETS surrender; loss of green product premiums, Innovation Fund milestones or CCfD payments; high-cost unabated operation.

The different segments of a CCS chain are both interdependent and at risk of falling out of sync. This combination gives rise to what is often described as **cross-chain risk – a major reason for hesitation** to go forward with projects. Capture facilities, transport networks and storage sites do not move at the same pace, and the cost of having one part of the chain completed but idle, while waiting for another part to catch up, can be prohibitively high. **The value of each asset hinges on decisions taken by third parties outside one's own control**. Those parties' own investment decisions in turn hinge on production levels, volatile ETS prices, evolving climate policy frameworks and the availability of technological alternatives, which complicates alignment. Each delay elsewhere in the chain can turn into a threat to one's own business case. CCS is particularly prone to these timing mismatches because the number of viable counterparties will stay structurally limited in the early phase of the market. There is a limited number of industrial installations, transport corridors, and available geological storage sites suited for and in need of CCS. This reduces substitutability: if one storage project drops out, a capture project often cannot simply switch to another sink on short notice. Alternative routes may not exist, spare capacity may not be available, and permitting constraints can be highly specific to the original chain. In more mature network industries such as electricity or gas, by contrast, a higher density of interconnected infrastructure and diversification of service providers makes rerouting more feasible.

CCS project developers across Europe report that **mismatches in timing and scale between emitters and storage projects are already stalling decisions**:[71] capture plants are asked to commit to long contracts without certainty that a storage site will be ready. Meanwhile, transport and storage operators hesitate to invest without a critical mass of firm capture commitments. Smaller and more dispersed emitters are particularly affected, as they struggle to provide the large, steady volumes usually demanded in current contracting practices, yet their collective volumes are still too small or uncertain to justify dedicated infrastructure.

The issue of timing mismatch is compounded by counterparty and credit risk. Long-term business cases for CO_2 transport and storage will have to assume that individual industrial sites will operate for decades at stable levels and continue to rely on CCS, rather than switching to other decarbonisation routes, relocating, or closing altogether. In practice, **European harder-to-abate industry is undergoing rapid structural change**, with uncertain prospects for some sectors and regions. If key anchor emitters reduce production or exit, neighbouring infrastructure can lose a large share of its expected revenue. Currently, no EU-wide regulatory instrument exists to alleviate these issues.

One example of a country that managed to address these barriers to investment is the United Kingdom (UK), where investment risks are being tackled through instruments such as revenue support mechanisms and government backstops.[42] The UK framework is designed to cover timing mismatches along the chain, the gradual build-up of utilisation, and periods of underuse, so that pipelines and storage sites can be financed and operated even before they are fully booked. In addition, the UK regime recognises "bad debt" risk: specific allowances and collateral requirements protect the transport and storage company if users default on their obligations, thus reducing the exposure of infrastructure operators to the financial fragility of individual emitters. A dedicated government support package further provides a public backstop for very low probability but high-impact events. Namely, the package covers the uncompensated capital investment of assets that have stranded through a complete and permanent loss of demand for transport & storage, and the extreme tail of the risk of significant storage leakage events, where commercial insurance is not available or already exhausted. Together, these measures shift an elementary portion of cross-chain, utilisation and counterparty risk away from individual projects and into a regulated framework, thereby improving the bankability of CO_2 transport and storage projects.

The EU could take inspiration from this arrangement and consider introducing **backstops and guarantees. With them, the EU could limit market actors' exposure to counterparty failure and make cost recovery more predictable, thereby reducing risk, improving financing conditions and accelerating investment decisions.** In addition, the Commission should provide guidance to member states on the use of state aid in policy interventions, so the risk of non-contracted volumes of CO_2 transport & storage capacity can be shared.

However, bankability is not determined by investment coordination risk alone. As CO_2 infrastructure evolves from isolated point-to-point chains into shared, interconnected networks, investors will also price exposure to liability risk stemming from operational issues, namely the risk that an incident at one node or corridor triggers wider unavailability, compensation claims and prolonged revenue disruption. The following subchapter therefore focuses on how the Regulation can address this other form of cross-chain risk through clearer liability allocation and insurance and risk-sharing arrangements.

6.2.2. Containing Liability & Reducing Compensation Claims through an Insurance Risk-Spreading Pool

As CCS projects spanning different segments from capture to storage will come with cross-chain dependencies, an **EU-level insurance risk-spreading mechanism should be developed from the outset to contain liability and compensation claims** potentially resulting from disruptions of operations.

At first, most CO_2 transport chains will be in the form of direct, project-specific, point-to-point connections that link single emitters or clusters to single storage sites, using one dedicated transport route each. Initial capacity will be built incrementally around the first capture and storage pairings.[72] Over time, the network is expected to become more intertwined as additional emitters connect to the same corridors and hubs and transport operators expand their truck and ship fleets, integrate shared infrastructure like pipelines and terminals, and offer different routings across borders to a variety of storage sites. As transport chains expand and mature by involving multiple subjects, compensation claims could grow. The associated risk both at the market inceptions and in the long-term with potentially growing claims, is that if one link of the value chain fails, the costs would cascade onto the other participants in the chain. Such a situation constitutes a great investment risk standing in the way of projects' realisation in the market's infancy, and when more mature could leave large shares of the network temporarily unavailable to multiple users.

As such cross-chain dependencies create contingent liabilities from both in the short and long-term, **risk management should be put in place at the early phase of the market**, and then scale as volumes and connectivity grow.

The more emitters' streams intersect at a given link that faces technical issues, the more costs associated with forced venting and business interruptions would add up. This is even more true in the context of the EU ETS, where any CO_2 that is captured but not stored must be reported and paid for in the form of emission allowances. At the same time, the emitter's capture unit has already generated operating costs, and will continue to do so the longer it is left on standby before the network functioning has been restored. Moreover, the technical problem might occur at an earlier link in the chain, such as a liquefaction terminal, but the emitter may still have a take-or-pay contract with the ship operator and the storage operator further downstream. Under such contracts, the emitter has to pay capacity charges to those ship and storage operators as long as their capacity is reserved for the emitter, even if no CO_2 can actually be moved. In this scenario, the potential losses of an emitter are compounded, both unable to avoid paying EU ETS costs and having to pay for unused transport and storage services. This is what has by some been referred to as a "double penalty". In view of this, many actors may face higher costs of capital, struggle to obtain adequate insurance, and thus become hesitant to enter the CCS market before such levels of connectivity are reached.

The Commission could address the issue of liability risk stemming from business interruptions and cross-chain connectivity by supporting the introduction of a **European insurance risk spreading tool** early on. Such a scheme could work by introducing a "buy-in" mechanism for actors along the value chain, backed by both EU and national governments guarantees. The scheme would also need to include private insurance providers, and the pooling of resources from market participants, EU and national government to function as an enabler. The "buy-in" from market participants would be crucial to prevent any risks of moral hazardous behaviour. One existing precedent for such a risk-spreading approach is the 2010 Protocol of the HNS Convention for maritime transport[j]: it sets up an international liability and compensation system with two layers for damage from carriage of hazardous and noxious substances by sea.[74] For the first layer, shipowners are to be held strictly liable up to a certain limit, which depends on the vessel's size, defined by a policy and backed by a compulsory insurance. Above that, an HNS Fund would pay directly additional compensation when shipowner insurance is insufficient, withdrawing from a collective pool financed by annual contributions of the receivers of bulk cargo. A comparable approach could be considered as part of the CO_2 market and infrastructure regulation, and a detailed proposal is being developed by Bellona Europa to this end.

6.3. Improving Predictability through Deferred Cost Recovery & Revenue Stabilisation

A central issue for the regulation of early CO_2 transport and storage networks comes with ensuring that operators can recover their costs through their means of revenue. Tariff design can serve as a vehicle for granting indirect financial and de-risking support to operators. Where member states apply control over allowed revenues, revenues can be stabilised through integrating deferred cost recovery tools such as intertemporal cost allocation into a tariff structure. Where tariffs remain negotiated, revenue smoothing can be pursued through targeted tax design.

For the upcoming CO_2 markets & infrastructure regulation, the Commission could enable the use of such tools by member states. On this basis, it could introduce common EU rules on what forms of tax relief CO_2 transport and storage networks can receive, and how they can recover their costs over time if subject to a regulated access model. Operators would be allowed to

[j] The Convention is not yet in force. However, a sufficient number of contracting parties for passing the threshold have committed to ratification in the near future.[73]

shift part of the recovery of their investment costs into later years, so that early users are not confronted with very high tariffs.

In some member states, regulators may choose to apply revenue control for certain forms of infrastructure (the topic of regulatory restriction of access conditions, including tariffs, is examined in detail in the subchapter "4.1 **Alleviating Monopolistic Tendencies of a Market in the Making**"). In such a regulated access model, the regulator sets an "allowed revenue" that should cover the operator's efficient costs while also providing them with a reasonable profit margin. These costs have two components: capital expenditure, which is the money spent on building assets such as pipelines, terminals or storage facilities, and operating expenditure, which is the money needed to run and maintain them every year. The capital expenditure enters a "regulated asset base", a book value of those assets. Each year, part of that book value is gradually written off as depreciation to reflect that assets are used up over time. In parallel, the regulator allows the operator to earn a regulated rate of return on their investment. This revenue rate shall compensate investors of those assets for tying up their capital. Tariffs for users are then calculated so that, in each year, the sum of all payments from emitters makes up a figure as close to this allowed revenue as possible. In other member states, operators will seek to recover costs through individually negotiated tariffs.

In both cases, this logic works smoothly when an asset is already well used. However, as not all emitters will bring their capture facilities online simultaneously, the actual volume throughput will rise incrementally over time. **For new CO_2 networks, pipelines and terminals must be sized with future demand in mind**. Thus, in the first years, emitters will not fully utilise the total capacity that the transport and storage infrastructure offers and that is expected to be needed later on. If the operator seeks to generate the full amount of the revenue needed for cost recovery through tariffs every year, costs are distributed on a small number of emitters in the beginning. Low initial volumes mean that each tonne of CO_2 that emitters supply for transport and storage has to carry a very high share of the cost that the operator bears. In practice, this results in very high per tonne handling charges for the early users of the network. Such high tariffs then discourage emitters from connecting, or becomes a barrier for investment and entering into the market, which perpetuates the cycle of network underutilisation**. The combination of high upfront investment and low initial throughput could trap new networks in a vicious circle** if nothing is done to spread costs more evenly over time.

To avoid this, governments look at ways of **smoothing cost recovery over time**. In both negotiated and regulated settings, a large share of network costs are capital costs that have to be recovered over time. This typically happens through depreciation of the underlying asset base and the financing cost of capital tied up in the assets. In a regulated access regime, this is formalised in a regulated asset base used for setting allowed revenue.

Where tariffs remain negotiated, governments can pursue revenue smoothing through **targeted tax design.** If a straight-line depreciation profile is applied rigidly from day one, the costs that operators could write off in the early years would be far higher than the revenues they could realistically generate from a small number of emitters. **By changing the depreciation profile, regulators can ease the economic pressure**: instead of applying common depreciation trajectories from day one, they can allow back-loaded depreciation, as was temporarily considered in the UK.[42] With a back-loaded depreciation curve, operators retain a larger share of the revenue per user in the early years and a smaller share only later, when volumes are expected to be higher and more total revenue flows in. This approach effectively yields a tax reduction for the operators, as the profits in later years can be virtually reduced by excessive losses from earlier years.

In addition, under regulated access models with revenue control, provisions for de-risking can be embedded directly into the rules for tariff setting. Instead of insisting that the operator fully recovers annual costs each year, the regulator may allow part of the fixed costs to be deferred into the future.

Germany's hydrogen network legislation provides a concrete reference point for such measures smoothing cost recovery over time in a revenue-controlled context, through what is described as an **intertemporal cost allocation scheme** (see Figure 3).[75] In essence, network operators set moderated and consistent tariffs over the economic lifetime of their assets. In the early phase of the market, tariffs are deliberately set below the break-even point: low enough not to deter the few early movers that could be interested in connecting, but too low to recover the annual cost, made up of the annual depreciation of the regulated asset base and the operating cost. The unrecovered gap is booked as a deficit in a separate amortisation account, offered by Germany's state investment and development bank KfW. This deficit works like a loan that is paid down later when infrastructure usage and thus revenue increases. In those later years, when more hydrogen users are connected and total volumes are higher, it would normally be possible to reduce the per-tonne tariff and still cover all ongoing costs due to economies of scale. However, operators are allowed to keep tariffs at the earlier, moderated level instead of lowering them, and use the extra revenue to pay down the accumulated deficit in the amortisation account. If, by 2055, full recovery of the investment still has not been achieved through tariffs, the government will absorb 76% of the remaining deficit. Such schemes can **protect early movers from prohibitively expensive tariffs for oversized infrastructures, while guaranteeing long-term economic viability for operators**.

With the CO_2 market and infrastructure regulation, the Commission could make such schemes broadly available by asking national regulators to permit adjusted depreciation curves and deferred cost recovery for CO_2 infrastructure that is used by emitters from different member states. This could be further facilitated by linking the mechanism for deferred cost recovery to an EU-level facility providing the amortisation account, potentially operated by the European Investment Bank. Any residual deficit at the end of a predefined period could be shared between national budgets and the EU budget.

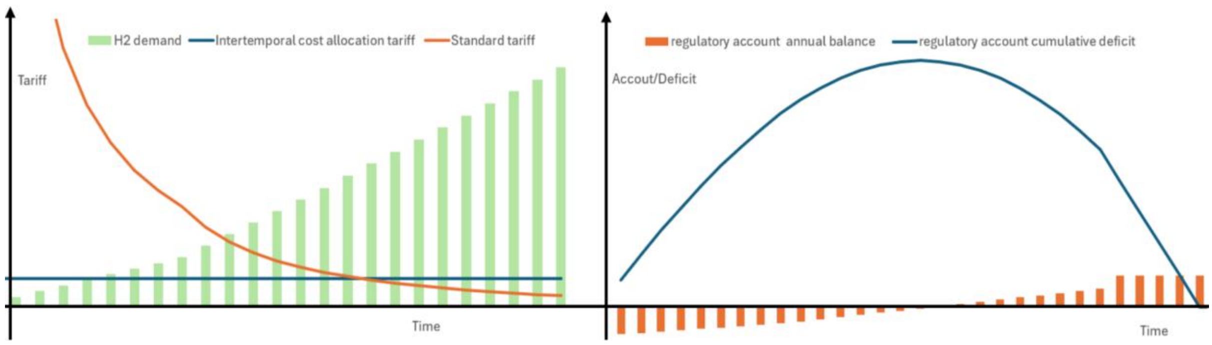


Figure 3: Hypothetical Tariff Projection - Intertemporal Cost Allocation[49]

7. Seamless Flow through Technical Standards and Harmonisation

CO_2 transport is an engineering exercise: captured CO_2 is dried, compressed into a dense phase and moved through pipelines, ships and terminals to geological storage sites. However, when it comes to coordinating transports across an interconnected, open-access European network, significant coordination challenges arise. Different capture processes produce different mixtures of CO_2 and impurities, necessitating common standards. If every project, hub or country sets its own purity thresholds, measurement rules and operating practices, CO_2 flows across segments and borders could be impeded due to long reconciliatory processes needed for the conflicting norms. This chapter examines how standards are currently set and what role the upcoming EU legislation on CO_2 Market and infrastructure could play in this process.

Based on Bellona Europa's research, the key takeaway of this chapter is that a cross-border CO_2 market in Europe will only scale up if it sits on **common technical foundations that protect safety and storage integrity without over-engineering**, so that emitters can connect to the emerging network without having to guess which standards will apply to their infrastructure tomorrow. This section therefore first tackles stream specifications and then end-to-end coordination.

Recommendations for the EU:

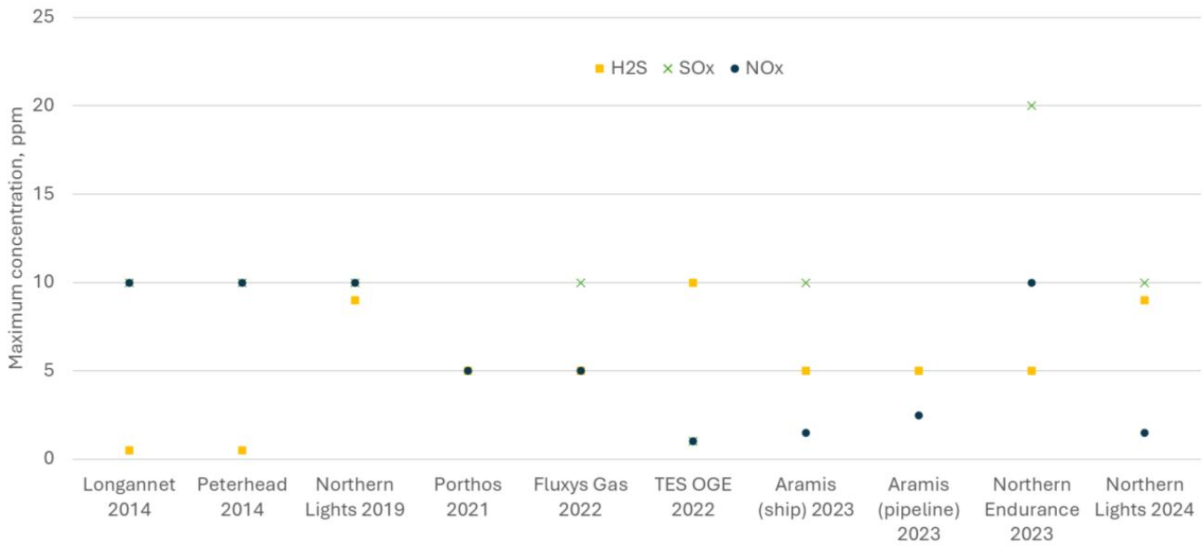
- elaborate EU-wide harmonised and transport mode-specific standards for stream composition and metering, set interim specification ranges for interconnection points, and require operators to share operational data so that these standards can evolve as experience accumulates.
- adopt a CO_2 interoperability network code and define minimum duties for national regulators.

7.1. Protecting Infrastructure through Standardisation of Stream Specifications and Measurement

Divergent CO_2 standards could fragment the nascent CO_2 market early on and hurt interoperability. To operate an integrated EU-wide network, it is necessary that CO_2 from different sources can be commingled and transported by multiple consecutive transport links across borders without damaging pipelines, tanks or compressors. Captured CO_2 streams contain varying levels of **impurities** (water, O_2, SO_2, NO_x, H_2S etc.) depending on the capture process and source. These impurities affect CO_2's phase behaviour (i.e. how its physical state and properties change with pressure and temperature) and can cause corrosion or hydrates in pipelines and valves, posing safety and integrity risks if unmanaged. For example, excessive oxygen or water content can lead to pipeline corrosion, and high hydrogen sulfide or nitrogen can alter the density and pressure characteristics of the CO_2.[76] [77] At the same time, standards tailored to CO_2 for metering its flow and composition, for the calibration of instruments or for the performance of leak detection and localisation systems are still underdeveloped. Operators are often forced to derive operating standards from existing protocols for oil and gas handling which do not fully capture CO_2-specific behaviour.[78] **Clear and specific minimum standards are therefore needed to streamline operations**, codifying best practices and thereby ensuring safe operations and building public trust.

At present, there is no binding EU-wide specification for the stream composition of transported CO_2. The CO_2 Storage Directive only broadly requires that the CO_2 stream consist "overwhelmingly" of CO_2, no waste may be added for the purpose of disposal, and that the concentration of any incidental substances must be low enough not to harm storage or transport integrity, pose significant environmental or health risks, or breach other EU law.[14] At the same time, standards are being set on a project-by-project or national basis (see Figure 4Figure 4). This lack of uniformity creates uncertainty. Investors could worry that, if they tailor their capture facilities to one stream specification, they may be unable to access another country's network without extra purification.

If every project or country imposes its own specifications for permissible impurity levels, a patchwork of standards would emerge, complicating the flow of CO_2 between networks. On the other hand, overly strict purity requirements could add unnecessary purification costs. Evidence on the impact that different levels of impurities have on transport equipment is continuously emerging, and because operational experience is still limited, the maximum permissible impurity levels cannot yet be determined with certainty. A balance must be struck via harmonised CO_2 stream standards that can be concluded in relatively short time, while also imposing strict enough conditions to protect infrastructure, but without overburdening operators.



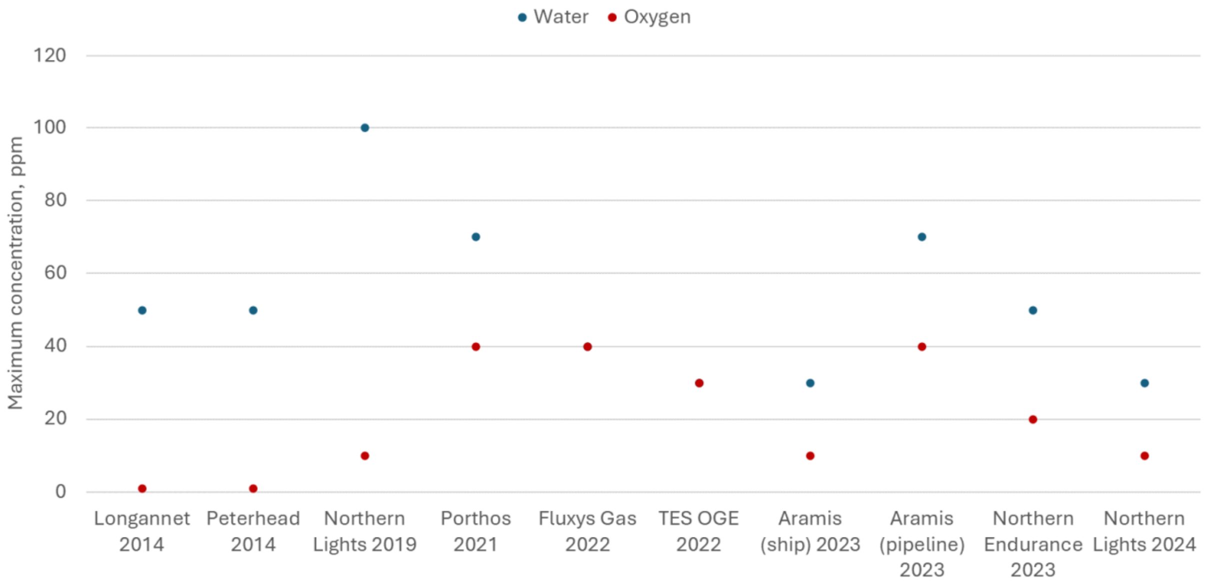


Figure 4: Overview: Stream specifications of selected European projects[79]

In order to prevent the issues potentially arising from the lack of tailored standards as well as their fragmentation across projects, standardisation work on European level is already ongoing: In 2023, the European Committee for Standardization (CEN) created the technical committee CEN/TC 474 dedicated to CCS, with the goal of building on existing ISO standards and a mandate that explicitly covers CO_2 stream composition and quality, pipeline transportation, and measurement, monitoring and verification across the value chain, directly speaking to the need for impurity limits, consistent metering rules and fit-for-purpose leak detection methods. First work streams aim to develop recommendations for common standards on the properties of CO_2 streams or their measurement.[80]

In the meantime, the Commission convened a working group on CO_2 standards in the context of the Industrial Carbon Management (ICM) forum, with representatives from emitters, transport and storage operators. In their concluding report, the group responds to the uncertainty around safe impurity levels: They urged a flexible, evidence-led approach on standards, recommending individual projects to start with conservative limits that ensure integrity and flow assurance, to then relax those limits as research findings and operational data accumulate. It further recommends using the German DVGW's C260 standard as a practical starting point, which the group identified as the most advanced standardisation work stream to date. Their report calls for standardisation beyond stream purity alone, including online measurement of integrity-critical components, common off-specification protocols at interfaces, and work on monitoring, reporting, and verification (MRV).[79] **What is still lacking, though, is the mandate for the EU to turn emerging technical work into coherent rules for the internal market**. The underlying problems remain: minimum standards are being worked on but not yet enforceable, and there is no legal safeguard against a patchwork of national thresholds.

The forthcoming CO_2 transport and market regulation should empower the Commission to issue a standardisation request to CEN/TC 474 to develop European standards on CO_2 stream composition, metering, calibration and uncertainty classes. In the short term, the Commission should further adopt interim common specification ranges by an implementing act, analogous to the regulation for hydrogen.[81] These ranges could be limited to cross-border use at interconnection points, and consider repealed once the relevant harmonised European standard by CEN comes into place. They would establish a single EU baseline for interconnections rather than fragmented national thresholds. If a country chooses a tighter specification for its domestic network, it would still have to accommodate incoming CO_2 that meets the EU minimum specification.

As real operational data comes in from early projects, the standards should be adjusted along the way. To facilitate this learning process, the Commission could mandate that operators share performance data on the impact of different levels of impurities into a shared database. This way, standards can be optimally recalibrated over time as operational evidence accumulates.

7.2. Preventing Flow Interruptions through Systems for CO_2 Handover and End-to-end Coordination

The operation of open-access, multi-node cross-border CO_2 transport networks also raises questions about how different segments of the transport chain hand off responsibility. In CO_2 networks, where streams are aggregated and blended, any molecule could plausibly pass any downstream link of the transport chain. Therefore, it would be prudent to set overarching specifications to protect the most sensitive component in the chain from impurities, whether that is ship transport or pipelines, depleted hydrocarbon fields or saline aquifers. This, however, could create tension: if all emitters have to meet the same standard, some individual emitters may potentially face stricter purification requirements than their own contracted route would require, making them effectively pay to meet constraints of transport modes or storage types they do not use. This could be the case if, for instance, an emitter has a contract with an onshore storage operator with less stringent requirements, but feeds its CO_2 into the same pipeline network that would also connect to a terminal for maritime shipping with stricter requirements.

A workable compromise is to set differentiated CO_2 specification standards, tied to the next transport mode at the relevant handover point: Emitters' CO_2 supply would only be required to meet the entry stream specification of the infrastructure they physically deliver into, for example a pipeline network. More stringent specifications needed for maritime shipping would apply only at the interface points that actually feed ships, so for liquefaction terminals. The additional conditioning and purification needed to reach the quality needed for ship transport would be provided as part of the service of liquefaction terminals. Consequently, the costs of the necessary additional purification would be distributed only among those that have contracted terminal and ship transport services, rather than being imposed upstream on all network users alike. The CO_2 Markets & Infrastructure **Regulation should therefore enable differentiated stream purity levels, allow for mode-specific specifications** and clearly designate where each applies. This approach limits unnecessary over-purification upstream while still protecting sensitive assets.

If, however, deviating streams are supplied, such incidents could pose another liability challenge: without clear rules for how they should be handled, every operator may default to protecting their own asset by refusing off-spec CO_2, which could lead to avoidable venting. A **coordinated approach would introduce protocols for handling off-specification CO_2 at**

cross-border points. For example, network operators could be required to cooperate and take remedial measures before refusing carriage. If CO_2 arriving at the border slightly deviates from specifications, the respective operators on both sides should assess if actions such as blending can bring it within safe limits.

Thus, the CO_2 market and infrastructure regulation should empower the Commission to adopt a network code on CO_2 interoperability and data exchange as an implementing regulation. Such a network code should set binding rules at cross-border points for data exchange, acceptance criteria, and off-spec handling, obliging adjacent operators to follow protocols for cooperation. This way, avoidable interruptions of cross-border flow can be minimised.

8. Enabling Cross-Border Storage by Linking Carbon Pricing Schemes

The rulebook on how CO_2 emissions are accounted for determines whether Europe's CO_2 market can be put to use efficiently and deliver emission cuts where they occur. As CO_2 could start to move across borders, rules clarifying which market actors may subtract captured and stored CO_2 from their balance become increasingly important. The question arises on **how to account for CO_2 storage in the EU-ETS in case of CO_2 export outside of the EU**, by way of the prominent case of the UK.

Recommendation for the EU:

- Swiftly agree with the UK through a dedicated working group on mutual recognition of storage sites and aligned accounting rules.
- Promote technical and regulatory harmonisation on chain of custody, leakage liability, and dispute resolution.

An influential lever for decarbonisation efforts for the EU industry is how the EU-ETS treats CO_2 that is transported to storage sites in non-EU jurisdictions, most notably the UK, which is an attractive storage destination for many EU-based emitters. The upcoming CO_2 Markets & Infrastructure **Regulation could initiate an ETS amendment that makes those capacities available**. Indeed, storage sites with an active exploration licence in the UK vastly outsize all of the EU's licensed storage sites combined, while being close to the EU's industrial heartland of the Dutch and Belgian coast.[82] According to an analysis by the Carbon Capture & Storage Association, **enabling cross-border CO_2 flow between the UK and the EU could result in a 28% cost reduction** in offshore CO_2 transport and storage for EU-based emitters (see Figure 5).[83]

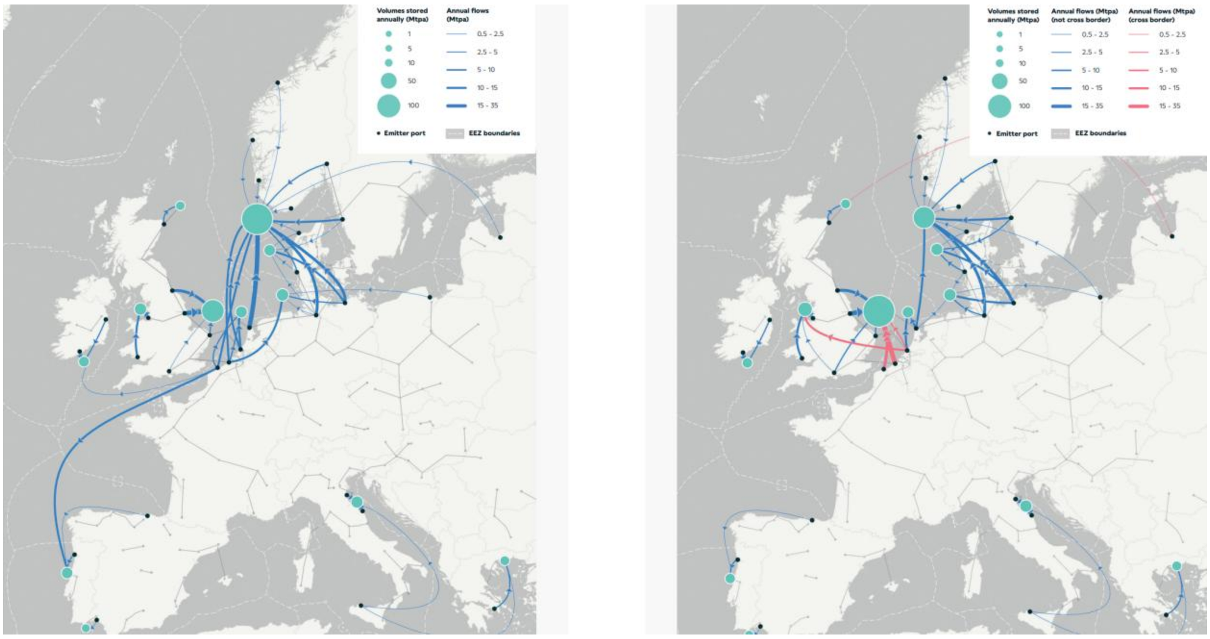


Figure 5: Comparison of scenarios for 2040: Offshore CO_2 flows with and without EU/EEA-UK cross-border storage availability[101]

However, under the EU-ETS and the MRR, an EU-based capture installation may only subtract transferred CO_2 if the storage site it is delivered to is permitted under the EU's CO_2 Storage Directive.[84] [85] **As UK storage sites are no longer included under that Directive, CO_2 that was exported to UK storages would still count as emitted according to the EU-ETS**. Further provisions in the MRR complicate the documenting of chain of custody, since the required monitoring plans of EU-ETS installations need to identify the storage spaces receiving the CO_2 from the Union Registry, which does not include non-EU installations.[86] The same issues are mirrored on the UK side.[87]

A solution is already under way: in 2025, the EU and UK have formed a Common Understanding over bilateral cooperation on a number of topics including the linkage of the EU- and UK-ETS.[88] However, such a linkage is both legally complex and politically charged.[82] Reaching an agreement on all necessary aspects may take considerable time, during which permanent infrastructure for geographically suboptimal CO_2 transport routes could already be established. **Separating the bilateral recognition of storage spaces from the broader agreement could yield faster results** and should be relatively straightforward, as the EU's CO_2 Storage Directive was transposed into UK law before the UK's withdrawal from the Union, and has remained largely unchanged since.[83] However, it cannot be excluded that EU negotiators might seek to use the opening of the CO_2 market for the UK as a bargaining chip to secure concessions in other areas.

Nevertheless, a **dedicated working group for CCS** under the Trade and Cooperation Agreement's Specialised Committee on Energy should be created so to institutionalise the already existing exchange.[89] The group should discuss issues of technical and regulatory harmonisation such as cross-border accounting rules for CO_2 ownership, chain of custody, transfer points, treatment of transport and storage emissions, leakage liability, and a simple dispute resolution mechanism. It should further adopt shared minimum standards for CO_2 stream specification and CO_2 metering methods, while also keeping an exchange on infrastructure network planning.[90] Consequently, the CO_2 Markets & Infrastructure regulation should establish an **EU-ETS & MRR amendment, enabling the deduction of CO_2 stored in third countries where the Commission has adopted an equivalence recognition decision** for the storage permitting and MRV framework.

9. Conclusion

Europe's CO_2 transport and storage market is moving from pilots towards early commercial buildout, but it is still far from an interconnected network and highly uneven across Member States. Without a dedicated EU framework, the market risks developing into a patchwork of national regimes, higher transaction costs for cross-border value chains, and slower, more expensive CCS deployment. The Commission's intention to propose EU-level legislation under the Industrial Carbon Management Strategy makes the next legislative cycle decisive for whether CO_2 handling services evolve into an open, investable internal market that delivers climate outcomes at scale.

9.1. Key takeaways

As corridors begin linking clusters and countries, the system needs **enforceable technical and market rules, clear accountability, and a reliable mechanism for cross-border coordination**. As today's oversight and planning are fragmented and largely national, this report argues for EU-level coordination functions and an operator body for network planning and data sharing.

Coordination instruments can lower transaction costs. An **EU-level data hub** that makes demand and supply visible can support more efficient matchmaking and investment decisions, and can later interoperate with capacity booking and secondary trading. Where capacity becomes scarce, open seasons and anti-hoarding measures help allocation remain transparent and contestable, rather than locking in bilateral deals and strategic reservations.

Market organisation will determine whether the emerging system serves the climate purpose or entrenches market power. CO_2 pipelines, terminals, and storages tend naturally towards market power concentration, if not even monopoly characteristics, and concentrated ownership plus vertical integration can create incentives for self-preferencing. **Clear EU rules on access, tariff supervision and ownership unbundling are central** to keeping infrastructure open to all eligible users and preventing discriminatory outcomes.

Legal certainty remains a prerequisite for cross-border buildout. The London Protocol's export amendment has still not entered into force, and reliance on ad hoc bilateral solutions and interpretations keeps legal risk elevated for shipping-based chains and cross-border projects. A credible EU approach should pair internal legal clarification with practical tools such as model clauses and incentives that speed up ratification, while also addressing overlapping regional seas constraints where relevant.

Financing constraints are driven not only by the cost of infrastructure but by uncertainties over risk allocation across the chain. Carbon pricing alone has not delivered a sufficient and predictable investment case for full CCS chains, and cross-chain risk can deter participation or raise the cost of capital. A structured EU response can reduce this by **stabilising revenues and addressing tail risks**, including through a European insurance risk-spreading pool concept layered above primary commercial insurance.

Interoperability will depend on common technical foundations. Divergent CO_2 stream specifications, metering approaches and operating practices would impede commingling and cross-border transport, while overly conservative requirements could inflate purification costs. Bellona calls for EU-level mandates to develop **harmonised standards, interim ranges where needed, and an interoperability network code approach supported by operational data sharing**.

Storage outside the EU, particularly in the UK, raises carbon accounting questions under the EU ETS. The proposals presented in this report around **mutual recognition of storage sites** aim to prevent inefficient routing decisions driven by accounting constraints.

9.2. Full List of Recommendations

Ensuring Functional Governance and Market Organisation

- Define governance objectives and minimum regulatory functions and require Member States to assign competent authorities with clear powers for technical oversight, access and tariff supervision, transparency requirements, and time-bound complaint and dispute procedures.
- Give an EU-level authority a formal role in coordinating national regulators and acting as arbiter for cross-border cases where national authorities cannot reach common solutions.
- Establish a dedicated EU-level joint body of CO_2 network operators (ENTSO-C) to draw up EU-wide network development plans and scenarios across transport modes.
- create a mandatory EU-level CO_2 aggregation platform as a regulated data hub, with standardised reporting on location, timing, volumes and stream quality for all supported and regulated projects, operated potentially by an ENTSO-C-type body.
- In a second step, develop an interoperable capacity-booking and secondary trading platform with harmonised, transferable capacity products, so that emitters can pool demand and reallocate unused capacity.
- Define EU-wide principles for capacity allocation and congestion management, including open-season procedures and measures to return persistently unused capacity to the market. Monitor outcomes across sectors to ensure alignment with climate objectives.

Maintaining Competitiveness and Fairness in Face of Market Power

- Oblige transport and storage operators to publish pricing and access conditions to ensure transparency.
- Enable national regulators to request information from operators on cost data, capacity use and access requests, and empower them to intervene in commercial agreements to ensure objectivity, transparency, and cost-reflectiveness of tariffs.
- require ownership unbundling for open-access, multi-node CO_2 networks so that transport and storage operators cannot use a market-dominant position to distort competition.
- allow narrowly defined exemptions for point-to-point value chains where not deemed a threat to market competition and function.

Overcoming Legal Barriers to Cross-Border Transport through Unified Legal Interpretation

- explicitly establish the legal permissibility of cross-border offshore CO_2 transport & storage in a legal act, in alignment with the London Protocol.
- actively encourage ratification of the 2009 London Protocol amendment within the EU and beyond to facilitate an international CO_2 market.
- lead processes to adapt regional seas conventions, clarifying that CO_2 transport and storage should not be treated as hazardous waste.

Closing the Finance Gap and Reducing Investment Risks

- set principles for cross-border interactions of national support schemes.
- introduce targeted public support schemes where current instruments do not provide sufficient support to segments of transport and storage.
- introduce targeted revenue stabilisation instruments so that early transport and storage projects can cover operating cost gaps while the market scales up.
- establish a common framework for how revenue limits are set and how costs for CO_2 networks are recovered over time.
- support the creation of an EU-wide, layered risk-spreading scheme on-top of or in support of commercial insurance to mutualise cross-chain outage and business-interruption risks. The scheme should include contributions or buy-in from EU, national and all actors along the value chain to spread risk while keeping accountability and without risking moral hazard behaviour.

Seamless Flow through Technical Standards and Harmonisation

- elaborate EU-wide harmonised and transport mode-specific standards for stream composition and metering, set interim specification ranges for interconnection points, and require operators to share operational data so that these standards can evolve as experience accumulates.
- adopt a CO_2 interoperability network code and define minimum duties for national regulators.

Enabling Cross-Border Storage by Linking Carbon Pricing Schemes

- Swiftly agree with the UK through a dedicated working group on mutual recognition of storage sites and aligned accounting rules.
- Promote technical and regulatory harmonisation on chain of custody, transfer points, leakage liability, and dispute resolution.

9.3 A vision for the future

Climate policy is sometimes framed as a post-materialist luxury that societies could not afford when faced with other challenges. Nothing could be further from the truth: Every euro the EU "saves" on climate action today, will lead to up to ten times the amount in future damage and adaptation costs, as a recent meta-study shows.[91,92] Nothing is more expensive than climate inaction, and the financially cautious choice is actually to spend early and decisively on decarbonisation.

Seen through that lens, the purpose of a CO_2 Markets & Infrastructure Regulation is not to create a market for CCS' own sake. It is to reduce the devastating effects of global warming and **make climate benefit-delivering investment possible** at the scale and speed needed for net-zero pathways, **by aligning private incentives with public interest.** In a net-zero EU industry, CO_2 handling services function as a normal part of industrial infrastructure. Industrial regions connect into multi-user corridors with transparent access and predictable tariffs. Storage access is not confined to the first movers or to a handful of bilateral deals, but expands through planned network development that anticipates demand growth and integrates shipping, terminals and pipelines. Technical interoperability is sufficient that emitters can connect without reengineering capture plants for each corridor's individual specifications, and operators can commingle streams safely under clear standards and monitoring requirements. Carbon accounting rules support, rather than distort, least-cost routing decisions, while still protecting environmental integrity and preventing double claiming. The result is a Europe where harder-to-abate industries such as cement, lime, chemicals, steel and waste-to-energy can decarbonise, and where industrial competitiveness is reinforced by predictable infrastructure access and a reliable long-term regulatory environment.

Bellona's work on this agenda will continue beyond this publication. This report was released ahead of a wider analysis for the Horizon Europe research project COREu, expected at the end of 2026.

List of References

1. Clean Air Task Force. Tracking CO_2 Storage Project Capacity in Europe. Accessed January 15, 2026. https://www.catf.us/carbon-capture/storage-project-capacity-europe/

2. European Commission. What is the Innovation Fund? Accessed November 16, 2025. https://climate.ec.europa.eu/eu-action/eu-funding-climate-action/innovation-fund/what-innovation-fund_en

3. Lockwood T. New Innovation Fund awards underscore growing market demand for CO_2 storage and cross-border transport. Clean Air Task Force. November 3, 2025. Accessed November 16, 2025. https://www.catf.us/2025/11/new-innovation-fund-awards-underscore-growing-market-demand-CO_2-storage-cross-border-transport/

4. European Commission. CEF Energy: Connecting Europe through CO_2 infrastructure - European Climate, Infrastructure and Environment Executive Agency. Accessed November 16, 2025. https://cinea.ec.europa.eu/news-events/news/cef-energy-connecting-europe-through-CO_2-infrastructure-2025-10-30_en

5. European Commission. *The Clean Industrial Deal: A Joint Roadmap for Competitiveness and Decarbonisation*. 2025. Accessed November 17, 2025. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0085

6. European Commission. *Innovation Fund IF25 Heat Auction - Terms and Conditions*. 2025. https://climate.ec.europa.eu/document/download/cfde57b3-d80f-43e1-9ee4-cd96c42c6ca8_en?filename=if_2025_draft_t_c_heat_auction_en.pdf

7. European Commission. *Communication from the Commission – Guidelines on State Aid for Climate, Environmental Protection and Energy 2022*. 2022. Accessed November 16, 2025. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022XC0218%2803%29

8. European Commission. *Framework for State Aid Measures to Support the Clean Industrial Deal (Clean Industrial Deal State Aid Framework) - Communication from the Commission*. 2025. Accessed November 3, 2025. http://data.europa.eu/eli/C/2025/3602/oj

9. Rijksdienst voor Ondernemend Nederland. Stimulering Duurzame Energieproductie en Klimaattransitie: Oriënteren. Accessed January 20, 2026. https://www.rvo.nl/subsidies-financiering/sde/orienteren

10. Netherlands Court of Audit. Carbon storage under the North Sea - On Profits under Water. March 2024. Accessed January 20, 2026. https://english.rekenkamer.nl/site/binaries/site-content/collections/documents/2024/03/28/carbon-storage-under-the-north-sea/PAC21%2BENGELS%2Brapport%2BPorthos.pdf

11. Bundesministerium für Wirtschaft und Klimaschutz. *Richtlinie Zur Förderung von Klimaneutralen Produktionsverfahren in Der Industrie Durch Klimaschutzverträge*. 2025. https://www.klimaschutzvertraege.info/lw_resource/datapool/systemfiles/agent/ewbpublications/b16525a0-6316-11f0-92b0-fa163ed847d2/live/document/entwurfsfassung_frl_zweites_gebotsverfahren.pdf

12. Energistyrelsen. CCS tenders and other funding for CCS development. November 28, 2024. Accessed November 3, 2025. https://ens.dk/en/supply-and-consumption/ccs-tenders-and-other-funding-ccs-development

13. Klimat- och näringslivsdepartementet. *Förordning Om Statligt Stöd till Avskiljning, Transport Och Geologisk Lagring Av Koldioxid Med Biogent Ursprung (Regulation on State Aid for the Capture, Transport and Geological Storage of Carbon Dioxide of Biogenic Origin)*. 2024. Accessed November 21, 2025. https://www.riksdagen.se/sv/dokument-och-lagar/dokument/svensk-forfattningssamling/forordning-om-statligt-stod-till-avskiljning_sfs-2024-626/

14. Council of the European Union, European Parliament. *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, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 (Text with EEA Relevance)*. 2009. Accessed November 1, 2025. https://eur-lex.europa.eu/eli/dir/2009/31/oj/eng

15. Council of the European Union, European Parliament. *Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on Guidelines for Trans-European Energy Infrastructure and Repealing Decision No 1364/2006/EC and Amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009 Text with EEA Relevance*. Vol 115. 2013. Accessed November 3, 2025. http://data.europa.eu/eli/reg/2013/347/oj

16. Council of the European Union, European Parliament. *Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on Guidelines for Trans-European Energy Infrastructure, Amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and Repealing Regulation (EU) No 347/2013*. Vol 152. 2022. Accessed November 3, 2025. http://data.europa.eu/eli/reg/2022/869/oj

17. European Climate, Infrastructure and Environment Executive Agency. CEF Energy: Connecting Europe through CO_2 infrastructure - European Climate, Infrastructure and Environment Executive Agency. October 30, 2025. Accessed November 3, 2025. https://cinea.ec.europa.eu/news-events/news/cef-energy-connecting-europe-through-CO_2-infrastructure-2025-10-30_en

18. European Commission. *Towards an Ambitious Industrial Carbon Management for the EU. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions*. 2024. Accessed November 3, 2025. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52024DC0062

19. Global Witness. Pipe down: Gas companies' control over billions in EU subsidies. June 18, 2020. Accessed November 20, 2025. https://globalwitness.org/en/campaigns/oil-gas-and-mining/pipe-down/

20. Equinor. *CDP Climate Change Questionnaire*. 2021. https://cdn.equinor.com/files/h61q9gi9/global/15c02a9371c20b61f3e2353771646d6fbf5cc1a4.pdf?2021-cdp-climate-change-response-equinor.pdf=

21. Equinor. First CO_2 volumes stored at Northern Lights. August 25, 2025. Accessed November 3, 2025. https://www.equinor.com/[...slug]

22. Council of the European Union, European Parliament. *Directive (EU) 2024/1788 of the European Parliament and of the Council of 13 June 2024 on Common Rules for the Internal Markets for Renewable Gas, Natural Gas and Hydrogen, Amending Directive (EU)*

2023/1791 and Repealing Directive 2009/73/EC (Recast) (Text with EEA Relevance). 2024. Accessed November 1, 2025. http://data.europa.eu/eli/dir/2024/1788/oj

23. ENTSOG. Transparency Platform. Accessed November 3, 2025. https://transparency.entsog.eu

24. European Commission. AggregateEU. Accessed November 2, 2025. https://energy.ec.europa.eu/topics/energy-security/eu-energy-platform/aggregateeu_en

25. European Commission. EU Energy and Raw Materials Platform - Hydrogen Mechanism. Accessed November 2, 2025. https://energy-platform.ec.europa.eu/hydrogen

26. ENTSOG. *Report on Capacity Booking Platforms*. 2014. https://www.entsog.eu/sites/default/files/entsog-migration/publications/CAM%20Network%20Code/2014/CAP0505_141104_Booking%20platform%20report_FINAL.pdf

27. Clean Air Task Force. The storage gap: Is Europe developing enough CO_2 storage capacity to meet demand? Accessed January 22, 2026. https://www.catf.us/resource/storage-gap-europe-developing-enough-CO_2-storage-capacity-meet-demand/

28. Deutsche Gesellschaft für Internationale Zusammenarbeit, Deutsche Energie-Agentur. *CO_2 Infrastructure Regulation*. 2025. https://www.dena.de/fileadmin/dena/Publikationen/PDFs/2025/ENTRANS/Entrans_FACTSHEET_CO_2-INFRASTRUCTURE_REGULATION.pdf

29. European Commission. *2012/490/EU: Commission Decision of 24 August 2012 on Amending Annex I to Regulation (EC) No 715/2009 of the European Parliament and of the Council on Conditions for Access to the Natural Gas Transmission Networks Text with EEA Relevance*. Vol 231. 2012. Accessed November 2, 2025. http://data.europa.eu/eli/dec/2012/490/oj

30. Bellona. Carbon Capture and Storage Ladder: Assessing the Climate Value of CCS Applications in Europe. July 7, 2023. Accessed November 17, 2025. https://bellona.org/news/industry/2023-07-carbon-capture-and-storage-ladder-assessing-the-climate-value-of-ccs-applications-in-europe

31. Brunsvold A, Jakobsen JP, Husebye J, Kalinin A. Case studies on CO_2 transport infrastructure: Optimization of pipeline network, effect of ownership, and political incentives. *Energy Procedia*. 2011;4:3024-3031. doi:10.1016/j.egypro.2011.02.213

32. Nicolle A, Cebreros D, Massol O, Jagu Schippers E. Modeling CO_2 Pipeline Systems: An Analytical Lens for CCS Regulation. *EEEP*. 2023;12(2). doi:10.5547/2160-5890.12.2.anic

33. Verbist F, Meus J, Valkering P, Erik D. *Shaping the CO_2 Value Chain: Impacts of Negative Emission Pricing and Infrastructure Economics on Network Rollout*. KU Leuven; 2025. Accessed November 19, 2025. https://kuleuven.limo.libis.be/discovery/fulldisplay/lirias4245313/32KUL_KUL:Lirias

34. European Union. *Regulation (EU) 2024/1735 of the European Parliament and of the Council of 13 June 2024 on Establishing a Framework of Measures for Strengthening Europe's Net-Zero Technology Manufacturing Ecosystem and Amending Regulation (EU) 2018/1724*. 2024. Accessed November 12, 2024. https://eur-lex.europa.eu/eli/reg/2024/1735/oj

35. Vlaamse Overheid. *Decreet van 29/03/2024 over het vervoer van koolstofdioxide via pijpleidingen in het vlaamse gewest*. Belgisch Staatsblad; 2024. Accessed November 1, 2025. https://etaamb.openjustice.be/nl/decreet-van-29-maart-2024_n2024003725.html

36. Danish Parliament. *Lov Om Rørført Transport Af CO_2*. 2024. https://www.retsinformation.dk/eli/lta/2024/612

37. Commission de régulation de l'énergie. *Rapport de La CRE Sur Le Cadre de Régulation Des Infrastructures d'hydrogène et de Dioxyde de Carbone*. 2024. https://www.cre.fr/fileadmin/Documents/Rapports_et_etudes/2024/Rapport_CRE_regulation_infra_H2_et_CO_2.pdf

38. Golombek R, Greaker M, Kverndokk S, Ma L. Policies to Promote Carbon Capture and Storage Technologies. *Environ Resource Econ*. 2023;85(1):267-302. doi:10.1007/s10640-023-00767-5

39. European Commission. *Summary of Commission Decision of 26 November 2008 Relating to a Proceeding under Article 82 of the EC Treaty and Article 54 of the EEA Agreement (Cases COMP/39.388 — German Electricity Wholesale Market and COMP/39.389 — German Electricity Balancing Market) (Notified under Document Number C(2008) 7367 Final) (Text with EEA Relevance)*. 2008. Accessed November 1, 2025. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=oj:JOC_2009_036_R_0008_01

40. European Commission. *Summary of Commission Decision of 18 March 2009 Relating to a Proceeding under Article 82 of the EC Treaty and Article 53 of the EEA Agreement (Case COMP/B-1/39.402 — RWE Gas Foreclosure) (Notified under Document Number C(2009) 1885) (Text with EEA Relevance)*. 2009. Accessed November 1, 2025. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=oj:JOC_2009_133_R_0010_01

41. European Commission. *Summary of Commission Decision of 29 September 2010 Relating to a Proceeding under Article 102 of the Treaty on the Functioning of the European Union and Article 54 of the EEA Agreement (Case COMP/39.315 — ENI) (Notified under Document C(2010) 6701) Text with EEA Relevance*. 2010. Accessed November 1, 2025. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52010XC1223%2801%29&qid=1762017697295

42. UK Government - Department for Business, Energy & Industrial Strategy. *Carbon Capture, Usage and Storage - An Update on the Business Model for Transport and Storage*. 2022. https://assets.publishing.service.gov.uk/media/61d6f02ae90e07037c8d6001/ccus-transport-storage-business-model-jan-2022.pdf

43. European Court of Justice. *Bulgarian Energy Holding and Others v Commission*. 2023. https://curia.europa.eu/jcms/upload/docs/application/pdf/2023-10/cp230160en.pdf

44. Council of the European Union, European Parliament. *Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 Concerning Common Rules for the Internal Market in Electricity and Repealing Directive 2003/54/EC (Text with EEA Relevance)*. Vol 211. 2009. Accessed November 1, 2025. http://data.europa.eu/eli/dir/2009/72/oj

45. Council of the European Union, European Parliament. *Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 Concerning Common Rules for the Internal Market in Natural Gas and Repealing Directive 2003/55/EC (Text with EEA*

Relevance). Vol 211. 2009. Accessed November 1, 2025. http://data.europa.eu/eli/dir/2009/73/oj

46. Fluxys. Fluxys c-grid appointed as “CO_2 Network Operator” in Flanders. October 24, 2025. Accessed November 1, 2025. https://www.fluxys.com/en/press-releases/fluxys-belgium/2025/251025-press-fluxys-c-grid-appointed-carbon-network-operator-flanders

47. UK Government. *Energy Act 2023 - Section 7(1) (As Modified by Section 16 and Schedule 1) - Carbon Dioxide Transport and Storage Licence For Net Zero North Sea Storage Limited*. 2024. https://assets.publishing.service.gov.uk/media/6758097843b2de5fee8daf00/CO₂-transport-storage-licence-net-zero-north-sea-limited.pdf

48. UK Government - Department for Energy Security & Net Zero. Evolution of economic regulation for CO_2 storage: call for evidence. August 6, 2025. Accessed November 1, 2025. https://www.gov.uk/government/calls-for-evidence/evolution-of-economic-regulation-for-CO₂-storage/evolution-of-economic-regulation-for-CO₂-storage-call-for-evidence-accessible-webpage

49. Nederlandse Regering. *Mijnbouwwet*. 2025. Accessed November 1, 2025. https://www.lawcat.nl/wetten/BWBR0037885

50. Bundeswirtschaftsministerium. *Entwurf Eines Gesetzes Zur Änderung Des Kohlendioxid-Speicherungsgesetzes*. 2025. https://www.bundeswirtschaftsministerium.de/Redaktion/DE/Downloads/Gesetz/2025/20250806-gesetzentwurf-kohlendioxid-speicherungsgesetz-aenderungsgesetz-kabinettsvorlage.pdf

51. UK Government - Department for Energy Security & Net Zero. *Carbon Capture, Usage, and Storage (CCUS): Call for Evidence on Non-Pipeline Transport and Cross-Border CO_2 Networks - Summary of Responses*. 2024. https://assets.publishing.service.gov.uk/media/6735db4354652d03d516113c/non-pipeline-transport-cross-border-cfe-summary-of-responses.pdf

52. International Maritime Organisation. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. Accessed November 13, 2025. https://treaties.un.org/doc/publication/unts/volume%201046/volume-1046-i-15749-english.pdf

53. United States Environmental Protection Agency. *London Convention and London Protocol: International Treaties to Prevent Marine Pollution*. https://www.epa.gov/marine-protection-permitting/london-convention-and-london-protocol-international-treaties-prevent

54. International Maritime Organisation. *1996 Protocol To The Convention On The Prevention Of Marine Pollution By Dumping Of Wastes And Other Matter, 1972*. 2006. https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/PROTOCOLAmended2006.pdf

55. International Maritime Organisation. *Resolution LP.3(4) on the Amendment to Article 6 of the London Protocol (Adopted on 30 October 2009)*. https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/LCLPDocuments/LP.3(4).pdf

56. International Maritime Organisation. *Resolution Lp.5(14) On The Provisional Application Of The 2009 Amendment To Article 6 Of The London Protocol (Adopted On 11 October 2019)*. wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/LCLPDocuments/LP.5(14).pdf

57. *The EU Legal Framework for Crossborder CO_2 Transport and Storage in the Context of the Requirements of the London Protocol. Commission Services Analysis Paper for the Information Exchange Group (IEG) under Directive 2009/31/EC – 30.09.2022*. https://climate.ec.europa.eu/document/download/dfbbc90c-071e-4088-ada2-7af467084b30_en?filename=EU-London_Protocol_Analysis_paper_final0930.pdf

58. Departement Kanselarij & Buitenlandse Zaken. *Memorandum of Understanding between the Minister for Environment of the Flemish Region and the Federal Minister for the North Sea of Belgium and the Minister for Climate, Energy and Utilities of Denmark on Cross Border Transportation of CO_2 with the Purpose of Permanent Geological Storage*. https://www.fdfa.be/sites/default/files/2023-02/1289_MoU%20in%20het%20Engels.pdf

59. European Court of Justice. *Federal Republic of Germany v Council of the European Union*. (Document 62012CJ0399 2014). Accessed November 13, 2025. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A62012CJ0399

60. European Court of Justice. *Federal Republic of Germany v Council of the European Union*. (Document 62014CJ0600 2017). Accessed November 13, 2025. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A62014CJ0600

61. Council of the European Union. *Council Decision (EU) 2017/769 of 25 April 2017 on the Ratification and Accession by Member States, in the Interest of the European Union, to the Protocol of 2010 to the International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, with the Exception of the Aspects Related to Judicial Cooperation in Civil Matters*. 2017. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX%3A32017D0769

62. Council of the European Union. *Council Decision (EU) 2017/770 of 25 April 2017 on the Ratification and Accession by Member States, in the Interest of the European Union, to the Protocol of 2010 to the International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, with Regard to the Aspects Related to Judicial Cooperation in Civil Matters*. 2017. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX%3A32017D0770

63. OSPAR Commission. *Amendments of Annex II and Annex III to the Convention in Relation to the Storage of Carbon Dioxide Streams in Geological Formations*. https://www.ospar.org/convention/text/amendments-of-annex-ii-and-annex-iii-to-the-convention-in-relation-to-the-storage-of-carbon-dioxide-streams-in-geological

64. Baltic Marine Environment Protection Commission. *Call for Tender: Legal Analysis of CCS in Accordance with the Helsinki Convention*. 2025. https://helcom.fi/call-for-tender-legal-analysis-of-ccs-in-accordance-with-the-helsinki-convention

65. Baltic Marine Environment Protection Commission. *Contracting Parties*. https://helcom.fi/about-us/contracting-parties/

66. United Nations Environmental Programme. *Mediterranean Action Plan Contracting Parties*. https://www.unep.org/unepmap/who-we-are/contracting-parties

67. United Nations Environmental Programme. *Bucharest Convention*. https://www.unep.org/bucharest-convention

68. Council of the European Union. *Proposal for a Council Decision on the Position to Be Taken on Behalf of the European Union in the Convention on the Protection of the Marine Environment of the Baltic Sea Area ('Helsinki Convention') on the Adoption of a Recommendation for Amending Annex III Part II of That Convention*. 2021. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CONSIL:ST_11553_2021_INIT

69. Andersen S, Hagspiel V, Oliveira C, Magnus J. Investing in Carbon Transportation Under Volume Uncertainty and Scaling Flexibility: A Comparative Analysis of Flexible Ships and Cost-Effective Trunklines for CO 2 Transport to the Norwegian Continental Shelf. November 23, 2024. Accessed November 19, 2025. https://www.researchgate.net/publication/386100683_Investing_in_Carbon_Transportation_Under_Volume_Uncertainty_and_Scaling_Flexibility_A_Comparative_Analysis_of_Flexible_Ships_and_Cost-Effective_Trunklines_for_CO_2_Transport_to_the_Norwegian_Continent

70. Itul A, Diaz RA, Eulaerts OD, et al. *Clean Energy Technology Observatory: Carbon Capture Storage and Utilisation in the European Union - 2023 Status Report on Technology Development, Trends, Value Chains and Markets*. Joint Research Centre; 2024. doi:10.2760/882666

71. Oslo declaration on low carbon value chains. *Together for a Competitive Decarbonisation of Our Industry in Belgium*. Fluxys; 2024. Accessed January 19, 2026. https://www.fluxys.com/en/CO_2/oslo-declaration-on-low-carbon-value-chains

72. Tumara D, Uihlein A, Hidalgo GI. *Shaping the Future CO_2 Transport Network for Europe*. European Commission, Joint Research Centre; 2024. doi:10.2760/582433

73. International Oil Pollution Compensation Funds. *Record of Decision of the November 2025 Sessions of the IOPC Funds' Governing Bodies*. 2025. https://documentservices.iopcfunds.org/download/83338/en/IOPC-NOV25-11-1_en.pdf

74. International Maritime Organisation. *Consolidated Text of the International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, 1996, and the Protocol of 2010 to the Convention*. https://www.hnsconvention.org/wp-content/uploads/2018/08/2010-HNS-Convention-Consolidated-text_e.pdf

75. Bundesnetzagentur. WANDA - Determination proceedings by the Grand Ruling Chamber for Energy on "Provisions for calculating the network tariffs chargeable for access to the hydrogen core network and for establishing a armortisation mechanism effective for a certain period (WANDA)" [GBK-24-01-2#1]. January 21, 2024. Accessed November 3, 2025. https://www.bundesnetzagentur.de/EN/RulingChambers/GBK/Level1/WANDA/start.html

76. Yan T, Xu LC, Zeng ZX, Pan WG. Mechanism and anti-corrosion measures of carbon dioxide corrosion in CCUS: A review. *iScience*. 2023;27(1):108594. doi:10.1016/j.isci.2023.108594

77. Simonsen KR, Hansen DS, Pedersen S. Challenges in CO_2 transportation: Trends and perspectives. *Renewable and Sustainable Energy Reviews*. 2024;191:114149. doi:10.1016/j.rser.2023.114149

78. Xu T, Martynov S, Mahgerefteh H. Monitoring systems for CO_2 transport pipelines: a review of optimization problems and methods. In: 2025. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5065990

79. Drescher M, van der Meer R, Neele F. *Report of the ICM Forum Working Group on CO_2 Standards - Towards EU-Wide CO_2 Specifications*. 2025. https://circabc.europa.eu/ui/group/75b4ad48-262d-455d-997a-7d5b1f4cf69c/library/c5cd0d90-d0a6-4fc6-b259-ad7124f83a22/details?download=true

80. CEN-CENELEC. CEN/TC 474 - Carbon dioxide Capture, transportation, Utilisation, and Storage (CCUS). Accessed November 28, 2025. https://standards.cencenelec.eu/ords/f?p=205:22:::::FSP_ORG_ID,FSP_LANG_ID:3356655,25&cs=11E4C08C2C7F35435692AAE50EB02783D

81. Council of the European Union, European Parliament. *Regulation (EU) 2024/1789 of the European Parliament and of the Council of 13 June 2024 on the Internal Markets for Renewable Gas, Natural Gas and Hydrogen, Amending Regulations (EU) No 1227/2011, (EU) 2017/1938, (EU) 2019/942 and (EU) 2022/869 and Decision (EU) 2017/684 and Repealing Regulation (EC) No 715/2009 (Recast) (Text with EEA Relevance)*. 2024. Accessed November 16, 2025. http://data.europa.eu/eli/reg/2024/1789/oj

82. Lockwood T. Carbon dioxide without borders: Connecting the UK and EU can create a more resilient and lower-cost CO_2 storage network. Clean Air Task Force. August 23, 2024. https://www.catf.us/2024/08/carbon-dioxide-without-borders-connecting-uk-eu-create-more-resilient-lower-cost-CO_2-storage-network/

83. Carbon Capture and Storage Association (CCSA). *Accelerating a Europe-Wide CO_2 Storage Market*. Analysis by Xodus and Clifford Chance; 2024. https://www.xodusgroup.com/media/o2mjjood/ccsa-accelerating-a-europe-wide-CO_2-storage-market.pdf

84. Council of the European Union, European Parliament. *Consolidated Text: Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 Establishing a System for Greenhouse Gas Emission Allowance Trading within the Union and Amending Council Directive 96/61/EC (Text with EEA Relevance)*. 2024. Accessed October 31, 2025. https://eur-lex.europa.eu/eli/dir/2003/87/2024-03-01

85. European Commission. *Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the Monitoring and Reporting of Greenhouse Gas Emissions Pursuant to Directive 2003/87/EC of the European Parliament and of the Council and Amending Commission Regulation (EU) No 601/2012 (Text with EEA Relevance.)*. 2018. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018R2066

86. European Commission. *Commission Delegated Regulation (EU) 2019/1122 of 12 March 2019 Supplementing Directive 2003/87/EC of the European Parliament and of the Council as Regards the Functioning of the Union Registry (Text with EEA Relevance.)*. 2019. https://eur-lex.europa.eu/eli/reg_del/2019/1122/oj/eng

87. UK Government. *UKETS01 MRR - General Guidance for Installations*. 2025. https://assets.publishing.service.gov.uk/media/6889f51c76f68cc8414d5b67/ukets01-mrr-general-guidance-for-installations.pdf

88. European Commission. A renewed agenda for European Union – United Kingdom cooperation Common Understanding. May 19, 2025. Accessed October 31, 2025. https://ec.europa.eu/commission/presscorner/detail/en/statement_25_1267

89. European Commission. *EU-United Kingdom Trade and Cooperation Agreement Specialised Committee on Energy – Minutes of the Meeting*. 2025. https://commission.europa.eu/document/download/66bca05d-ed0b-4b8b-b16e-33af2709e038_en?filename=20250618-EU-UK-Specialised-Committee-Energy-Meeting-six-Minutes.pdf

90. Ihejirika N. *Potential Regulatory Frameworks for Cross-Border CO_2 Transport between the EU and UK*. Oxford Institute for Energy Studies; 2024. https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/06/Insight-152-Crossborder-CO_2-transport-between-the-EU-and-UK.pdf

91. Kriwak H. Climate inaction could cost Europe €5.6 trillion by 2050, study finds. EU Observer. October 28, 2025. Accessed November 17, 2025. https://euobserver.com/green-economy/ar6f240dba

92. Stagl S. *Zusammenfassung: Die Ökonomischen Kosten Der Untätigkeit Im Klimaschutz in Der Europäischen Union*. 2025. https://cdn.table.media/assets/zusammenfassung_bericht_was_kostet_uns_der_klimawandel_stagl_gruene_2025.pdf

CONTACT

Behnam Lot
Policy Advisor
Industrial Decarbonisation
Bellona Europa

Phone

Mobile: +49 15750140863

Online

Email: behnam@bellona.org
Website: eu.bellona.org

Bellona Europa is an international, independent and non-profit organisation that meets environmental and climate challenges head on. We are solutions-oriented and have a comprehensive and cross-sectoral approach to assess the economics, climate impacts and technical feasibility of necessary climate actions. To do this, we work with civil society, academia, governments, institutions, and industries.