

CCB's Position Paper on Offshore Carbon Capture and Storage (CCS)

CCB POSITION PAPER

(Released in October 2026)

WHAT IS OFFSHORE CCS AND WHY DOES IT MATTER FOR THE BALTIC SEA CONTEXT?

As global temperature rises, methods and technologies to limit and reduce carbon emissions to the atmosphere have been suggested, including Carbon Capture and Storage (CCS)¹ (IPCC, 2023). Applied to the marine/maritime scenario, offshore CCS is the collection, transport and long-term storage of carbon dioxide (CO₂) through its injection into cavities deep underground such as saline aquifers or depleted or near-depleted oil and gas wells beneath the seafloor. Point sources of carbon dioxide used for CCS are industrial processes (e.g., natural gas processing), fossil fuel power generation, and biomass-based fuel combustion.²

Even though CCS is promoted as a near-term climate mitigation option, several uncertainties remain regarding the long-term permanence of CO₂ storage, and the technology inherently requires energy and industrial activity at every stage of its value chain, resulting in associated emissions and ecological consequences. At the same time, captured and injected CO₂ underground from CCS technology can in turn be used to intensify oil and gas extraction, also known as Enhanced Oil or Gas Recovery (EOR/EGR),

which questions the ultimate purpose of the CCS development and whether its deployment supports decarbonisation efforts or risks prolonging fossil fuel production and GHG emissions.

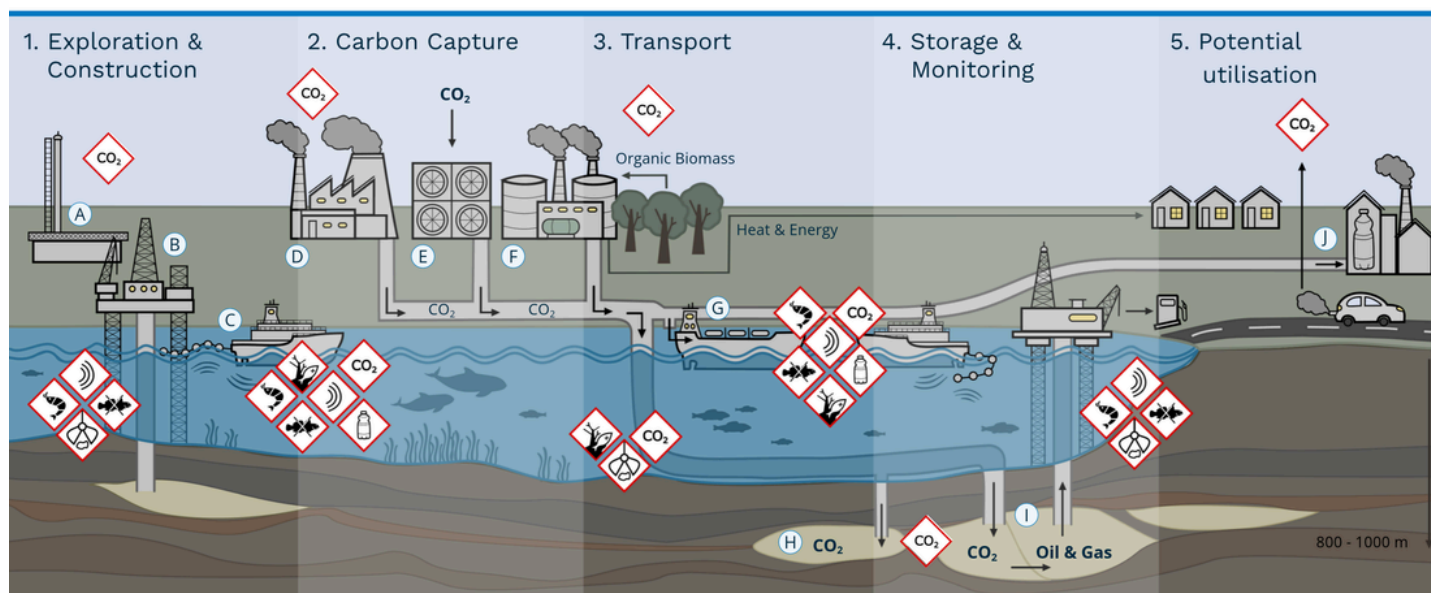
Apart from the climate considerations above, offshore CCS also poses several environmental risks, threats, and impacts during all its project phases: capture, early exploration phase, transport, injection, monitoring, and the envisaged long-term storage of CO₂ (Figure 1).

Coalition Clean Baltic (CCB) believes that these considerations are particularly important in the Baltic Sea, one of the most heavily used and environmentally stressed marine regions in the world, which is already impacted by multiple anthropogenic pressures and remains in poor ecological status. Therefore, this position paper aims to examine offshore CCS through the lens of environmental protection and outlines the risks, impacts, concerns, and key position points regarding the heightened interest in the development of CCS in the Baltic Sea.

1. United Nations Environment Programme. (2003). *Global marine assessments: A survey of global and regional marine environmental assessments and related scientific activities* (UNEP/05/B615/No.16). United Nations Digital Library. <https://digitallibrary.un.org/record/4008074>

2. Intergovernmental Panel on Climate Change (IPCC). (2023). *Climate change 2023: Synthesis report: Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. <https://doi.org/10.59327/IPCC/AR6-9789291691647>

Environmental impacts of Carbon Capture and Storage (CCS) on the Baltic Sea ecosystem



Pressures



Underwater Noise Pollution
e.g. from drilling, shipping, or seismic activity, harming / disturbing marine life



Ecological Impacts
e.g. changes to benthic community structures and trophic cascades



Habitat Loss, Seabed Disturbance
e.g. from pile driving activities and infrastructure installation, increasing turbidity and sedimentation



Hazardous Substances
e.g. oil spills and leakage of CO₂ or anti-fouling chemicals from ships



Risk of releasing CO₂
e.g. leakage or emission of CO₂ fueling climate change and ocean acidification



Marine Litter
e.g. loss of equipment at sea or dropping litter overboard



Invasive Species
can be introduced by ships and spread by growing on infrastructures at sea

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- (A) geological exploration and drilling equipment, e.g. Riksrigger in Sweden
- (B) offshore drilling platform used for seafloor exploration
- (C) research vessel using seismic surveys to explore the sub-surface seafloor
- (D) classic CCS where CO₂ is captured from a point-source facility (e.g. cement factory or power station)
- (E) a Direct Air Capture (DAC / DACCS) facility, capturing CO₂ from the air

- (F) combustion of organic material to produce heat, energy, & CO₂, i.e. Bioenergy CCS (BECCS)
- (G) transport of compressed / liquid CO₂ via pipelines or ships
- (H) long-term storage of CO₂ in porous geological formations (e.g. deep saline aquifers, empty oil / gas fields)
- (I) captured CO₂ can be used for Enhanced Oil Recovery (EOR)
- (J) potential short-term storage of CO₂ in products, i.e. Carbon Capture, Usage & Storage (CCUS)

Infographic created by Paula Benders for CCB

FIGURE 1. INFOGRAPHIC OF ENVIRONMENTAL IMPACTS OF CCS ON THE BALTIC SEA ECOSYSTEM

THE OCEAN'S ROLE IN CLIMATE MITIGATION AND ADAPTATION

Healthy oceans are ultimate climate buffers and extraordinary carbon sinks. As the largest active carbon reservoir in the Earth's climate system, they have absorbed over 90 percent of the excess heat generated by anthropogenic greenhouse gas emissions (GHGs) since the 1970s, as well as approximately one-third of human-driven CO₂ emissions since the Industrial Revolution, thereby substantially moderating global warming while contributing to ocean acidification.^{3,4}

The Baltic Sea is one of the most impacted marine regions in the world, with a recorded ocean warming of about 1.5 degrees, lack of oxygen at depth and pronounced ocean acidification affecting i. a. species distributions, fisheries and food webs. As such,

urgent action is needed to combat the climate crisis by substantially and consistently reducing CO₂ emissions, while also increasing the capacity of natural carbon sinks to remove CO₂ from the atmosphere. This means protecting, strengthening, and restoring natural ecosystems that can absorb and store carbon in biomass and sediments, helping reduce the excess of CO₂ that has accumulated in the atmosphere over time.

Thereby, maintaining and restoring the health of marine ecosystems is essential to sustaining the ocean's capacity to function as a long-term carbon sink. Well-managed and highly protected marine ecosystems can moreover contribute to climate

3. Intergovernmental Panel on Climate Change (IPCC). (2019). Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC). Summary for Policymakers
4. Huguenin, M. F., Holmes, R. M., & England, M. H. (2022). Drivers and distribution of global ocean heat uptake over the last half century. *Nature Communications*, 13, 4921.
doi.org/10.1038/s41467-022-32540-5

mitigation and adaptation, enhancing ecosystem resilience, carbon storage capacity and overall ecosystem functioning.^{5,6} In the Baltic Sea context, safeguarding ecosystem health is therefore key to preserving and strengthening its role in climate regulation and carbon storage and climate resilience in the long term. Hence, undermining natural blue carbon ecosystems through industrial development that fails to apply the precautionary principle fundamentally contradicts efforts to address climate change, as it weakens one of the most effective natural carbon sinks in the climate system.



RISKS AND ENVIRONMENTAL IMPLICATIONS OF CCS DEVELOPMENT IN THE BALTIC SEA

The deployment of CCS techniques requires feasibility surveys to identify suitable deep bedrock using seismic survey methods. The seismic survey methods themselves generate substantial underwater noise, compounded by the associated increase in ship traffic during the survey and operational phases, thereby placing severe acoustic pressure on marine ecosystems across multiple trophic levels. Increased underwater noise levels from CCS activities (both impulsive and continuous) can negatively and cumulatively impact benthic communities, plankton, fish and, particularly, marine mammals, including the critically endangered and vulnerable harbour porpoise populations of the Baltic Proper and the Belt Sea, respectively.

In addition to underwater noise, the construction of infrastructure and the transport of CO₂, whether by ship or pipeline, adds further environmental pressures to the Baltic Sea ecosystems through habitat loss and disturbance. Moreover, CCS infrastructure development on coastal areas threatens maintenance and restoration of natural blue carbon ecosystems such as seagrass meadows and carbon-sequestering sediments leading to resuspension of released CO₂ already trapped in the

upper layers of e.g., silt sediments. Another key consideration is that, if regulations and standards are not strictly followed,⁷ CO₂ transport of typically compressed liquid or supercritical form under high pressure, entails inherent safety and environmental risks in the event of accidental release due to factors such as corrosion, material failure, natural hazards, operational error, or intentional damage. CO₂ streams in pipelines may contain impurities that vary depending on the source and capture technology. In the presence of water, certain impurities can form corrosive compounds, including acids, which can degrade pipeline integrity over time. Moreover, some admixtures may also exhibit toxic or ecotoxic properties, posing various threats to the marine environment that can be complex and difficult to predict. CCS infrastructure also often requires the use of chemical tracers or additives for monitoring and detection purposes, which can potentially increase environmental risks, including upstream impacts associated with their production and life-cycle emissions.⁸

During and after injection, CCS requires continuous monitoring and long-term surveillance, potentially for decades or even centuries. For instance, existing

5. IPCC. (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report

6. Sala, E., Mayorga, J., Bradley, D., et al. (2021). Protecting the global ocean for biodiversity, food and climate. *Nature*, 592, 397–402.

7. European Parliament & Council of the European Union. (2009). Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide. Official Journal of the European Union, L 140, 114–135. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0031>

8. International Association of Oil & Gas Producers. (2026, January 28). Upstream oil & gas and CCS operations in Europe: Perspective on a proposed EU universal-PFAS restriction. <https://iogpeurope.org/wp-content/uploads/2026/01/Upstream-Oil-Gas-and-CCS-operations-in-Europe-Perspective-on-a-proposed-EU-Universal-PFAS-Restriction.pdf>

projects in the North Sea have conducted seismic monitoring roughly every two to three years since the 1990s.⁹ Consequently, as we know the technology today, the potential deployment of offshore CCS projects in the Baltic Sea, would not only constitute a temporary activity, but rather entail an enduring commitment and industrial presence in the marine ecosystem on the long term.

A major environmental concern associated with geological carbon storage is the unrecognised and unintended release of CO₂, potential methane mobilisation and release,^{10,11,12} and/or formation water from storage reservoirs. Leakage may occur through various pathways, including during injection operations, legacy wells and boreholes, via faults and fractures, caprock failure, defective seals, or as a result of seismic activity.^{13,14} CO₂ release can alter local seawater chemistry, increase local acidification, and expose habitats, marine organisms, and microbial and microfaunal communities to elevated CO₂ concentrations and associated impurities. CO₂ exposure and modelling studies have demonstrated that such release and exposure can induce negative effects on physiological processes, behaviour, reproduction, and survival across multiple taxa in the marine environment, depending on the characteristics and communities impacted,^{15,16,17,18} as well as the intensity, duration, and extent of the leak.¹⁹ Moreover, geochemical changes associated with increased acidification, may reduce the efficiency of phosphorus burial and increase its mobility in marine sediments, potentially exacerbating

eutrophication and anoxic conditions in the Baltic Sea.²⁰ These impacts are of particular importance in the Baltic Sea, which is characterised by low species diversity, limited water exchange, widespread eutrophication, oxygen depletion, and cumulative anthropogenic pressures, making it highly vulnerable to additional environmental disturbances.^{21,22}

Despite growing expectations in offshore CCS, important knowledge gaps remain regarding leakages, CO₂ migration through sediments and pore waters, interactions with local hydrodynamic conditions, release of hazardous substances, cumulative effects, and the long-term ecological consequences of related life-cycle activities as well as potential releases. In particular, impacts from CO₂ leakage on marine food webs, biodiversity, and ecosystem services, remain insufficiently understood and pose a long-standing threat, especially for the Baltic Sea condition.

Given these risks, uncertainties, and environmental impacts, added to an already heavily pressured ecosystem, including the requirements for long-term monitoring and maintenance, CCS activities highly risk undermining the achievement and maintenance of a Good Environmental Status in the Baltic Sea.

Therefore, CCB cannot support the introduction and development of CCS technologies in the Baltic Sea marine environment.

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CCB'S KEY POSITION POINTS ON OFFSHORE CCS IN THE BALTIC SEA:

- The climate crisis is already impacting the Baltic Sea marine ecosystem. While urgent climate action is needed, it must not come at the expense of ocean health. Nature conservation and climate mitigation should not be competing objectives but rather mutually reinforcing actions. Protecting and restoring the marine environment are not only environmental objectives, but they are also effective and proven climate actions.
- Offshore CCS should neither be used as a strategy to delay the reduction of CO₂ emissions at the source nor to incentivize business-as-usual fossil fuel use and emissions. Root causes of climate change need to be addressed through the systematic phase-out of oil and gas exploitation to reduce dependence on fossil fuels (sufficiency and efficiency first).
- CCS introduction poses environmental threats throughout the whole life cycle, including e.g., high sound pressure levels and habitat degradation. Its deployment will inevitably introduce added environmental pressures to the ecosystem as a whole and, directly or indirectly, threaten marine protected areas, blue carbon ecosystems, or other key ecological sites for biodiversity. Such ecological and carbon storage implications must be adequately analysed and accounted for in CCS impact assessments.
- There is a general need for spatial planning that also considers activities below the seabed (underground) to avoid conflicts with conservation objectives and among different uses, while reducing environmental and operational risks.
- Considering the existing risks and uncertainties, the precautionary principle should be applied and guide all decisions for any infrastructure development in the Baltic Sea, guided by risk assessments, environmental and cumulative impacts assessments.
- Given the essential role of healthy oceans and coasts in tackling the climate crisis as natural carbon sinks and refugia, their long-term protection, restoration and additional conservation measures must come first as long-term climate solutions. In a heavily pressured ecosystem like the Baltic Sea, CCB opposes any additional activities that increase pressure on the marine environment, compromise biodiversity, ecosystem resilience, and/or the achievement of conservation objectives, including GES. Efforts to address climate change should secure a healthy Baltic Sea for future generations. Therefore, **CCB does not support the introduction and development of CCS technologies in the Baltic Sea.**

PUBLISHED IN 2026

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Co-funded by
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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.

