Nordic Council
of Ministers

Carbon Capture, Utilisation and Storage in the Nordic Countries Beyond 2025

Overview of key themes and critical issues

Contents

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Foreword

This report was produced as part of the *Carbon Capture Utilisation and Storage (CCUS) in Nordic Countries Beyond 2024-2025* -project, funded by the Nordic Council of Ministers for the Environment and Climate (MR-MK) under Finland's presidency program 2025. It was written by Researcher Fredric Mosley, Researcher Jari Niemi, and Leading Researcher Sampo Soimakallio from the Finnish Environment Institute (SYKE). The aim of the project was to provide up-to-date and comprehensible information about CCUS in Nordic countries by synthesizing related key themes and critical issues. The authors would like to thank the project group and everyone who participated in the workshop and commented on the draft report for their contributions. This report reflects the views of the authors and not necessarily those of the funder.

Summary

Carbon capture, utilisation and storage (CCUS) comprises a portfolio of technologies that vary in terms of maturity, capture potential, and cost. Capture and permanent storage of fossil carbon dioxide (CO_2) can support the production of low-emission energy and materials by preventing emissions from entering the atmosphere. The utilisation of captured CO_2 in products, whether from fossil or biogenic origin, or directly from the atmosphere can substitute fossil-based materials, thereby preventing emissions. CO_2 can be removed from the atmosphere if captured CO_2 of biogenic or atmospheric origin is stored permanently or in durable products, and such activities are often referred to as carbon dioxide removal (CDR) or negative emission technologies (NETs). As climate reporting frameworks and policies are being developed, Nordic solutions, networks, and competences contribute to establishing CO_2 value chains, and increasing CO_2 storage capacity. In this report we provide an overview of key themes and critical issues related to CCUS in Nordic countries beyond 2025.

1 Introduction

Climate policy has been organised around the timelines and pathways for reaching net-zero greenhouse gas (GHG) emissions, often referred to as climate neutrality (Fankhauser et al., 2022). Finland aims to reach climate neutrality by 2035, Iceland by 2040, Sweden by 2045 and Denmark by 2050. Norway aims to become a low-emission society by 2050, reducing emissions by 90–95% compared to the year 1990. Climate laws emphasise the need for all economic sectors to contribute to climate goals. Indications of the needed transition pathways are provided through various national strategies, plans, and Nationally Determined Contributions (NDCs). Mitigation options that rely on Carbon Capture, Utilisation and/or Storage (CCUS) are increasingly recognized, and there is an ongoing process to coherently cover all of them in national and EU policies. Currently (up to 2030) the climate policy implementation frameworks of Nordic countries in the European Economic Area (EEA) (Iceland, Norway) and European Union (EU) (Denmark, Finland, Sweden) are largely aligned, and consist of three pillars: The Emissions Trading System (ETS), which sets a cap and price on carbon dioxide (CO_2) emissions from installations; Land Use, Land Use Change and Forestry (LULUCF), which covers carbon stock changes and non-CO_2 GHG flows on managed land as a result of direct human-induced land use; and the Effort Sharing Regulation (ESR), which covers greenhouse gas emissions from sectors not included under ETS or LULUCF, such as transport, buildings, agriculture, small industry, and waste (Figure 1) (EU, 2023a, 2023b, 2024a).

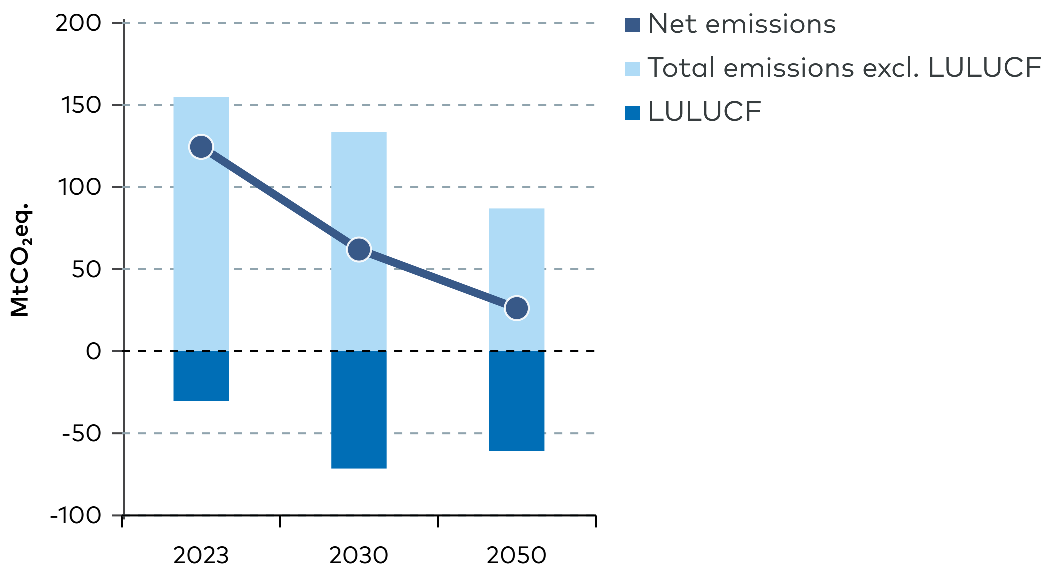

Figure 1: total GHG emissions and removals for Nordic countries in year 2023 based on national inventory submissions (UNFCCC, 2025) and projections provided under Regulation (EU) 2018/1999 (EEA, 2025).

Carbon capture (CC) and permanent storage of fossil CO_2 (CCS) can support the production of low-emission energy and materials by preventing emissions from entering the atmosphere. The utilisation of captured CO_2 in products, whether from fossil (CCU) or biogenic origin (bio-CCU), or directly from the atmosphere (DACCU) can substitute fossil-based materials, thereby preventing emissions. CO_2 can be removed from the atmosphere if captured CO_2 of biogenic or atmospheric origin is stored permanently (bio-CCS, DACCS) or in durable products (bio-CCU, DACCU), and such activities are often referred to as carbon dioxide removal (CDR) or negative emission technologies (NETs). It should be noted that CCUS requires energy and other resources such as biomass or land which results in GHG emissions and may cause other sustainability challenges. Because the concept of CCUS refers to capturing CO_2 from ambient air or point sources, it does not include CDR based on biochar, wood products or other technological sinks such as enhanced weathering or ocean alkalinity enhancement.

CCUS comprises a portfolio of technologies that vary in terms of maturity, capture potential, and cost, often exceeding the current price of ETS allowances. The development of GHG inventory reporting and policy frameworks are underway, and Nordic countries actively work to introduce new CCUS-related policy instruments. As a result, Nordic solutions, networks, and competences contribute to establishing CCUS as a part of climate policy, developing CO_2 value chains, and increasing CO_2

storage capacity. Denmark, Finland, Iceland, Norway and Sweden have different focus areas. For example, Finland and Sweden have potential primarily for bio-CCS and bio-CCU, Iceland has experience with DACCS using Carbfix mineralization method and Norway and Denmark are developing geological CO_2 storage as part of the CCS value chain.

The aim of this report is to provide an overview of key themes and critical issues related to CCUS in the Nordic countries through an extensive review of existing scientific literature, technical reports by government research institutes and grey literature, complemented by a stakeholder workshop. The report is divided into five chapters. Chapter 2 provides a definition of CCUS, an overview of guidelines for reporting of emissions and removals, the latest CO_2-emission data, and information about CO_2 transport and storage. In Chapter 3 we provide an overview of the policy framework and current instruments used to scale CCUS in the Nordic countries. Chapter 4 contains information about environmental aspects and Chapter 5 presents conclusions.

2 Carbon Capture, Utilisation and Storage

2.1 Definition

The concept of carbon capture (CC) refers to the capture of CO_2 from ambient air or point sources, such as gas streams or flue gases. Carbon capture and storage (CCS) means that CO_2 that is captured is transported to and injected into geological formations for the purpose of permanent storage (EU, 2009). Carbon capture and utilisation (CCU) refers to the use of captured CO_2 in products, for example in fuels, chemicals and construction materials (EC, 2024c). Different abbreviations are used when activities rely on biogenic CO_2 or CO_2 captured directly from ambient air for permanent storage (bio-CCS, DACCS) or utilisation (bio-CCU, DACCU). Carbon Capture, Utilisation and/or Storage (CCUS) is an umbrella term referring to all these technologies, meaning that captured CO_2 is either permanently stored or used for products (EC, 2025a; IEA, 2025; NCM, 2022).

2.2 Reporting of emissions and removals

CO_2 flows and carbon stock changes should be accurately quantified so that they can be attributed to countries and sectors in the official record, the GHG inventory. Improving methodologies can increase the visibility of activities, thereby better reflecting their contribution to climate targets and enabling international cooperation under the Paris Agreement. The 2006 and 2019 IPCC Guidelines provide a technically sound methodological basis for national GHG inventories, and CCS and bio-CCS are included in the guidelines (IPCC, 2025). GHG inventories follow the principle that fossil CO_2 emissions are reported in the sector and at the point in time they occur, and biogenic carbon is reported as stock changes under the relevant category in the LULUCF sector. If captured CO_2 is permanently stored, then the corresponding amount of CO_2 can be fully deducted from the CO_2 emissions of the sector where the CO_2 capture takes place. There is no differentiated treatment between biogenic carbon and fossil carbon for CCUS activities in the guidelines. To maintain consistency, captured CO_2 intended for later use and short-term storage should not be deducted from the sector where the CO_2 is captured except for when CO_2 emissions are reported elsewhere in the inventory.

If comprehensively and consistently quantified and reported, CCS and CCU can support the production of low-emission energy and materials. CCS reduces emissions when fossil CO_2 emissions from a sector are captured and stored permanently, while CCU delays emissions by chemically binding the CO_2 in products. CCU products can also provide a substitution effect, reducing emissions by replacing fossil materials. Bio-CCS and DACCS can remove and permanently store CO_2 from the atmosphere. Bio-CCU and DACCU products reduce emissions by replacing fossil or non-sustainable alternatives, and they can temporarily remove CO_2 from the atmosphere by chemically binding in products. In some cases, bio-CCU and DACCU can both remove CO_2 from the atmosphere and reduce emissions, for example if a long-lasting product (removal) substitutes a fossil product (emission reduction).

According to the IPCC, carbon removal is a human activity that removes CO_2 from the atmosphere, durably storing it in geological, terrestrial or ocean reservoirs or in products (IPCC, 2025b). Many interpretations exist for what constitutes a durable product. For example Smith et al. (2024) suggest that storage duration should be decades or more. In the policy context durability is typically referred to as permanence. Permanent storage according to the ETS Directive (2003/87/EC) is geological storage defined under CCS Directive (2009/31/EC) and products in which captured CO_2 is permanently chemically bound, as further specified in Delegated Regulation (EU) 2024/2620 (EU, 2009, 2024a, 2024c). Currently permanent products include mineral carbonates used in construction products, but the list will be reviewed and rules revised to make certain CCU storages equivalent to CCS in the ETS (EC, 2024c). Quality criteria for permanent removals are being developed in parallel in the Carbon Removals and Carbon Farming (CRCF) regulation (EC, 2025b), and it seems that these criteria could be used to prove permanence if new compliance and/or voluntary carbon markets are introduced in the future (Bencini et al., 2025). The CRCF defines permanent as lasting several centuries, including "permanently chemically bound carbon in products", and aims to specify what products could be considered permanent (EC, 2025b).

2.3 CO_2 emission sources, transport and storage

CCUS relies on facilities to capture CO_2, typically this includes installations in industry, the energy sector and waste management. To provide an overview (Table 1) of the type and geographical distribution of large-point sources of CO_2, we compiled 2023 emission data using ETS verified emissions and the most recent data provided by EEA (2024), which is based on European Pollutant Release and Transfer Register (E-PRTR) Regulation and Industrial Emissions Directive 2010/75/EU data reports. For Norway, we complemented the data using National European Pollutant Release and Transfer Register (PRTR) data, as ETS verified emission reporting ceased for some Norwegian installations in 2017. We divided the emissions into fossil and biogenic emissions to provide an understanding of the potential for applying CCUS for both sources. In the data, emissions reported for Denmark and Iceland were not consistently divided into fossil- and biogenic emissions, so it was not possible to separate them in every category.

Table 1. Type and quantity of CO_2 emissions from large point sources in Nordic countries based on E-PRTR compiled by EEA.

Emissions Mt CO_2 yr^{-1}	Denmark [1]	Finland	Iceland [2]	Norway [3]	Sweden
Total	15.01	38.22	0.94	14.00	47.00
Total fossil	N/A	13.3	N/A	12.6	14.8
Total biogenic	N/A	24.9	N/A	1.4	32.2
Total biogenic %	N/A	65%	N/A	10%	68%
Power plants total	9.61	12.11	N/A	N/A	10.23
Power plants fossil	4.82	5.26	N/A	N/A	2.80
Power plants biogenic	4.78	6.85	N/A	N/A	7.43
Power plants biogenic %	50%	57%	N/A	N/A	73%
Forest industry total	0.03	17.75	0	0.55	22.81
Forest industry fossil	0.00	0.98	0	0.14	0.48
Forest industry biogenic	N/A	16.77	0	0.46	22.33
Forest industry biogenic %	N/A	94%	N/A	84%	98%
Other industry total	3.19	6.91	1.81	12.63	10.40
Other industry fossil	N/A	6.91	1.81	12.15	10.13
Other industry biogenic	N/A	0	N/A	0.48	0.27
Other industry biogenic %	N/A	0%	N/A	4%	3%
Waste management total	2.19	1.45	0	0.83	3.56
Waste management fossil	0.22	0.70	N/A	0.35	1.41
Waste management biogenic	1.98	0.75	N/A	0.48	2.15
Waste management biogenic %	90%	52%	N/A	58%	60%

1. Inconsistency in reporting fossil and biogenic emissions separately
2. Year 2022 used, as reporting does not continue further
3. Year 2017 used, as reporting does not continue further

Total-, fossil- and biogenic emissions reported in EEA 2025 using the most recent data from the year 2023 when possible, and divided into power plants, wood industry, other industries and waste management. The value after slash represents the CO_2 emissions of energy sector, industry, waste management and biomass burning in the year 2023 reported in the national NIDs 2025.

We found that based on 2023 data, the largest potential for biogenic CO_2 carbon capture in the Nordic countries is in the forest industry, mainly linked to pulp and paper production. The fossil CO_2 capture potential is largest in the 'other industries' category, where the use of bioenergy is lower. Norway and Sweden hold the largest potential for capturing fossil carbon from industry emissions, followed by Finland. There are variations in how countries report emissions from waste incineration, which makes estimates uncertain. Currently municipal waste emissions are only included if waste is burned in ETS installations that utilize mixed fuels, or if countries have decided to voluntarily include certain waste incineration plants in the ETS.

The data compiled by EEA does not reflect all national emissions. The total emissions from energy, industrial processes and product use, waste, and CO_2 emissions from biomass have been estimated in National Inventory Documents published in 2025 for inventory year 2023 (UNFCCC, 2025), and were 43.19, 73.21, 3.56, 44.33 and 87.66 Mt CO_2 for Denmark, Finland, Iceland, Norway and Sweden, respectively. This shows that the PRTR database covers slightly more than half of the emissions for Finland and Sweden, around one third for Denmark and Norway, and around a quarter for Iceland. Even though ETS installations in the PRTR represent only a portion of all emitters, they are large point sources and could be considered cost-effective options before carbon capture technologies become affordable for smaller installations.

Since the European Commission Communication on Sustainable Carbon Cycles (EC, 2021), several new initiatives, such as the Industrial Carbon Management Strategy, have been launched to support the expansion of CO_2 transport and infrastructure (EC, 2023; KEFM, 2023a). Administrative procedures and permission structures are being reviewed under the EU Net-Zero Industry Act (Regulation (EU) 2024/1735), and the planned Industrial Decarbonisation Accelerator Act (IDAA) (EC, 2025k; EU, 2024b). Cross-border infrastructure planning is supported by the Trans-European Energy Infrastructure Regulation (Regulation (EU) 2013/347) which can recognise specific projects as eligible for funding under the Connecting Europe Facility (EC, 2025h). A recent study shows that transport is a key enabler, and that early investments will shape value chains by determining locations and capacities of transport routes (Tumara et al., 2024). To facilitate the needed change, governments could allocate state funding to generate overcapacity in open-access transport and storage infrastructure (EU, 2023c) and enabling information exchange nationally and internationally. Studies also highlight that regulatory guidance and standardization are needed (IEA, 2021).

For many years, the London Protocol on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter prohibited geological storage of CO_2 in the seabed, as well as transporting CO_2 to storage in another country. Amendments to the London Protocol now allow geological storage of CO_2, while cross-border transport has not been ratified by enough countries. However, cross-border transportation is possible between countries that have ratified the amendment and have entered into arrangements (IEA, 2021). Currently, among the Nordic countries, Memoranda of Understanding exist between Denmark-Sweden, Norway-Denmark, Norway-Sweden, Finland-Denmark, Finland-Norway (IMO, 2025).

Some assessments indicate substantial technical storage potentials in Denmark (Hjelm et al., 2020) and Norway (Ministry of Energy Norway, 2024) in saline aquifers and depleted oil and gas fields. Iceland could have large potential for geological CO_2 storage primarily through basalt mineralization (Snæbjörnsdóttir et al., 2014). Several storage projects have been permitted in Denmark, Iceland and Norway under specific conditions and following different approval processes (NCM, 2023). Finland lacks the aquifers for CO_2 storage but might hold some potential for CO_2 mineralization in near surface rock (Teir et al., 2010). CO_2 storage is prohibited in Finland under the CCS-law transposing the CCS directive, and there are no sites that could be permitted (Ministry of the Environment Finland, 2025a). Sweden is carrying out geological investigations for both onshore and offshore storage, but it is possible that there will not be any domestic capacity by 2030 (Swedish Energy Agency, 2024).

3 Policy framework

3.1 Target setting

Ambitious climate targets provide the foundation, acknowledging the potential role of CCUS in mitigation. The Nordic countries have separate sectoral and/or economy-wide climate targets, and they are spread out over different target years (Table 2). Many countries have aggregated net-zero GHG emissions targets for the whole economy: Finland by 2035, Iceland by 2040, Sweden by 2045 and Denmark by 2050. Norway does not have a net zero target and aims for economy-wide 90–95% emission reduction by 2050 compared to 1990. Finland, Sweden and Denmark are part of a "Group of Negative Emitters" which advocate for the inclusion of net negative ambitions in updated climate plans, facilitating knowledge sharing and capacity building (KEFM, 2024).

Table 2. Economy-wide and sectoral climate targets of Nordic countries. The numbers are not directly comparable as emission reduction targets may have different reference years and LULUCF treatment.

<table>
<tr><th rowspan="2">Country</th><th rowspan="2">Sector</th><th colspan="5">Net emission reduction compared to base year</th><th rowspan="2">Base year, (reference), comment</th></tr>
<tr><th>2030</th><th>2035</th><th>2040</th><th>2045</th><th>2050</th></tr>
<tr><td rowspan="4">Finland</td><td>ESR</td><td rowspan="2">60%</td><td rowspan="4">100%</td><td rowspan="2">80%</td><td></td><td rowspan="2">90–95%</td><td rowspan="4">1990 (Finlex, 2022)</td></tr>
<tr><td>ETS</td><td></td></tr>
<tr><td>LULUCF</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Other</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="4">Iceland</td><td>ESR</td><td>41%*</td><td>55%*</td><td rowspan="4">100%</td><td></td><td></td><td rowspan="4">*2005 (EC, 2025d)</td></tr>
<tr><td>ETS</td><td></td><td></td><td></td><td></td></tr>
<tr><td>LULUCF</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Other</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="4">Sweden</td><td>ESR</td><td>63%</td><td></td><td>75%</td><td rowspan="2">85%</td><td></td><td rowspan="4">1990 (Swedish Environmental Protection Agency, 2025c) *additional</td></tr>
<tr><td>ETS</td><td></td><td></td><td></td><td></td></tr>
<tr><td>LULUCF*</td><td></td><td></td><td></td><td rowspan="2">15%</td><td></td></tr>
<tr><td>Other</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="4">Denmark</td><td>ESR</td><td>70%</td><td></td><td></td><td></td><td rowspan="4">100%</td><td rowspan="4">1990 (KEFM, 2020), (FVM, 2021)</td></tr>
<tr><td>ETS</td><td></td><td></td><td></td><td></td></tr>
<tr><td>LULUCF</td><td>55%</td><td></td><td></td><td></td></tr>
<tr><td>Other</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="4">Norway</td><td>ESR</td><td rowspan="4">50–55%</td><td rowspan="4">70–75%</td><td></td><td></td><td rowspan="4">90–95%</td><td rowspan="4">1990 (Ministry of Climate and Environment Norway, 2017)</td></tr>
<tr><td>ETS</td><td></td><td></td></tr>
<tr><td>LULUCF</td><td></td><td></td></tr>
<tr><td>Other</td><td></td><td></td></tr>
</table>

The ETS Directive, which currently extends to all Nordic countries, explicitly recognizes that CCS can contribute to the sectoral target. The Directive does not recognize non-permanent CCU storage, and operators capturing carbon for these types of uses still need to surrender allowances as if CO_2 was emitted. Bio-CCS and DACCS could be counted to economy-wide national targets if they were visible in the inventory, but they are not within the scope of any EU sectoral target at least until 2030. Looking forward, it is an open question whether bio-CCS, DACCS, bio-CCU, DACCU should be counted to a sectoral target, or have separate quantitative targets in national and EU policy.

The European Scientific Advisory Board on Climate Change (ESABCC), reports and certain scientific works recommend more detailed frameworks and separate targets for LULUCF and permanent removals (e.g., bio-CCS, DACCS) over several target years (Allen et al., 2025; ESABCC, 2025; Kujanpää et al., 2023). This could ensure a certain level of CO_2 removals, help avoid non-sustainable biomass use and avoid mitigation deterrence. For example, it would be possible to set separate targets for specific industrial sectors or activities, for example targeting process emissions in hard-to-abate sectors and treating them as supplementary measures with case-specific monitoring.

Each Nordic country currently has its own approach to target-setting. Sweden aims to use LULUCF, bio-CCS or international cooperation, so-called supplementary measures, of a maximum of 15% GHG emission reductions compared to 1990 (or approximately 11 $MtCO_2$) to reach climate neutrality in 2045 (Swedish Environmental Protection Agency, 2025c). There is currently no technology-specific quantitative target for bio-CCS, but a dedicated budget based on targets of the Government Official Report 2020:4, which sets the ambition to capture and store 2 $MtCO_2$/a by 2030 (Swedish Energy Agency, 2025c). Sweden's ESR target of -63% by 2030 can also contain a maximum of 8% supplementary measures (Government offices of Sweden, 2021). Finland's Climate Act contains an economy-wide climate neutrality target by 2035, and combined ETS and ESR emission reduction targets for 2030, 2040 and 2050. Interpolating between the 2030 and 2040 GHG emission reduction targets indicates that removals (incl. LULUCF) of at least 21 $MtCO_2$ may be needed to reach climate neutrality in 2035, but it does not specify the role of technologies or international cooperation (Finlex, 2022). Denmark does not have quantitative targets for CCUS but has dedicated budgets for CCS and bio-CCS. Norway's target for 2050 to become a low-emission society is not framed as a net emission reduction target, meaning it does not specify the role of removals and international cooperation. In Iceland and Norway all CCUS activities visible in GHG inventory contribute to climate targets, but there are no technology-specific targets. As countries move towards climate neutrality, there will be some residual emissions from so-called hard to abate sectors that may need to be decarbonised using CCUS, but it remains unclear what these sectors are in practice (Buck et al., 2023; Dufour & Möllersten, 2025). The EU refers to hard to abate sectors in relation to its proposed 2040 target without defining what sectors belong to this category (EC, 2024b). Nordic policy documents indicate residual emissions to be those which cannot be eliminated using “emission-free alternatives or technological advances”(UNFCCC, 2020) or emissions that originate from “sectors where other emission reduction options either do not exist or are not feasible” (KEFM, 2023a; Swedish Environmental Protection Agency, 2025c). Energy intensive industries, maritime and aviation transport are sometimes mentioned (EC, 2024c; EU, 2025). Nordic countries have funded or expressed interest in activities linked to mixed waste incineration (Danish Energy Agency, 2025a; Icelandic Environment and Energy Agency, 2025; Ministry of the Environment Finland, 2025b; Swedish Energy Agency, 2025d), cement production (Ministry of Energy Norway, 2025), geothermal energy plants and heavy industry in general (Icelandic Environment and Energy Agency, 2025).

The Nordic countries have also signed the Helsinki Declaration on Nordic Carbon Neutrality in 2019 (NCM, 2019). This Declaration underlines the important role of CO_2 removal and the need to intensify cooperation. Climate action in Nordic countries is also closely tied to cooperation linked to, and implementation of the EU climate targets. There are aggregated GHG emission reduction targets enshrined in EU Law, which are delivered by sector specific targets in ETS Directive, ESR and LULUCF Regulations (EU, 2023a, 2023b, 2024a). By 2030 net GHG emissions should be reduced by 55%, and this target considers CCS and CCU within the scope of the EU ETS. There is a proposal for a net 90% emission reduction target by 2040 and a decision to reach climate neutrality by 2050 (EC, 2025i). The 2030 and 2050 targets need to be achieved via domestic emission reductions and removals. The proposed 2040 target may allow international cooperation, permanent removals and new flexibilities between sectors.

The ETS1 cap and trade system, introduced in 2005, uses a linear reduction factor on the number of CO_2eq emission permits available to energy installations, intra-EEA aviation and energy intensive industries (EU, 2024a). The cap is applied throughout EEA and is not distributed between Member States. Based on legislative proposals on the implementation of the EU Green Deal, no new allowances will be issued after 2039, which means that the ETS sectors should reach net zero by 2040 based on current EU climate law (Matthes & Graichen, 2022). The shrinking allowance budget brings new challenges. Maintaining competitiveness through the transition, and ensuring all remaining installations are zero-emission, will be challenging without offsets and flexibilities. The functioning of the framework will be tested when free allowances are phased out (e.g., aviation in 2026) and the Carbon Border Adjustment Mechanism (CBAM) enters into force (EU, 2023g). Additional changes, and the role of domestic and international CCUS, may be proposed in connection with on the ongoing ETS review, concluding in Q3 2026.

ESR contains Member State-specific emission reduction targets for sectors such as agriculture, buildings and waste (EU, 2023b). Each Member State receives allowances, or Annual Emissions Allocations, equal to the ESR target, but there is no mechanism to include CCUS. However, waste incineration can already be included into the ETS1, where CCS is considered. Starting in 2027, a new trading system (ETS2) will cover fossil fuels in transport, buildings and small installations currently under the ESR sector (EU, 2023f).

There are also Member State-specific quantitative targets for LULUCF (EU, 2023a). Under the revised LULUCF regulation, EU Member States have individual reference levels for 2021–2025, and sectoral emissions should at least be compensated by at least an equivalent amount of removals. If countries do not meet their LULUCF commitments in this period, the remaining calculated emissions are transferred to the ESR. For 2026–2030, each Member State has a budget and target with the aim of bringing EU net LULUCF removals to -310 Mt CO_2eq in 2030.

The new CRCF creates a framework for generating permanent and non-permanent CDR units, and it is unclear whether units will be traded in voluntary and possibly compliance markets, and if/how they should contribute to achieving LULUCF targets (EU, 2024d).

Another notable policy package, the Renewable Energy Directive III (Directive (EU) 2023/2413) sets EU-level binding targets for certain CCU products, called renewable fuels of non-biological origin (RFNBOs) (EU, 2023j). In 2030 5.5% of energy used in transport should be based on hydrogen or CCU e-fuels, and by 2035 CCU e-fuels should prioritize biogenic or atmospheric CO_2 as feedstock. Delegated Regulation (EU) 2023/1185 states that "Captured emissions from the combustion of non-sustainable fuels for the production of electricity should be considered avoided emissions up to 2035 [...] while emissions from other uses of non-sustainable fuels should be considered avoided emissions up to 2040" (EU, 2023e). This means that RFNBOs based on CO_2 captured from ETS installations, including waste incineration, will not be considered avoided emissions from 2041 onwards. The use of RFNBOs is promoted as RefuelEU Aviation Regulation (EU) 2023/2405 and FuelEU Maritime Regulation (EU) 2023/1805 require the gradual shift to low-carbon fuels and clean energy (EU, 2023h, 2023i). Because CCU fuel production is limited and unevenly distributed additional flexibilities and support mechanisms may be needed to enable access in island states such as Iceland (Government of Iceland, 2025). Policy implementation is done by countries individually, and there are some differences in how countries view and promote CCU.

According to the Communication on Sustainable Carbon Cycles (EU Communication 2021/800), the EU should have a framework for reporting fossil, atmospheric, and biogenic CO_2 by 2028 (EC, 2021). Whereas fossil carbon capture is subtracted in the sector where it occurs, CCUS-based removals including DACCS, mineral carbonates and possible permanent CCU products could have designated common reporting table (CRT) categories (Jörß et al., 2022). In the absence of IPCC guidelines, CCUS can be included in GHG inventories using national methods which go through a technical inventory review. Possible CRT category options for including removals are CRT 2.H 'Other' of the industrial processes sector and CRT 6 'other emissions and removals' (Jörß, 2024). As a result, fossil and biogenic CO_2 may be included in the same category, and/or they may be outside the scope of national and EU climate targets.

The IPCC methodology report on Carbon Dioxide Removal Technologies, Carbon Capture Utilisation and Storage planned for 2027, estimated publication time in 2029, is expected to propose a framework for better including CCU and CDR in national greenhouse gas inventories which will enable the development of more detailed national policies (IPCC, 2024). In the meantime, it seems that the CRCF Regulation may contribute to the EUs climate goals by generating removals within Member States. Yet, there is a missing link between project-based certified units and GHG inventory reporting, and the process of finalizing methodologies is challenging, and the outcome is uncertain (Chiti et al., 2024).

3.2 Policy measures

Nordic countries accelerate CCUS by implementing national measures. Several CCUS-related strategies or plans have been published, and currently the priority is to develop value chains, build capacity, cut costs, and demonstrate technologies. Substantial state aid has been approved and distributed in recent years. In Norway, around NOK 22 billion in grants has been distributed to the Longship project, which opened for CO_2 shipments in June 2025 (Ministry of Energy Norway, 2025). It includes CO_2 capture at cement and waste-to-energy plants, ship transportation and permanent storage beneath the seabed on the Norwegian west coast, managed by Northern Lights. The project has signed commercial agreements to store CO_2 from waste incineration and from shipments from companies in Denmark, Sweden and the Netherlands. In Denmark grants have been distributed to projects via the Energy Technology Development and Demonstration Programme (EUDP), specifically to scale CCS (Danish Energy Agency, 2025b). By regulatory measures such as licensing rounds Denmark also supports the development of storage capacity connected to depleted oil and gas fields and saline aquifers in the North Sea, as well as onshore projects (Danish Energy Agency, 2024b). In Sweden, the Industrial Leap and Climate Leap support programs continues to distribute grants to climate projects (Swedish Energy Agency, 2024). Iceland uses the Climate Fund and the Technology Development Fund to support a wide range of climate projects (Icelandic Centre for Research, 2025). Finland has relied on tax credits for clean industry investments and allocated funding for clean hydrogen and CCUS in industry projects in industry, specifically promoting CCU (Finnish Government, 2024).

Public purchasing programs and contracts for difference have also been used to procure CCUS. Sweden has approved the use of SEK 30.6 billion for reverse auctions to support bio-CCS, and distributed SEK 20 billion to Stockholm Exergy's bio-CCS Stockholm project in the first auction round (Swedish Energy Agency, 2025a; Swedish Government, 2025). The project will capture 0.8 Mt biogenic CO_2 per year over a 15-year period from a combined heat and power plant and transport it for injection into geological storage. Denmark uses tendering processes to distribute three climate funds with different focus areas and criteria (Danish Energy Agency, 2024a): The CCUS fund distributes DKK 8 billion to CCUS projects over a 20+ year period, in order to reduce emissions by 0.4 Mt CO_2 starting in 2026 and 0.9 Mt CO_2 from 2030 onwards (Danish Energy Agency, 2024a) . The CCS fund distributes DKK 27 billion to CCS and CCU in 2029–2044, in order to store around 2.3 Mt CO_2in 2030 (KEFM, 2025). The NECCS fund supports bio-CCS projects with a total of DKK 2.6 billion over 8 years (KEFM, 2025). Reverse auctions will be used to distribute DKK 268 million to use sustainable aviation fuels (SAF) in the operations of domestic airline routes (EC, 2025c). Finland is planning to distribute EUR 90 million via reverse auctions for biogenic CCS and CCU activities in years 2030–2035 (TEM, 2025).

There may also be other measures planned or in effect which support CCUS development directly and indirectly. For example, Norway and Iceland have placed a CO_2 tax on fossil fuels in non-ETS sectors (Icelandic Environment and Energy Agency, 2025; Norwegian Ministry of Climate and Environment, 2023). Much work is carried out to improve national schemes and assess potential new policy instruments. Key questions relate to the size of projects that can receive funding, whether the origin of CO_2 should be biogenic, fossil or atmospheric, the size of compensation and timelines, and interactions with other funding sources and policy packages. There is growing awareness of the need for information sharing between Nordic countries to facilitate CCUS development, for example to facilitate matchmaking between stakeholders across the value chain. Studies have suggested that in the future auctions could be arranged across Nordic countries, for example to trade bio-CCS (Möllersten et al., 2021; Pedersen et al., 2020).

The Draghi report highlights that even though there is strong focus on transport in EU policy, it is still excluded from planning documents such as the National Energy and Climate Plan (NECP) (EU, 2025). NECPs will be updated again in 2030, and they could provide an overview of planned CO_2 capture at ETS installations, and capture of biogenic CO_2 and atmospheric CO_2, planned transport infrastructure, storage capacity and injection volumes (EU, 2018). Meanwhile, CCUS projects could benefit Nordic cooperation and a better overview of responsibilities.

The EU also promotes Nordic CCUS through various instruments. Since 2020, revenues from the ETS have been distributed via the Innovation Fund to advance the following activities in Nordic countries (EC, 2025g): transport storage of CO_2 in onshore basalt formations (Iceland), build capacity for bio-CCS (Sweden), CCS linked to cement production (Denmark), waste incineration (Sweden), geothermal power (Iceland), and CCU for hydrogen and methanol (Sweden; Finland). The Innovation Fund received around 10% of ETS revenues in 2022, and assuming a price of EUR 75 per tCO_2, a total of EUR 40 billion of revenues from 2020 to 2030 could be channelled to mitigation (ESABCC, 2025).

There are several other EU initiative, for example INNO-CCUS, a research mission and partnership created in 2020 under the Innovation Fund that supports CCUS activities (INNO-CCUS, 2025). Research infrastructure and development linked to carbon capture, for example is maintained via Horizon Europe (EC, 2025f). The EU is also exploring the option of having an EU-wide purchasing program for CCUS-based removals, and recent studies focus on how to design such a framework (McDonald et al., 2025) and align it with other funding schemes (Marton et al., 2025).

In Table 3 we provide a short overview of near-term Nordic CCUS policies building on multiple sources. It contains information about CCUS-relevant documents, what is said about transport and storage, and what funding instruments are used to accelerate CCUS activities.

Table 3. Overview of national CCUS policies, storage and transport initiatives and funding instruments.

Denmark	CCUS policies: CCS strategy (Danish Energy Agency, 2024c). Storage and transport: Efforts to scale domestic transport, onshore and offshore storage (Bellona, 2025) and international agreements to facilitate cross-border CO_2 transport (KEFM, 2023a). Funding: DKK 38 billion total for storing CO_2 via NECCS, CCUS, and CCS Funds (Danish Energy Agency, 2024a; KEFM, 2025).
Finland	CCUS policies: CCUS included in separate policies related to clean energy and industry (Ministry of the Environment Finland, 2025a). Storage and transport: There are no geological storage sites available for permitting (Ministry of the Environment Finland, 2025a) but international agreements with Denmark and Norway to facilitate cross-border CO_2 transport (Finnish Government, 2025b, 2025a). Funding: EUR 90 million to be distributed to bio-CCS and bio-CCU activities via reverse auction (VM, 2025)
Iceland	CCUS policies: CCS included in the climate action plan and CCUS in separate policies (Icelandic Environment and Energy Agency, 2025). Storage and transport: Efforts to scale storage using CarbFix method (Carbfix, 2022). Funding: Distributed via Climate Fund and Technology Development Fund (Icelandic Centre for Research, 2025).
Norway	CCUS policies: CCUS included in separate policies and incentives Storage and transport: Efforts to scale domestic transport and offshore storage (Ministry of Energy Norway, 2025), and international agreements to facilitate cross-border CO_2 transport. Funding: Total NOK 22 billion distributed to Longship project (Ministry of Energy Norway, 2025). Other funding distributed via Enova, Climate and Energy Fund (Ministry of Climate and Environment Norway, 2018) and CLIMIT carbon capture R&D and demonstration support scheme (Gassnova, 2025).
Sweden	CCUS policies: Dedicated bio-CCS policy and CCUS included in separate policies and incentives (Government offices of Sweden, 2020; Swedish Environmental Protection Agency, 2025c) Storage and transport: Sweden is conducting geological investigations linked to onshore and offshore storage, but there may not be any projects before 2030 (Swedish Energy Agency, 2024). There are international agreements for cross-border transportation of CO_2 with Denmark, Norway (Regeringskansliet, 2024). Funding: SEK 30.6 billion reserved for bio-CCS (EC, 2024a). Industry Leap and Climate Leap are major funding programs (Swedish Energy Agency, 2024).

3.3 Market-based mechanisms for permanent removals

The European Commission finds that reaching climate targets will require creating price incentives for removing CO_2 from the atmosphere that mirror the mechanisms in place for reducing emissions (EC, 2024b). The 2040 impact assessment shows that a high carbon price is needed to drastically upscale bio-CCS, DACCS, CCU in mineral, chemical, metal and other industries (EC, 2024b), and the European Commission recommends using an ETS1 carbon price of over 100€/t CO_2 in 2030, 290€/t CO_2 in 2040 and 490 €/t CO_2 in 2050 in modelling of scenarios with additional measures (WAM) (EC, 2025j). At these levels CCUS could become cost-effective and projects in hard-to-abate sectors could start to reach positive returns by 2030 (Tumara et al., 2024).

As a result, in connection to the proposal for a 2040 target, the European Commission suggested that CO_2 trading of domestic and permanent CO_2 removals could help to compensate for residual emissions, specifically mentioning bio-CCS and DACCS with permanent geological storage (EC, 2025i). During April–July 2025, the European Commission has collected evidence from stakeholders in preparation for the 2026 ETS review impact assessment, and over 80% of respondents support introducing CRCF-certified permanent removals into the ETS (EC, 2025e). This suggests that a new compliance market for removals could be created by extending the Emission Trading System (Directive 2003/87/EC) in connection with the review due in Q3/2026 or later. Trading of removals would be compatible with the 'polluter pays' principle, and practical considering that permanent CCUS relying on fossil carbon and carbon from non-sustainable biomass can already be subtracted from ETS1 emissions (Jörß et al., 2022).

The (Swedish Environmental Protection Agency, 2025a) has presented four approaches for ETS integration as possible options in a preparatory work for the government: (1) without restrictions; (2) with restrictions on the amount of removals and a cap for emissions; (3) indirect integration with restrictions and a price mechanism to ensure sufficient incentives; and (4) indirect integration using ETS revenues or reverse auctions. The Danish Ministry of Climate, Energy and Utilities has published a position paper proposing an option for direct integration (KEFM, 2023b) which contains two phases. In the first phase (2030–2035), permanent removals could be used to cancel out allowances under the existing cap. In the second phase (2036–2040), removal allowances could be issued. According to SEPA (2025) the Danish approach would probably not generate the amount of permanent removals needed for 2030–2040, and it would favour low-cost removal technologies. Consequently, complementary policies need to be developed to support a diverse portfolio of technologies, and ETS integration should wait until policies are adapted to consider the differences in costs, maturity and environmental concerns (Swedish Environmental Protection Agency, 2025b). The recent proposal by the UK to integrate removals into the UK ETS by the end of 2028 is important because the EU is committed to link the emission trading systems in some way (UK Government, 2025). The UK intends to allow permanent removals (200 years permanence minimum) to be used without restrictions, while maintaining a cap on emission allowances. This approach considers that supply controls may be adopted if needed.

Current EU suggestions to introduce market-based mechanisms for incentivizing removals tend to ignore non-permanent removals, such as CO_2 storage in bio-CCU or DACCU products. However, the EU Industrial Decarbonisation Accelerator Act states that incentives for the uptake of CCU should be considered in the future. A recent report by the Netherlands Scientific Climate Council presents what the responsible use of non-permanent removals may look like, including whether they should be used in order to limit peak warming and whether the like-for-like principle should apply (WKR, 2025).

The trading of carbon credits representing emission reductions or removals in voluntary carbon markets will still have a role in the post-2030 policy framework. Internationally Transferred Mitigation Outcomes (ITMOs) are expected to be a key instrument for mobilizing removals (Michaelowa et al., 2023). Ahonen et al. (2025) find that authorizing ITMOs under Article 6 of the Paris Agreement would make it possible to count credits towards an NDC and at the same time for companies to make contribution claims. To be counted towards NDCs a 'corresponding adjustment' must be applied by the host country. In connection to the proposed EU 2040 target, the European Commission suggests to allow the use of international credits to contribute to the 90% economy-wide net emissions reduction target (EC, 2025i). Sweden and Norway are cooperating with Switzerland to pilot transactions and reporting of removals (Swedish Energy Agency, 2023). Nordic countries may foresee different roles for ITMOs in national targets or voluntary offsetting.

Current efforts aim to clarify the types of activities can be credited under Article 6.4 mechanism and to define the requirements for removals which can be transferred from a host party or project developer to a buyer party or entity. Also the planned EU legislation on green claims may also influence the private demand for carbon credits, including ITMOs (EU, 2023d). The CRCF will create a framework for voluntary carbon markets, and all emission reductions and removals generated under CRCF must contribute to the EUs NDC and cannot be transferred via ITMOs (CRCF art 1 point 2). It is important to make sure that the financing, usage and claiming of removals is done right, as there are concerns about the quality and durability of projects. Monitoring, reporting and verification play an important role, and methodologies are still being developed. In the past there have been deficiencies (e.g., related to biomass certification schemes under the Renewable Energy Directive, and the ESABCC calls for more effort to enhance the capacities of institutions involved (ESABCC, 2025).

4 Environmental aspects

Capture, use, transport and storage of CO_2 require energy which results in GHG emissions and other environmental impacts. Current CCS technologies with 85–90% CO_2 capture rates typically provide around 50–70% overall CO_2 emission reduction. Increasing the emission reduction above 80% requires CO_2 capture rates that exceed 90%. Most of the CO_2 emissions associated with CCS are related to capturing and transportation the CO_2 as they rely mainly on fossil fuels (Burger et al., 2024). Net CO_2 emissions related to CCU supply chains may depend on the need for hydrogen and the overall energy input, especially electricity (Garcia-Garcia et al., 2021). Assessing CO_2 emissions related to electricity demand is not straightforward, as system level consequences may be very different from those attributed to a specific supply chain (Soimakallio et al., 2011).

Land use effects related to bio-CCS or bio-CCU technologies depend on the case and assumptions. Deployment of bio-CCS or bio-CCU may potentially lead to increased biomass utilisation (i.e. increased harvests) or reduce the desirability of minimizing biomass use. However, biomass use is not affected if capture of CO_2 is applied in existing bioenergy plant that would have continued emitting CO_2 into the atmosphere in the reference system (i.e. without CO_2 capture). On the other hand, if capture of CO_2 is applied in a new bioenergy plant which would have not been built without the capture of CO_2, or if the capture of CO_2 results in continuation of biomass use that would have otherwise ceased, then biomass use increases compared to the reference system without deployment of CCUS. If increased biomass use leads to increased harvests, the harmful effects of harvesting on land ecosystem carbon stocks may exceed the credits biomass capture and use and/or storage provides for decades (Fuss et al., 2018; Soimakallio et al., 2021).

If land use is affected by bio-CCS or bio-CCU technologies, for example maintaining intensive land use practices, then the broader environmental and sustainability issues, such as harmful biodiversity and social impacts are related to deployment of these technologies. In addition, CO_2 storage is subject to risks related to overpressure, which could lead to pollution of potable water, to seismic activity or to leaks (Fuss et al., 2018). These risks need to be addressed for sustainable deployment of these technologies.

The EU RED III directive (2023/2413) provides sustainability criteria for renewable energy sources, including renewable fuels of non-biological origin, which means liquid and gaseous fuels derived from renewable sources other than biomass (EU, 2023j). These criteria capture certain direct GHG emissions that are considered to be part of supply chain emissions. However, they exclude indirect market-mediated effects and direct land use effects, which means that potentially the most significant consequences are ignored (Soimakallio & Koponen, 2011). At the moment, it is an open question what kind of sustainability criteria are to be applied for bio-CCS, but the CRCF draft methodology states that individual operators shall ensure compliance with RED III criteria (ICF, 2025).

Funding is currently distributed through national schemes with varying project requirements and sustainability criteria. This experimentation phase provides opportunities to study climate impacts and broader public consultation about the role of CCUS. Recently the Swedish Energy Agency commissioned a nation-wide survey to study how knowledge, attitudes and perception of the general public with regards to CCS in Sweden (Swedish Energy Agency, 2025b) The study found broad interest in learning more about CCS, what technology means in practice, safety and costs.

Overreliance on future technologies for meeting climate targets presents a significant risk of failure. For example, CCUS projects may be delayed or not implemented in a required scale due to technical issues, acceptance or high costs. In addition, CCUS technologies may deliver lower overall climate benefits than expected. These risks should be taken into account in climate strategies by maintaining high ambition in emission reductions across the economy.

5 Conclusions

Carbon capture, utilisation and storage is increasingly recognized as an element in pathways leading to climate neutrality. CCS can support the production of low-emission energy and materials by preventing emissions from entering the atmosphere. CCU, bio-CCU and DACCU can substitute fossil-based materials, thereby preventing emissions. CO_2 can be removed from the atmosphere and stored permanently using Bio-CCS and DACCS, and stored in durable products using bio-CCU or DACCU.

For complete and consistent reporting of CCUS emissions and removals, and to enable the trade of Internationally Transferred Mitigation Outcomes, it is necessary to develop and approve good practice guidelines for GHG inventory reporting. CCUS activities reflected in national GHG inventories may contribute to overall national and EU economy wide climate targets, but not necessarily to any sectoral target. Currently several elements of CCUS are not completely and coherently reported in GHG inventories and excluded from the climate policy implementation framework. Only in the ETS (EU Directive 2003/87/EC) are CCS and certain CCU products considered as operators do not need to surrender allowances for the amount of CO_2 permanently stored. Bio-CCS and DACCS are not considered under the EU ETS, ESR or LULUCF at least until 2030.

The majority of emissions in Finland and Sweden are of biogenic origin, while in Norway, Denmark, Iceland they are more mixed. In 2023, total emissions included in ETS in Nordics were 115 Mt CO_2, where confirmed emissions by large point sources were 41 Mt fossil and 59 Mt biogenic CO_2. The available data is fragmented and does not necessarily specify if emissions are fossil, biogenic or mixed. The current geological storage projects are located in Norway, Denmark, and Iceland. While Finland does not have any planned storage projects, investigations for storage potential are underway in Sweden, yet any storage project is unlikely to realize before 2030. CCU may be seen currently as economically more attractive option than CCS in countries without storage capacity. National characteristics and priorities affect what types of projects are considered and planned.

Many policy instruments are used to accelerate CCUS development in the near-term, and Nordic countries mainly use direct subsidies, reverse auctions and tenders. National schemes have different selection criteria with unique requirements for CO_2 sources, storages and uses. For the long-term, the EU commission suggests allowing permanent storage of atmospheric and biogenic CO_2 to offset residual emissions. There are several options for incentivizing permanent removals, such as rule-based mechanisms or purchasing programs. One possible option is to propose integration of permanent removals into the ETS, as this would enable trading of permanent removal units, such as bio-CCS, DACCS, in the wider European Economic Area, however, a design of such a system should not undermine mitigation efforts and the implementation of transformative policies.

GHG emissions and other environmental impacts are associated with CCUS technologies, directly or indirectly through market-mediated mechanisms due to the requirement of energy and land resources. It is important to develop frameworks to avoid potential negative consequences of CCUS, and the links and interactions between policies need to be better addressed. To avoid mitigation deterrence in line with principles of fairness and equity, countries could set separate targets for specific activities or sectors, treating them as different supplementary measures.

References

Ahonen, H.-M., Dufour, M., Honegger, M., Michaelowa, A., Möllersten, K., Poralla, M., Samaniego, X., Veen, P., & Weldner, K. (2025). Promoting biogenic carbon capture and storage in the nordic region through carbon markets. https://perspectives.cc/wp-content/uploads/2025/03/Nordic_bio-CCS_Art6_Discussion_Paper-1.pdf

Allen, M. R., Frame, D. J., Friedlingstein, P., Gillett, N. P., Grassi, G., Gregory, J. M., Hare, W., House, J., Huntingford, C., Jenkins, S., Jones, C. D., Knutti, R., Lowe, J. A., Matthews, H. D., Meinshausen, M., Meinshausen, N., Peters, G. P., Plattner, G.-K., Raper, S., Zickfeld, K. (2025). Geological Net Zero and the need for disaggregated accounting for carbon sinks. Nature, 638(8050), 343–350. https://doi.org/10.1038/s41586-024-08326-8

Bellona. (2025). Carbon Capture and Storage in the National Energy and Climate Plans. https://eu.bellona.org/publication/carbon-capture-and-storage-in-the-national-energy-and-climate-plans/

Bencini, J., Delbeke, J., Dombrowicki, P. M., & Marro, E. (2025). Policy developments in carbon markets rewarding high-quality carbon removals. European University Institute. https://doi.org/10.2870/5110686

Buck, H. J., Carton, W., Lund, J. F., & Markusson, N. (2023). Why residual emissions matter right now. Nature Climate Change, 13(4), 351–358. https://doi.org/10.1038/s41558-022-01592-2

Burger, J., Nöhl, J., Seiler, J., Gabrielli, P., Oeuvray, P., Becattini, V., Reyes-Lúa, A., Riboldi, L., Sansavini, G., & Bardow, A. (2024). Environmental impacts of carbon capture, transport, and storage supply chains: Status and the way forward. International Journal of Greenhouse Gas Control, 132, 104039. https://doi.org/10.1016/j.ijggc.2023.104039

Carbfix. (2022). Carbfix's Coda Terminal awarded large EU grant. https://www.carbfix.com/awarded-large-eu-grant

Chiti, T., Rey, A., Abildtrup, J., Böttcher, H., Diaci, J., Frings, O., Lehtonen, A., Schindlbacher, A., Zavala, M. A., European Forest Institute, & Wunder, S. (2024). Carbon farming in the European forestry sector. European Forest Institute. https://efi.int/publications-bank/carbon-farming-european-forestry-sector

CLC. (2025). Carbon removal and utilisation in the Nordic countries—Status, outlook and policies needed. Climate Leadership Coalition. https://www.clc.fi/insights/clcreportoncarbonremovalandutilizationinthenordiccountries

Danish Energy Agency. (2024a). CCS tenders and other funding for CCS development. https://ens.dk/en/supply-and-consumption/ccs-tenders-and-other-funding-ccs-development

Danish Energy Agency. (2024b). Licenses for exploration and storage of CO2, including environmental consultation rounds. https://ens.dk/en/supply-and-consumption/licenses-exploration-and-storage-co2-including-environmental-consultation

Danish Energy Agency. (2024c). Political agreements and applicable legislation. https://ens.dk/en/supply-and-consumption/political-agreements-and-applicable-legislation

Danish Energy Agency. (2025a). 10 companies selected to compete for Denmark's CCS Fund with DKK 28.7 billion for Carbon Capture and Storage. https://ens.dk/en/press/10-companies-selected-compete-denmarks-ccs-fund-dkk-287-billion-carbon-capture-and-storage

Danish Energy Agency. (2025b). The Energy Technology Development and Demonstration Programme. https://eudp.dk/en/projektgalleri

Dufour, M., & Möllersten, K. (2025). Nordic net-zero: Counterbalancing residual emissions in the context of unevenly distributed BECCS potentials. Climate Policy, 0(0), 1–17. https://doi.org/10.1080/14693062.2025.2546116

EC. (2021). Communication from the Commission to the European Parliament and the Council—Sustainable Carbon Cycles. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0800&qid=1654786967285

EC. (2023). European Green Deal: New EU-Norway Green Alliance to deepen cooperation on climate, environment, energy and clean industry [Text]. European Commission - European Commission. https://ec.europa.eu/commission/presscorner/detail/en/ip_23_2391

EC. (2024a). Commission approves €3 billion Swedish State aid scheme to support the roll-out of biogenic carbon dioxide capture and storage. https://ec.europa.eu/commission/presscorner/detail/lt/ip_24_3583

EC. (2024b). Impact Assessment accompanying Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society. European Commission. https://eur-lex.europa.eu/resource.html?uri=cellar:6c154426-c5a6-11ee-95d9-01aa75ed71a1.0001.02/DOC_1&format=PDF

EC. (2024c). 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 Region. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52024DC0062

EC. (2025a). Carbon capture, utilisation and storage. https://joint-research-centre.ec.europa.eu/projects-and-activities/carbon-capture-utilisation-and-storage_en

EC. (2025b). Carbon removals and carbon farming – methodologies for certifying permanent carbon removals. European Commission. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14573-Carbon-removals-and-carbon-farming-methodologies-for-certifying-permanent-carbon-removals_en

EC. (2025c). Commission approves €36 million Danish State aid scheme to boost use of sustainable aviation fuel. European Commission. https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1928

EC. (2025d). Energy, Climate change, Environment. https://commission.europa.eu/energy-climate-change-environment_en

EC. (2025e). EU emissions trading system for maritime, aviation and stationary installations, and market stability reserve – review. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14549-EU-emissions-trading-system-for-maritime-aviation-and-stationary-installations-and-market-stability-reserve-review_en

EC. (2025f). Horizon Europe - New CO2 capture technologies. European Commission. https://cordis.europa.eu/programme/id/HORIZON_HORIZON-CL5-2026-02-D3-24

EC. (2025g). Innovation Fund projects. https://climate.ec.europa.eu/eu-action/eu-funding-climate-action/innovation-fund/innovation-fund-projects_en

EC. (2025h). Projects of Common Interest and Projects of Mutual Interest. https://energy.ec.europa.eu/topics/infrastructure/projects-common-interest-and-projects-mutual-interest_en

EC. (2025i). Proposal for a regulation of the European Parliament and of the Council amending Regulation (EU) 2021/1119 establishing the framework for achieving climate neutrality. https://climate.ec.europa.eu/document/download/e1b5a957-c6b9-4cb2-a247-bd28bf675db6_en

EC. (2025j). Recommended parameters for GHG projections 2025. European Commission. https://www.eionet.europa.eu/reportnet/docs/govreg/projections

EC. (2025k). Public consultation on the Industrial Decarbonisation Accelerator Act. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14505-Industrial-Decarbonisation-Accelerator-Act-speeding-up-decarbonisation_en

EEA. (2024). Industrial Reporting under the Industrial Emissions Directive 2010/75/EU and European Pollutant Release and Transfer Register Regulation (EC) No 166/2006—Ver. 14.0 Mar. 2025 (Tabular data). European Environment Agency. https://doi.org/10.2909/21e758c6-a9ac-4a7d-a64a-19d2ba9eecb7

EEA. (2025). Member States' greenhouse gas (GHG) emission projections 2024. https://sdi.eea.europa.eu/data/d5d2a7ab-dd89-410d-9f92-b5180759a06d?path=%2F

ESABCC. (2025). Scaling up carbon dioxide removals – Recommendations for navigating opportunities and risks in the EU. The European Scientific Advisory Board on Climate Change. https://climate-advisory-board.europa.eu/reports-and-publications/scaling-up-carbon-dioxide-removals-recommendations-for-navigating-opportunities-and-risks-in-the-eu

EU. (2009). 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). https://eur-lex.europa.eu/eli/dir/2009/31/oj/eng

EU. (2018, December 11). Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (Text with EEA relevance.). http://data.europa.eu/eli/reg/2018/1999/oj

EU. (2023a). Consolidated text: Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU (Text with EEA relevance). European Union. https://eur-lex.europa.eu/eli/reg/2018/841/2023-05-11/eng

EU. (2023b). Consolidated text: Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (Text with EEA relevance). European Union. https://eur-lex.europa.eu/eli/reg/2018/842/2023-05-16/eng

EU. (2023c). EU regulation for the development of the market for CO2 transport and storage. Publications Office of the European Union. https://op.europa.eu/en/publication-detail/-/publication/bb3264da-f2ce-11ed-a05c-01aa75ed71a1

EU. (2023d). Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on substantiation and communication of explicit environmental claims (Green Claims Directive). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2023%3A0166%3AFIN

EU. (2023e). Commission Delegated Regulation (EU) 2023/1185 of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a minimum threshold for greenhouse gas emissions savings of recycled carbon fuels and by specifying a methodology for assessing greenhouse gas emissions savings from renewable liquid and gaseous transport fuels of non-biological origin and from recycled carbon fuels. http://data.europa.eu/eli/reg_del/2023/1185/oj

EU. (2023f). Directive (EU) 2023/959 of the European Parliament and of the Council of 10 May 2023 amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system (Text with EEA relevance). http://data.europa.eu/eli/dir/2023/959/oj

EU. (2023g). Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 establishing a carbon border adjustment mechanism (Text with EEA relevance). http://data.europa.eu/eli/reg/2023/956/oj

EU. (2023h). Regulation (EU) 2023/1805 of the European Parliament and of the Council of 13 September 2023 on the use of renewable and low-carbon fuels in maritime transport, and amending Directive 2009/16/EC (Text with EEA relevance). http://data.europa.eu/eli/reg/2023/1805/oj

EU. (2023i). Regulation (EU) 2023/2405 of the European Parliament and of the Council of 18 October 2023 on ensuring a level playing field for sustainable air transport (ReFuelEU Aviation) (Text with EEA relevance). http://data.europa.eu/eli/reg/2023/2405/oj

EU. (2023j). Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast) (Text with EEA relevance)Text with EEA relevance. http://data.europa.eu/eli/dir/2018/2001/2023-11-20

EU. (2024a). 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). European Union. https://eur-lex.europa.eu/eli/dir/2003/87/2024-03-01/eng

EU. (2024b). 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 (Text with EEA relevance). http://data.europa.eu/eli/reg/2024/1735/oj

EU. (2024c). Commission Delegated Regulation (EU) 2024/2620 of 30 July 2024 supplementing Directive 2003/87/EC of the European Parliament and of the Council as regards the requirements for considering that greenhouse gases have become permanently chemically bound in a product. http://data.europa.eu/eli/reg_del/2024/2620/oj

EU. (2024d). Regulation (EU) 2024/3012 of the European Parliament and of the Council of 27 November 2024 establishing a Union certification framework for permanent carbon removals, carbon farming and carbon storage in products. http://data.europa.eu/eli/reg/2024/3012/oj

EU. (2025). The future of European competitiveness. Publications Office of the European Union. https://commission.europa.eu/topics/eu-competitiveness/draghi-report_en

Fankhauser, S., Smith, S. M., Allen, M., Axelsson, K., Hale, T., Hepburn, C., Kendall, J. M., Khosla, R., Lezaun, J., Mitchell-Larson, E., Obersteiner, M., Rajamani, L., Rickaby, R., Seddon, N., & Wetzer, T. (2022). The meaning of net zero and how to get it right. Nature Climate Change, 12(1), 15–21. https://doi.org/10.1038/s41558-021-01245-w

Finlex. (2022). Climate Act. https://www.finlex.fi/fi/lainsaadanto/2022/423#chp_1__sec_2__heading

Finnish Government. (2024). EUR 72.6 million in investment aid granted to 13 clean energy projects. https://valtioneuvosto.fi/-/1410877/puhtaan-energian-ratkaisuja-edistaville-13-hankkeelle-yhteensa-72-6-miljoonaa-euroa-investointitukea?languageId=en_US

Finnish Government. (2025a). Finland and Denmark agree on framework for CO_2 transport and storage. Finnish Government. https://valtioneuvosto.fi/en/-/1410903/finland-and-denmark-agree-on-framework-for-co2-transport-and-storage

Finnish Government. (2025b). Finland and Norway strengthen cooperation on carbon capture, transportation and storage. Ministry of the Environment. https://ym.fi/en/-/finland-and-norway-strengthen-cooperation-on-carbon-capture-transportation-and-storage

Fuss, S., Lamb, W. F., Callaghan, M. W., Hilaire, J., Creutzig, F., Amann, T., Beringer, T., de Oliveira Garcia, W., Hartmann, J., Khanna, T., Luderer, G., Nemet, G. F., Rogelj, J., Smith, P., Vicente, J. L. V., Wilcox, J., del Mar Zamora Dominguez, M., & Minx, J. C. (2018). Negative emissions—Part 2: Costs, potentials and side effects.

Environmental Research Letters, 13(6), 063002. https://doi.org/10.1088/1748-9326/aabf9f

FVM. (2021). Deal on green transition in Danish agriculture (in Danish). https://fvm.dk/arbejdsomraader/landbrug/aftale-om-groen-omstilling-af-dansk-landbrug

Garcia-Garcia, G., Fernandez, M. C., Armstrong, K., Woolass, S., & Styring, P. (2021). Analytical Review of Life-Cycle Environmental Impacts of Carbon Capture and Utilization Technologies. ChemSusChem, 14(4), 995–1015. https://doi.org/10.1002/cssc.202002126

Gassnova. (2025). The CLIMIT programme. https://climit.no/en/

Government of Iceland. (2025). EU emissions trading system for maritime, aviation and stationary installations, and market stability reserve – review: Feedback from: Government of Iceland. European Commission - Have Your Say. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14549-EU-emissions-trading-system-for-maritime-aviation-and-stationary-installations-and-market-stability-reserve-review/F3573630_en

Government offices of Sweden. (2020). Road to a climate positive future (in Swedish). Regeringen och Regeringskansliet. https://www.regeringen.se/rattsliga-dokument/statens-offentliga-utredningar/2020/01/sou-20204/

Government offices of Sweden. (2021). Sweden's climate policy framework. https://www.government.se/articles/2021/03/swedens-climate-policy-framework/

Government Offices of Sweden (2024). Five northern European countries conclude international arrangements on transport and storage of carbon across borders. Regeringskansliet; Regeringen och Regeringskansliet. https://www.government.se/press-releases/2024/04/five-northern-european-countries-conclude-international-arrangements-on-transport-and-storage-of-carbon-across-borders/

Hjelm, L., Lyng Anthonsen, K., Dideriksen, K., Moller Nielsen, C., Nielsen, L. H., & Mathiesen, A. (2020). Capture, Storage and Use of CO_2 (CCUS) Evaluation of the CO2 storage potential in Denmark. https://data.geus.dk/pure-pdf/GEUS-R_2020_46_web.pdf

Icelandic Centre for Research. (2025). Research and Innovation. https://en.rannis.is/funding/research/

Icelandic Environment and Energy Agency. (2025). Report on Policies, Measures, and Projections. https://www.ust.is/library/sida/Loft/Report%20on%20Policies,%20Measures,%20and%20Projections_Iceland_2025.pdf

ICF. (2025). Draft technical specifications for the certification of permanent carbon removals through DACCS/BioCCS. https://climate.ec.europa.eu/document/download/22174fb5-c2bc-4b53-9c7c-baec424bc395_en?filename=policy_crcf_draft_methodology_permanent_removals_en.pdf

IEA. (2021). Exporting CO2 for Offshore Storage – The London Protocol's Export Amendment and Associated Guidelines and Guidance. https://www.club-co2.fr/files/2021/04/IEAGHG-2021-TR02-Exporting-CO2-for-Offshore-Storage-The-London-Protocol-s-Export-Amendment-and-Associated-Guidelines-and-Guidance.pdf

IEA. (2025). Carbon Capture Utilisation and Storage. https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage

IMO. (2025). LC-LP circulars. https://docs.imo.org/Category.aspx?cid=624

INNO-CCUS. (2025). Pushing forward the frontiers of carbon capture, utilisation and storage. https://inno-ccus.dk/

IPCC. (2024). Call for nomination of experts to Scoping Meeting for Methodology Report on Carbon Dioxide Removal Technologies and Carbon Capture Utilization and Storage. https://www.ipcc.ch/2024/06/18/nominations-scoping-meeting-cdr/

IPCC. (2025). Task Force on Greenhouse Gas Inventories: Methodology reports. Intergovernmental Panel on Climate Change. https://www.ipcc-nggip.iges.or.jp/public/index.html

IPCC. (2025b). IPCC Glossary Search. Intergovernmental Panel on Climate Change. https://apps.ipcc.ch/glossary/

Jörß, W. (2024). Accounting of negative and neutral emission technologies (NETs). https://www.oeko.de/fileadmin/oekodoc/WP-NET-Accounting-2024.pdf

Jörß, W., Emele, L., Moosmann, L., & Graichen, J. (2022). Challenges for the accounting of emerging negative and zero/low emission technologies. https://www.oeko.de/fileadmin/oekodoc/WP-NET-accounting.pdf

KEFM. (2020). Climate Act Denmark. Danish Ministry of Climate, Energy and Utilities. https://www.en.kefm.dk/Media/1/B/Climate%20Act_Denmark%20-%20WEBTILG%C3%86NGELIG-A.pdf

KEFM. (2023a). Aalborg Declaration. Danish Ministry of Climate, Energy and Utilities. https://www.kefm.dk/Media/638641513877792088/Aalborg%20declaration.pdf

KEFM. (2023b). Position paper on integrating permanent CDR into the EU ETS (in Danish). Danish Ministry of Climate, Energy and Utilities. https://www.eu.dk/samling/20231/almdel/EUU/bilag/756/2910818/index.htm

KEFM. (2024). Alliance brings likeminded nations together on a path towards global net negative emissions. Danish Ministry of Climate, Energy and Utilities. https://www.en.kefm.dk/news/news-archive/2024/nov/launch-alliance-brings-likeminded-nations-together-on-a-path-towards-global-net-negative-emissions

KEFM. (2025). Climate program 2025 (in Danish). Danish Ministry of Climate, Energy and Utilities. https://www.kefm.dk/Media/638948087473597195/Klimaprogram%202025.pdf

Kujanpää, L., Reznichenko, A., Saastamoinen, H., Mäkikouri, S., Soimakallio, S., Tynkkynen, O., Lehtonen, J., Wirtanen, T., Linjala, O., Similä, L., Keränen, J. T., Salo, E., Elfving, J., & Koponen, K. (2023). Carbon dioxide use and removal: Prospects and policies. http://urn.fi/URN:ISBN:978-952-383-197-1

Marton, C., Bert, N., Steinmann, J., Witteveen, E., & Pieleanu, R. (2025). Funding EU carbon removals: Assessment of existing EU funding programmes and new funding models to increase carbon removal supply. Publications Office of the European Union. https://data.europa.eu/doi/10.2834/7897019

Matthes, F., & Graichen, J. (2022, December 12). Policy Brief: Emissions trading system for road transport and buildings in the policy mix for achieving climate neutrality in the EU. oeko.de. https://www.oeko.de/publikation/policy-brief-emissions-trading-system-for-road-transport-and-buildings-in-the-policy-mix-for-achieving-climate-neutrality-in-the-eu/

McDonald, H., Gardiner, J., Görlach, B., & Tarpey, J. (2025). An EU purchasing programme for permanent carbon removals: Assessment of policy options and recommendations for short term policy design. Publications Office of the European Union. https://data.europa.eu/doi/10.2834/8212975

Michaelowa, A., Honegger, M., Poralla, M., Winkler, M., Dalfiume, S., & Nayak, A. (2023). International carbon markets for carbon dioxide removal. PLOS Climate, 2(5), e0000118. https://doi.org/10.1371/journal.pclm.0000118

Ministry of Climate and Environment Norway. (2017). Information about Norwegian legislation. https://lovdata.no/dokument/NL/lov/2017-06-16-60

Ministry of Climate and Environment Norway. (2018). Enova. https://www.regjeringen.no/en/dep/kld/organisation/selskaper/enova/id2599611/

Ministry of Energy Norway. (2024). Norway leads the way in offering commercial CO2 storage. regjeringen.no. https://www.regjeringen.no/en/aktuelt/norway-leads-the-way-in-offering-commercial-co2-storage/id3037033/

Ministry of Energy Norway. (2025). Longship goes into operation – A Global Breakthrough for Carbon Capture and Storage. regjeringen.no. https://www.regjeringen.no/en/aktuelt/longship-goes-into-operation-a-global-breakthrough-for-carbon-capture-and-storage/id3109272/

Ministry of the Environment Finland. (2025a). Net-Zero Industry Act—Transparency of CO2 storage capacity data Report by Finland according to Articles 21(2) and (3). https://ym.fi/documents/1410903/33891761/Report_Finland_21_2_3.pdf/686ad63f-8d84-cedd-b61b-be0032cb9707/Report_Finland_21_2_3.pdf?t=1738655357342

Ministry of the Environment Finland. (2025b). Draft medium-term climate policy plan (in Finnish). https://www.lausuntopalvelu.fi/FI/Proposal/Participation?proposalId=f8db002d-2622-4146-b2e7-0a558b2cb198

Möllersten, K., Zetterberg, L., Nielsen, T., Torvanger, A., Siikavirta, H., Kujanpää, L., & Hannula, I. (2021). Policies for the promotion of BECCS in the Nordic countries. Nordic Council of Ministers. https://www.norden.org/en/publication/policies-promotion-beccs-nordic-countries

NCM. (2019). Declaration on Nordic Carbon Neutrality—Nordic cooperation. Nordic Council of Ministers. https://www.norden.org/en/declaration/declaration-nordic-carbon-neutrality

NCM. (2022). Hydrogen, electrofuels, CCU and CCS in a Nordic context. Nordic Council of Ministers. https://www.nordicenergy.org/wordpress/wp-content/uploads/2022/02/Endelig-rapport-udgivet.pdf

NCM. (2023). Regulatory framework for CCS in the Nordic countries. Nordic Council of Ministers. https://norden.diva-portal.org/smash/get/diva2:1773525/FULLTEXT01.pdf

Norwegian Ministry of Climate and Environment. (2023). Norway's Eighth National Communication. regjeringen.no. https://www.regjeringen.no/en/documents/norways-eighth-national-communication/id2971116/

Pedersen, J. L., Bey, N., Friis Gerholt, S., Rohde, R., Ødegård Berg, H., Almqvist, M., Halonen, M., Laine, A., Mikkola, J., & Gíslason, S. (2020). The Road towards Carbon Neutrality in the different Nordic Countries. Nordisk Ministerråd. https://urn.kb.se/resolve?urn=urn:nbn:se:norden:org:diva-6010

Smith, S. M., Geden, O., Gidden, M. J., Lamb, W. F., Nemet, G. F., Minx, J. C., Buck, H., Burke, J., Cox, E., Edwards, M. R., Fuss, S., Johnstone, I., Müller-Hansen, F., Pongratz, J., Probst, B. S., Roe, S., Schenuit, F., Schulte, I., & Vaughan, N. E. (2024). The State of Carbon Dioxide Removal—2nd Edition. The State of Carbon Dioxide Removal. https://osf.io/f85qj/

Snæbjörnsdóttir, S. Ó., Wiese, F., Fridriksson, T., Ármansson, H., Einarsson, G. M., & Gislason, S. R. (2014). CO2 storage potential of basaltic rocks in Iceland and the oceanic ridges. Energy Procedia, 63, 4585–4600. https://doi.org/10.1016/j.egypro.2014.11.491

Soimakallio, S., Kalliokoski, T., Lehtonen, A., & Salminen, O. (2021). On the trade-offs and synergies between forest carbon sequestration and substitution. Mitigation and Adaptation Strategies for Global Change, 26(1), 4. https://doi.org/10.1007/s11027-021-09942-9

Soimakallio, S., Kiviluoma, J., & Saikku, L. (2011). The complexity and challenges of determining GHG (greenhouse gas) emissions from grid electricity consumption and conservation in LCA (life cycle assessment) – A methodological review. Energy, 36(12), 6705–6713. https://doi.org/10.1016/j.energy.2011.10.028

Soimakallio, S., & Koponen, K. (2011). How to ensure greenhouse gas emission reductions by increasing the use of biofuels? – Suitability of the European Union sustainability criteria. Biomass and Bioenergy, 35(8), 3504–3513. https://doi.org/10.1016/j.biombioe.2011.04.041

Swedish Energy Agency. (2023). Sweden and Switzerland pave the way for international trade with carbon removals. https://www.energimyndigheten.se/en/news/2023/sweden-and-switzerland-pave-the-way-for-international-trade-with-carbon-removals/

Swedish Energy Agency. (2024). Net Zero Industry Act (NZIA) 2024 report for article 21.2 and 21.3 in chapter 3 (in Swedish). https://energimyndigheten.a-w2m.se/Arkitektkopia/ViewTemplate?tid=0cdf4d1996cd4299bcb132d66fe28445

Swedish Energy Agency. (2025a). Swedish Energy Agency grants 20 billion in aid to store over 11 million tons of carbon dioxide (in Swedish). https://www.energimyndigheten.se/nyhetsarkiv/2025/energimyndigheten-ger-20-miljarder-i-stod-for-att-lagra-over-11-miljoner-ton-koldioxid/

Swedish Energy Agency. (2025b). People in Sweden want to know more about CCS (in Swedish). https://www.energimyndigheten.se/nyhetsarkiv/2025/svenskarna-vill-veta-mer-om---koldioxidavskiljning-och-lagring/

Swedish Energy Agency. (2025c). State aid for BECCS. https://www.energimyndigheten.se/en/sustainability/carbon-capture-and-storage/state-aid-for-beccs/

Swedish Energy Agency. (2025d). 228 million to Öresundskraft—CCS in Helsingborg (in Swedish). https://www.energimyndigheten.se/nyhetsarkiv/2025/228-miljoner-till-oresundskraft--stor-satsning-pa-ccs-i-helsingborg/

Swedish Environmental Protection Agency. (2025a). Incentives and accounting of permanent removals in EU climate policy until 2040 (in Swedish). https://www.naturvardsverket.se/4921a4/contentassets/82ba32d8069a4e619c123f587c0aa197/analys-av-incitament-och-bokforing-av-permanenta-upptag-i-eu-till-2040.pdf

Swedish Environmental Protection Agency. (2025b). Overview of EU ETS 2026—A first analysis (in Swedish). https://www.naturvardsverket.se/49d00d/contentassets/82ba32d8069a4e619c123f587c0aa197/delredovisning-7.-oversynen-av-eu-ets_en-forsta-analys.pdf

Swedish Environmental Protection Agency. (2025c). Swedens climate targets and climate policy framework (in Swedish). https://www.naturvardsverket.se/amnesomraden/klimatomstallningen/sveriges-klimatarbete/sveriges-klimatmal-och-klimatpolitiska-ramverk/

Swedish Government. (2025). Budget proposal 2026—Climate, environment, nature. https://www.regeringen.se/contentassets/3416d1df56ae4fcaacf03ecd8ed81ab1/utgiftsomrade-20-klimat-miljo-och-natur/

Teir, S., Pikkarainen, T., Kujanpää, L., Tsupari, E., Kärki, J., Arasto, A., & Aatos, S. (2010). Potential for carbon capture and storage (CCS) in the Nordic region. https://publications.vtt.fi/pdf/tiedotteet/2010/T2556.pdf

TEM. (2025). Finnish Government Act to support scheme to incentivize capture of biogenic carbon dioxide in industry (in Finnish). Ministry of Economic Affairs and Employment Finland. https://www.lausuntopalvelu.fi/FI/Proposal/Participation?proposalId=688c91e8-ff21-490c-a174-36bde5912516

Tumara, D., Uihlein, A., & Hidalgo, G. I. (2024). Shaping the future CO2 transport network for Europe. JRC Publications Repository. https://doi.org/10.2760/582433

UK Government. (2025). Removals in the UK Emissions Trading Scheme: Main Response. https://assets.publishing.service.gov.uk/media/689cda8487bf475940723f5b/uk-ets-ggrs-main-response.pdf

UNFCCC. (2020). Norway's long-term low-emission strategy for 2050. United Nations Framework Convention on Climate Change. https://unfccc.int/documents/266947

UNFCCC. (2025). National Inventory Submissions 2025. United Nations Framework Convention on Climate Change. https://unfccc.int/ghg-inventories-annex-i-parties/2025

VM. (2025). Budget proposal 2026 (in Finnish). Valtiovarainministeriö (Ministry of Finance). https://budjetti.vm.fi/sisalto.jsp?year=2026&lang=fi&maindoc=/2026/taet/hallituksenEsitys/hallituksenEsitys.xml&opennode=0:1:79:369:393

WKR. (2025). Responsible use of temporary carbon dioxide removal. The Netherlands Scientific Climate Council. https://english.wkr.nl/documents/2025/04/10/background-report-responsible-use-of-temporary-co2-removal

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