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GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Developments with Carbon Management (CCUS and CDR) Programmes

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CARBON CAPTURE UTILIZATION & STORAGE
AN INITIATIVE OF THE CLEAN ENERGY MINISTERIAL

MI CARBON DIOXIDE REMOVAL MISSION

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Introduction

12 October 2026

Dear reader,

This slide deck contains a snapshot of carbon management policy and programme developments across the Clean Energy Ministerial CCUS Initiative and Mission Innovation CDR Mission Members. The scope includes deployment policy, as well as key aspects of innovation where relevant.

This slide deck is published on 12 October 2026, at the 17th Clean Energy Ministerial and 11th Mission Innovation Ministerial meeting, hosted by the Kingdom of Saudi Arabia. The slides are published under the joint CEM-MI "Gigatonne by 2030" campaign, which has its lighthouse objective to accelerate carbon management deployment to gigatonne scale by 2030, in support of the Carbon Management Challenge launched in 2023.

Carbon management technologies can play a significant role in decarbonising several industrial and energy sectors, and in providing the necessary removal of CO_2 from the atmosphere. Carbon management also has the capability to help create and retain jobs and contribute to economic prosperity. Deploying carbon management will however require significant government programmes, to kickstart the industry. Several countries have enacted carbon management programmes and policies, and this document provides a high-level snapshot into today's status in selected CEM and MI countries.

If you are interested in these developments, or in the work of the CEM CCUS Initiative or MI CDR Mission, we would be delighted to hear from you. Please email us at info@cemccus.org or mi.cdr@outlook.com.

Summary (1/5): CCUS – strategy and policy

- **Part of a wider toolkit:** Carbon management remains one element of a broad portfolio of measures towards Members' net-zero targets. It is not a "silver bullet", but is prioritised for hard-to-abate sectors (e.g. cement, steel, chemicals, hydrogen) and for retaining jobs and industry in regions.
- **From strategies to legal frameworks:** Several Members have moved to dedicated CCS law: Germany's Carbon Dioxide Storage and Transport Act (in force November 2025), Brazil's Future Fuel Law (ANP now drafting regulation), Japan's CCS Business Act with two designated storage areas, and the EU's 50 Mtpa NZIA storage target with an investment obligation on 44 oil and gas companies.
- **A mix of "sticks" and "carrots":** Carbon pricing and regulation (e.g. EU ETS, Australia's Safeguard Mechanism, Canada's OBPS, Norway's CO_2 tax) are combined with multi-billion support: investment tax credits (Canada), long-term revenue support (UK up to £21.7bn over 25 years; Netherlands SDE++ for 15 years) and strategic financing (Canada Growth Fund, UK National Wealth Fund).
- **Contracts for difference gaining ground:** CfD-type mechanisms are emerging as a preferred tool for long-term investor certainty – in Canada, the Netherlands and the UK, and in Japan possibly from FY2027.
- **Emerging CCUS countries building foundations:** Mexico, Nigeria and South Africa are laying legal, regulatory and geological groundwork, with first pilots in preparation (e.g. South Africa's CO_2 injection pilot, 2026/27).

Summary (2/5): CCUS – deployment status

- **Large-scale projects operating in a growing number of countries:** Large-scale CCUS is operational in Australia (Gorgon, Moomba), Brazil (Santos Basin, 14 Mtpa), Canada (10 commercial projects), China, the EU (Yara Sluiskil, Greensand), Norway (Sleipner, Snøhvit and now the Longship full chain), Saudi Arabia and the United Arab Emirates.
- **A next wave under construction:** Major projects are being built in Canada (five, incl. Polaris and Path2Zero), the Netherlands (Porthos from 2027), Norway (Hafslund Celsio), Saudi Arabia (Eastern CCS hub, 9 Mtpa by 2028) and the UK (HyNet and East Coast Cluster). Japan's nine Advanced CCS projects target operation in the early 2030s.
- **Hubs and shared infrastructure as the dominant model:** Most Members organise deployment around clusters linking several emitters to common CO_2 transport and storage networks – e.g. Northern Lights, Aramis, the four UK clusters, Saudi Arabia's eastern CCS and western CCU hubs, and 10 Mtpa cluster studies in China.
- **Cross-border CO_2 transport becoming reality:** Commercial cross-border shipments to Northern Lights start in 2026. Norway has signed seven bilateral agreements under the London Protocol, Germany has ratified the export amendment, and Australia and Japan are building regional frameworks (Regional Cooperation Initiative, Asia CCUS Network).
- **Utilisation complements storage:** CCU is gaining ground, notably in Saudi Arabia (CO_2 utilisation policy, carbon-cured concrete standard), Japan (Carbon Recycling Roadmap) and Australia (Carbon Capture Technologies Program).

Summary (3/5): CDR – strategy and policy

- **Recognised as essential to net zero:** CDR is seen as necessary to balance residual emissions, and Members increasingly quantify the need: e.g. around 400 $MtCO_2e$ of residual emissions to balance in the EU by 2050, several hundred Mt per year in Japan, 35.8 Mt per year in the UK and 20–25 Mtpa in the Netherlands.
- **Dedicated strategies and roadmaps:** National frameworks are maturing, e.g. Australia's National CDR Roadmap, the Netherlands' CDR Roadmap (2025), Germany's upcoming long-term strategy for negative emissions (2026), Canada's Carbon Management Strategy and Japan's GX 2040 Vision.
- **Policy focus shifting from R&D towards demand creation:** A key change since last year – governments are starting to build markets for removals: the EU's proposal to integrate permanent removals in the EU ETS and its CRCF Buyers' Club, the UK's GGR business model and intention to include engineered removals in the UK ETS, Canada's federal CDR procurement, and Germany's direct support and market incentive programme from 2027.
- **Certification and MRV:** Robust accounting is a common priority – the EU CRCF methodologies for DACCS, BioCCS and biochar, the UK GGR Standard, Canada's federal offset protocols for DAC and BECCS, and the first Article 6.2 BECCS credits under the Norway–Switzerland pilot.
- **Innovation support continues:** Public R&D and demonstration programmes remain central, e.g. Australia's CarbonLock, Germany's CDRmare and CDRterra, Japan's Green Innovation Fund and Moonshot, and Horizon Europe's 2027 DAC call encouraging cooperation with MI CDR Members.

Summary (4/5): CDR – industry and projects

- **A broad technology portfolio:** Activity spans direct air capture (DAC), BECCS/BioCCS, biochar, mineralisation and enhanced weathering, as well as marine and river alkalinity approaches. Governments generally support a wide portfolio rather than narrowing down the options early.
- **First commercial-scale removals delivered:** Europe's first BECCS plant began operating in Norway in 2026 (Inherit Carbon Solutions) and Hafslund Celsio has secured long-term offtakes, incl. 1.1 Mt with Microsoft. In Canada, Deep Sky Alpha issued North America's first certified DAC credits.
- **Private demand is growing:** Multi-year offtake agreements from buyers such as Microsoft and Frontier are financing projects (e.g. in Canada and Norway), and public-private initiatives such as Canada's Advance Carbon Removal Coalition (CAD 100M by 2030) aim to aggregate demand.
- **Pilots across Members:** DAC, mineralisation and biochar pilots are underway in Australia, Canada, China, Germany, Japan, the Netherlands, Saudi Arabia (DAC test units in Riyadh and Jubail), the UAE (Fujairah mineralisation) and the UK (12 pilots from the £100m innovation programme). Most projects are still in the range of hundreds to thousands of tonnes per year.

Summary (5/5): Key next steps and enablers

- **Strategic priority:** CCUS and CDR are positioned as cornerstones of industrial decarbonisation, competitiveness, jobs and a just transition.
- **From pilots to scale:** The coming years will see a number of new hubs start operation (e.g. Porthos, Saudi Eastern hub, HyNet and ECC) and the next wave move towards FID (e.g. Aramis, Acorn and Viking, Japan's CCS business projects). For CDR, the step is from pilots to the first large-scale projects.
- **Completing regulatory frameworks:** Priorities include CCS regulation and long-term liability (Brazil, Mexico, Nigeria, UAE), CO_2 pipeline rules (Germany), standards (China) and an EU CO_2 market and transport infrastructure initiative.
- **Infrastructure and storage:** Build-out of CO_2 transport and storage capacity remains a key enabler, supported by storage atlases (Australia, EU, Nigeria), new storage acreage (Australia, Norway) and further cross-border agreements.
- **Revenue certainty and durable demand:** Long-term business models (CfDs, tax credits), ETS integration of removals, public procurement and credible certification are needed to unlock private investment in both CCUS and CDR.
- **International cooperation:** Members continue to share learnings and build confidence through the CEM CCUS Initiative and MI CDR Mission, via their bilateral agreements, as well as via action by our international partners, such as Global CCS Institute, IEA, IEAGHG and the State of CDR collective.

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Australia – CCUS

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☑

Member of Carbon Management Challenge ☑

Strategy and approach to CCS and CCUS

- Australia sees carbon management technologies, including CCS, CCUS and CDR, **as part of a portfolio of approaches to meeting its legislated emissions reduction targets,** of 43 per cent by 2030, 62-70 per cent by 2035 and net-zero emissions by 2050.
- Government support focusses on reducing emissions from **hard-to-abate industries** and **creating jobs and opportunities** in our regions.
- Australia has **vast potential for the geological storage of carbon dioxide**, with a sub-commercial storage capacity of over 31 gigatonnes.
- We're focused on ensuring the right policy and regulatory frameworks are in place to enable the safe and permanent removal of greenhouses gases, including **transboundary CCS** to help our trading partners decarbonise.

Climate policies

- The **Safeguard Mechanism** ensures Australia's largest emitters contribute to our national emissions reduction targets.
  - Facilities must reduce their emissions by 4.9% annually by undertaking onsite abatement, from activities like CCS, or surrendering carbon credits.
- The **Australian carbon credit unit scheme** is a voluntary scheme allowing project proponents to earn carbon credits for activities that reduce, avoid or sequester emissions, including from eligible CCS projects.
- Australia's Future Gas Strategy outlines the role of geological storage of CO_2 in supporting Australia's decarbonisation plans.
- Supporting the Net Zero Plan, the Industry and Resources sector plans highlight the role of CCS in supporting emissions reduction.

Commonwealth CCS and CCUS Initiatives and Programs

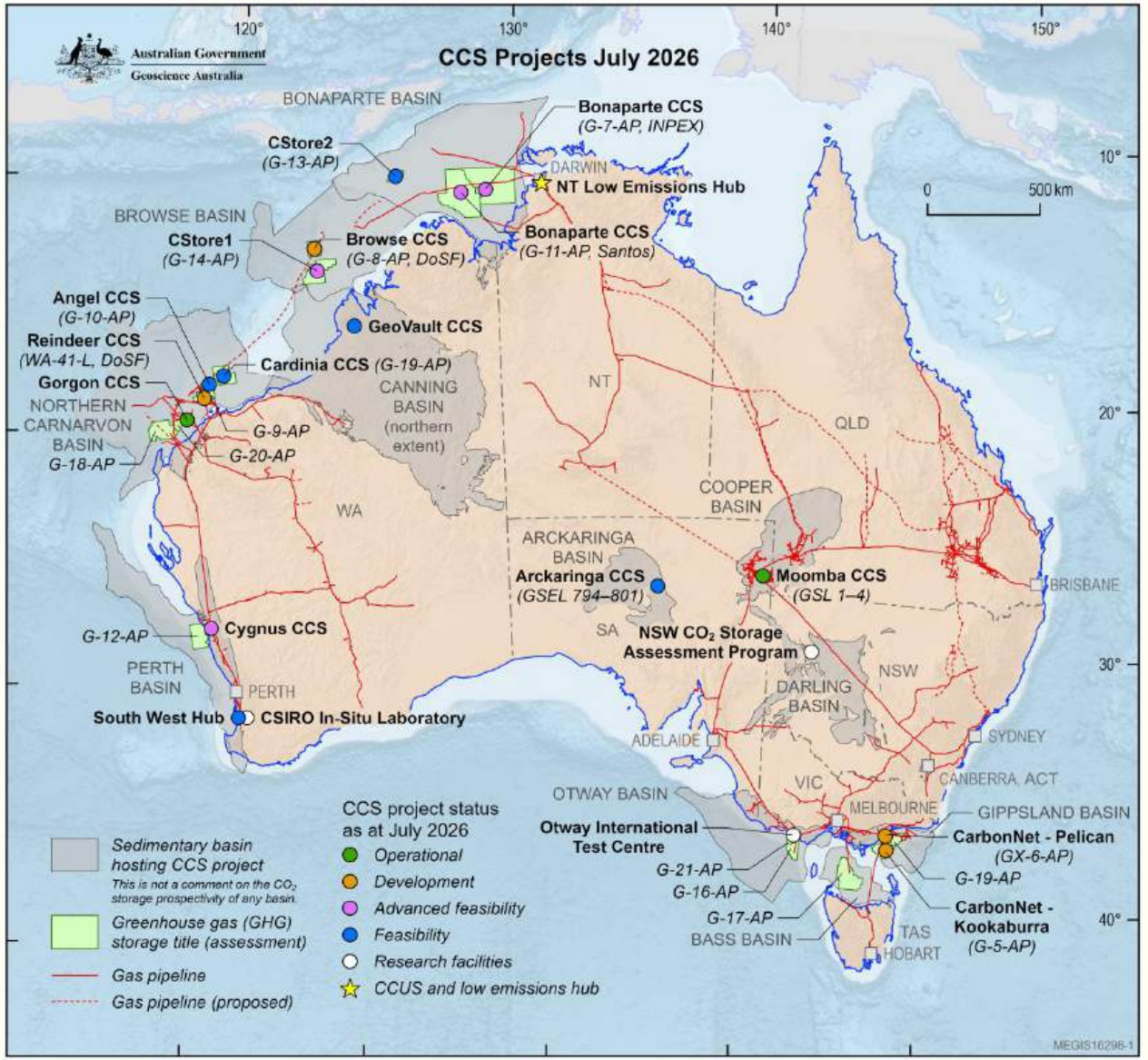
- Under the ***Regional Cooperation Initiative on Carbon Sequestration***, Australia is working towards establishing regulatory frameworks and bilateral instruments, as required under the London Protocol. These instruments will support Australia and its trading partners to decarbonise by enabling the transboundary movement of carbon dioxide for offshore storage.
  - This builds on Australia's acceptance of the 2009 amendment to the London Protocol, with the declaration of provisional application taking effect from 7 November 2024.
- Under the ***Resourcing Australia's Prosperity Initiative***, Geoscience Australia is developing a national atlas of onshore and offshore geological storage potential for carbon dioxide, for release in 2028; comprehensive geological studies targeting priority storage locations and uncertainties related to storage and resource management; and generating precompetitive data to inform decision-making and investment.
- The ***Carbon Capture Technologies Program*** is funding the research, development and demonstration of novel carbon dioxide capture and utilisation technologies. In 2024, $65 million in grant funding was awarded to projects addressing emissions in hard-to-abate sectors and utilising CO_2 in the development of low-carbon products, including building materials and batteries and furthering novel carbon dioxide removal approaches. In September 2026, a further $32.6 million was invested in projects that remove, utilise or permanently store CO_2.
- Following the ***2023 Offshore Greenhouse Gas Storage Acreage Release***, an additional 10 greenhouse gas storage assessment permits were awarded in 2024. There are now a total of 17 active greenhouse gas storage assessments permits located in Commonwealth waters offshore of Western Australia, Northern Territory, Victoria and Tasmania, providing significant exploration potential.

Australia – CCS and CCUS projects

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LARGE-SCALE, OPERATIONAL CCS PROJECTS

- **Gorgon CO_2 Injection Project (Chevron Australia):** Over 12 Mt of CO_2 stored since Aug 2019. The project aims to reduce greenhouse gas emissions by over 100 Mt over the project's life.
- **Moomba CCS Hub Project (Santos):** Began operating in Sept 2024, with an annual storage capacity of 1.7 Mt of CO_2. Over 2 Mt of CO_2 stored to date.



On 12 June 2024, the Queensland Government banned all greenhouse gas storage and injection activities in Queensland's Great Artesian Basin.
Pipeline routes from the GPInfo petroleum database.
DoSF: Declaration of an identified Greenhouse Gas Storage Formation.

Australia – CDR

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Vision and strategy for CDR

- The Net Zero Plan recognises that achieving net zero will require both emissions reduction and scaled-up net carbon removals, identifying "Net carbon removals" as one of the five priorities underpinning Australia's transition to net zero.
- Australia's **Climate Change Authority** states that novel CDR will play a role in reducing residual emissions. In 2050, at least 10% of Australia's residual emissions will need to be removed using novel CDR to achieve our net-zero target.
- Australia's National Science Agency (CSIRO) released a **National CDR Roadmap**, outlining the most promising novel CDR technologies for Australia in terms of offering scalable, durable and economically viable CO_2 storage.
- The National CDR Roadmap will underpin and inform policy considerations for carbon management technologies in Australia.

CDR technology innovation and RD&D programs

- ***Carbon Capture Technologies Program (Commonwealth)*** - $97.6 million investment in projects using emerging technologies to help decarbonise hard-to-abate industrial processes and remove CO_2 from the atmosphere:
  - University of Melbourne - trialling the conversion of carbon dioxide captured from the atmosphere into travertine, a carbonate rock.
  - Airthena Technology Development Company Pty Ltd - demonstrating the feasibility of large-scale direct air capture of carbon dioxide.
- ***Lower Carbon Grants Program – Gorgon Fund (State government - WA)*** - $33.6 million investment in green energy and technology projects in Western Australia to support a sustainable, low-carbon future:
  - Direct air capture: CSIRO's Carbon Capture Material Acceleration Centre.
  - Biochar carbon removal: Biomass Projects Pty Ltd - Mardi Char Biomass Project.
- ***CSIRO's CarbonLock Program (Commonwealth)*** - $30 million investment in Australia's leading novel CDR research program. CDR research has transitioned to 'business as usual'.
- ***Accelerated Mineral Carbonation Research Program (State Government - WA)*** - $2.5 million to accelerate the development and implementation of mineral carbonation using mining wastes and byproducts.

Current and Future CDR Projects





Brazil – CCUS

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Carbon management in NDC ☑

Member of Carbon Management Challenge ☑

Current government strategy for CCUS

- Brazil is fully aligned to meet the goals of the Paris Agreement and achieve Net Zero by 2050. Within the new Climate Plan, the country has made progress in the construction of its Adaptation and Mitigation Plans. The Ministry of Mines and Energy is responsible for conducting the Adaptation and Mitigation Plans related to the Energy Sector.
- Brazil already stands out for its renewable energy matrix, with more than 49% of its energy coming from renewable sources, and 89.2% of the electricity generated by these sources in 2023.
- The main GHG-emitting sectors are the agriculture/feedstock and land use sectors, followed by the energy sector, which has a significant share of GHG emissions from the transportation sector.
- To achieve Net Zero, the land use sector needs to become negative, but that will not be enough. We need technologies such as CCS/CCUS/BECSS and DACS to achieve Net Zero.

Deployment policies and programmes in place

- With the approval of the Future Fuel Law (Law 14,993/2024), the legal basis for the capture and geological storage of carbon dioxide was established.
- Currently, the National Agency of Petroleum, Natural Gas and Biofuels (ANP) is responsible for defining the regulatory framework for the capture and geological storage of carbon dioxide.

Priorities going forward

- Establish the regulatory framework for capture and geological storage of carbon dioxide.
- Develop the business model
- Monitor the development of ongoing regulatory pilot projects

CURRENT LARGE-SCALE CCUS PROJECTS

- Brazil has one of the largest carbon sequestration projects in the world: CCUS in the Santos Basin, capturing 14Mtpa. The plan is to capture and inject 40Mtpa by 2030.

POTENTIAL FUTURE PROJECTS

- CCS Pilot Project - Rio de Janeiro - Petrobras
  - Cabiúnas Terminal
  - First CCS pilot project in Brazil
  - Injection of 100,000 t CO2/year in saline reservoirs
- BECCS - FS Project - Agrisolutions Biofuels Industry (FS) – Mato Grosso
  - Lucas do Rio Verde corn ethanol plant
  - 423,000 t CO2/day
- BECCS HUB – Manacá – São Paulo
  - BECSS for sugarcane ethanol production
  - Potential of 2 billion t of CO2Pilot well with ~300,000 tCO2/year
  - Extension to HUB of 2 million t/year
- R&D Projects: 10 using R,D&I funds from E&P contracts

Canada – CCUS

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☑

Member of Carbon Management Challenge ☑

Policy and investments

Canada is a leader and early mover in CCUS with a longstanding and active CCUS ecosystem and a suite of federal measures to accelerate deployment of large CCUS projects and infrastructure and RD&D to improve technology performance and cost

Carbon Management Strategy

- Sets out a vision and federal priorities for developing and deploying CCUS and CDR technologies to help achieve Canada's climate and economic objectives.

Investment Tax Credits (ITC)

- Available to taxable Canadian corporations that incur eligible expenditures for qualified projects (recent commitment to include enhanced oil recovery, not enacted yet). Rates of 37.5 - 50% for CCS; rates to be halved in 2036-2040. Complemented by a suite of Clean Economy ITCs - total of $93B in incentives by 2034-35.

Strategic Financing

- $15B Canada Growth Fund (CGF) offers investment tools, e.g., $7B reserved for carbon contracts for difference. Canada Infrastructure Bank can invest in private-led CCUS projects, including Front-End Engineering and Design (FEED) studies.

Pollution Pricing & Regulatory Incentives

- Canada has implemented industrial carbon pricing: Output-Based Pricing System (OBPS); GHG Offset Credit System; Clean Fuel Regulations.

CCUS RD&D Programming

- $319 M/7 years to advance commercial viability of carbon management technologies, and CCUS FEED Call for Proposals. Advancing federal RD&D through world-class federal laboratories, such as CanmetENERGY.

Industry Highlights & Key Developments

10 commercial projects in operation

- Including SaskPower's Boundary Dam (SK coal-fired power generation); Shell Quest (AB hydrogen production/oil sands upgrading); Wolf Midstream 240 km Alberta Carbon Trunk Line (CO_2 transport); Entropy Glacier (AB NG processing and NG power capture and storage); Bison Meadowbrook Hub Ph1 (CO_2 storage) etc.

Five major projects in construction

- Including Shell & ATCO's Polaris and Atlas Hub (AB hydrogen capture and storage), Dow and Linde's Path2Zero project (AB chemical production capture), Air Products' Net-Zero Hydrogen Energy Complex (AB); and Wolf's ACTL extension (AB CO_2 transportation).

Canada Growth Fund Investments

- Major strategic investments made in Svante, Strathcona Resources, Varme, and Entropy, including CCFD contracts with Varme and Entropy.

Canada-Alberta MOU Implementation Agreement

- MOU and implementation agreement signed between Canada and AB, and trilateral MOU signed with AB and Oil Sands Alliance in July 2026 that includes commitments to pursue a 6$MtCO_2$/yr CCS project and to work together on other supports for CCUS.

Canada – CDR

Policy and funding

Canada is an early-mover in engineered CDR approaches, with **95 CDR companies active in Canada,** a growing ecosystem of technology developers, projects and research expertise, supported by federal measures to advance RD&D, build market demand, accelerate deployment.

Carbon Management Strategy

- Acknowledges the role of CDR in addressing residual and historic emissions and sets out a vision for developing and deploying technology-enabled CDR.

Government CDR Procurement

- World-leading program to spend at least $10M CAD to procure CDR services from broad portfolio of projects based in Canada, as part of greening government and building market confidence.

Investment Tax Credit (ITC)

- Refundable ITC for Canadian corporations that incur eligible expenditures for qualified projects. Up to 60% for DAC, up to 50% for BECCS, and up to 37.5% for transport and storage; rates reduced by half in 2036-2040.

RD&D Funding

- Tech-enabled CDR projects eligible to receive funding for RD&D projects and FEED studies via the Energy Innovation Program.

Federal Offset Protocols

- Government of Canada is developing federal offset protocols for DAC and BECCS, which will enable Canadian CDR projects to generate compliance-grade credits.

Industry Highlights & Key Developments

Advance Carbon Removal Coalition Launched

- A public-private coalition committing to mobilize a collective $100M in investments, purchases, and project finance for Canadian CDR projects by 2030. Designed to build market demand for Canadian CDR.

Quebec Surficial Mineralization Hub

- Launched by Carbon Removal Canada and Frontier, the hub will host RD&D projects at the legacy mining site.

Significant Private Sector Offtake Agreements

- Including Arca (from Microsoft), Deep Sky (from TD Bank, Lufthansa, ENGIE, and NATS), NULIFE (from Frontier), and Svante/Meadow Lake Tribal Council (from Microsoft) – the latter of which represents the first major Indigenous-led BECCS project in Canada.

Notable First Certified Credits Issued from Canadian Companies

- Including North America's first certified DAC credits from Deep Sky Alpha in Alberta and the world's first verified river alkalinity enhancement (RAE) credits from CarbonRun's project in Norway.



China – CCUS (1/2)

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☑

Member of Carbon Management Challenge ☐

Current government strategy for CCUS

- **National 15th Five-year Plan (Mar 2026):** strengthen CO_2 capture & biosequestration innovation, support CCUS demonstration projects; NEA Action Plan for Energy Conservation & Carbon Reduction in the Energy Sector (2026–2028); Oil & Gas Development "15th FYP" Plan (NDRC & NEA, Aug 2026): CCS/CCUS injection to reach 10 Mt CO_2/yr by 2030
- **"1+N" policy framework for carbon peaking and carbon neutrality:** top-level guidance by CPC & the State Council; sectoral plans by NDRC, MOST, MEE, MIIT, NEA, etc
- **RD&D:** Roadmap for CCUS Technology Development in China (2025); Action Plan for Low-Carbon Transformation of Coal-Fired Power (2024–2027) (NDRC); Implementation Plan for Green and Low-Carbon Advanced Technology Demonstration Projects (NDRC)
- **Incentive:** Green Finance Support Project Catalogue (2025) (PBOC); national voluntary GHG (CCER) market in operation; CCUS methodology under development (MEE)

Deployment policies and programmes in place

- National Key R&D Programme and National Natural Science Foundation
- Standards: 12 GB/T CCUS standards effective Jul 2026; ISO 27927:2025 international CCUS standard (led by China Huaneng); DAC standard proposal at ISO/TC 265 (led by CHN Energy)
- Private capital: Tencent CarbonX Program — Phase 1 backed CCUS pilots in China (2023); CarbonX 2.0 (~USD 30M; CDR, steel CCUS, CCU, LDES) announced 16 winners Jun 2026; pilots span China, Kenya, Serbia & Maldives
- >120 CCUS demonstration projects in operation/planning; ~9.4 Mt/a capture, ~5.9 Mt/a injection; 2025 injected >3.8 Mt

Priorities going forward

- Low-cost CO_2 capture & biosequestration
- CO_2 capture in the industrial sector
- Offshore CO_2 sequestration
- Large-scale integrated demonstration, pipeline system and hubs
- Regulatory, standards, and methodology framework

China – CCUS (2/2)

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

CURRENT LARGE-SCALE CCUS PROJECTS

Power generation

- **China Huaneng:** ZhengNing Power Plant Post-Combustion 1.5 Mt/a CCUS Project
- **CHN Energy:** JinJie 150 Kt/a Power Plant Full-chain CCUS Project; Taizhou 0.5 Mt/a Thermal Power CCUS Project

Oil & gas (EOR & offshore storage)

- **Sinopec:** ShengLi Oil Field 1 Mt/a CCUS Project (in operation; 1.7 Mt CO_2 injected cumulatively, CSLF-certified; expanding to 6 blocks)
- **CNPC:** Jilin Oilfield 0.8 Mt/a CO_2-EOR project (>4 Mt stored cumulatively); Jilin Petrochemical–Jilin Oilfield CO_2 pipeline, Phase I (3.3 Mt/yr; under construction)
- **CNOOC:** Enping Oilfield 0.3 Mt/a Offshore CCUS Project (CCS and CO_2-EOR in operation; >0.3 Mt injected to date); Dongfang 1-1 1.0 Mt/a Offshore CO_2-EGR CCUS Project (in construction)
- **Deep-sea storage:** CO_2-hydrate solidification storage exploratory sea trial completed (South China Sea)

Iron, steel & cement

- **Baotou Steel:** 2 Mt/a full-chain CCUS demonstration project (Phase I 0.5 Mt/a; CO_2 for steel-slag mineralization & EOR)
- **Qingzhou Zhonglian (CNBM):** oxy-fuel cement CCUS project (200 kt/a CO_2 capture; WCA Climate Action Award 2024)

Coal chemical & CO_2 utilization

- **CHN Energy & CNPC:** Ningdong 3 Mt/a CCUS Demonstration Project (coal-chemical capture, 130-km pipeline to Changqing EOR; Phase I 0.5 Mt/a in operation)
- **CAS-SARI & Baosteel:** integrated CO_2 capture & methanation pilot (200k Nm^3/yr in operation; scaling up with HBIS)
- **China Coal Energy:** Ordos “Liquid Sunshine” CO_2-to-methanol project (100 kt/a methanol from 150 kt/a captured CO_2)

POTENTIAL FUTURE HUBS

- **CNPC:** XinJiang 1.5 Mt/a CCUS Hub (pre-feasibility study)
- **CNOOC:** Daya Bay 10 Mt/a CCUS Cluster (pre-feasibility study)
- **Sinopec:** East China 10 Mt/a open-source CCUS Cluster (pre-feasibility study)

China – CDR

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Vision and strategy for CDR

- **National 15th Five-year Plan (Mar 2026):** strengthen CO_2 capture & biosequestration innovation
- **"1+N" framework for carbon peaking & carbon neutrality:** top-level design by CPC & the State Council; sectoral implementation by NDRC, MOST, MEE, MIIT, NEA, etc
- **RD&D:** Implementation Plan for Science & Technology Support for Carbon Peaking and Carbon Neutrality (2022–2030); Roadmap for CCUS Technology Development (2025; extended to DAC, BiCRS and CO_2 mineralization); CDR Special Report of China's National Assessment Report on Climate Change

CDR Innovation and deployment policies and programmes

- National Key R&D Programme and National Natural Science Foundation
- Voluntary & international carbon crediting: CCER market restarted Jan 2024; Chinese biochar & DAC developers certified under Puro.earth and Isometric (Isometric signings in China)

Priorities going forward

- Role and potential evaluation of CDR
- Life Cycle Assessment and Techno-Economic Analysis
- Low-cost CDR technologies
- Development of CO_2 storage resources
- Sustainability Impact Assessment; CDR standards, MRV and certification

Notable CDR Projects

DAC

- **Carbonology:** kilotonne-scale DAC-to-e-SAF demonstration project (in construction)
- **CNPC:** 1000 t/y CO_2 DAC pilot (in construction)
- **China Energy Engineering Co. Ltd. & Shanghai Jiao Tong University:** 600 t/y CO_2 DAC pilot "CarbonBox" (in operation; 5,000 t/a scale-up planned)
- **Yuanchu Technology:** DAC + CO_2 mineralization integrated demonstration, Zhongshan (in operation; ~1,000 t CO_2/yr removal capacity)

BiCRS — biochar & biomass

- **Nanjing Nianda Environmental Technology Co. Ltd. & Nanjing Forestry University:** Nian'da Biochar Project, 330 CORCs in the first crediting period (biochar credits on Puro.earth); Zhejiang Tongao & Shanghai Shike also certified; Tongao Greenchar & Vastwing Energy signed with Isometric
- **Jinan Boiler Group:** Integrated biomass carbon capture boiler

CO_2 mineralization & enhanced weathering

- **Nanjing University:** Enhanced Rock Weathering field trials in Xuyi, Jiangsu; BioChargeDAC team won the CDR track of Tencent CarbonX 2.0
- **Sinopec:** Ningdong 100 kt/a chemical-looping CO_2 mineralization project (in construction)
- **Ansteel:** Yingkou steel-slag CCU project (in operation)
- **HBIS:** Tangsteel semi-dry CO_2 mineralization facility (in operation)

Germany – CCUS

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☐

Member of Carbon Management Challenge ☐

Overarching goals of German climate policy

- Reduce/mitigate emissions, before they are created
- Decarbonise industry
- Roadmap for transitioning away from fossil fuels
- CCS and CCU complement the accelerated expansion of renewable energies and energy-efficient production processes, as essential tools for achieving climate neutrality

Carbon Dioxide Storage and Transport Act

- The revision of the Carbon Dioxide Storage Act (new title: Carbon Dioxide Storage and Transport Act) entered into force on 28 November 2025.
- Key Elements of the Carbon Dioxide Storage and Transport Act are:
  - Enabling the construction of CO2 pipelines and storage facilities
  - Storage facilities in the German exclusive economic zone will be enabled – the federal states have the option of allowing storage on their territory via an opt-in
  - Determination of the overriding public interest for pipelines and storage facilities (acceleration of approval procedures)

Further legislative and regulatory work

- Furthermore, Germany ratified an amendment to the London Protocol allowing the export of CO2 for the purpose of offshore storage. In parallel to this ratification, the High Seas Dumping Act has been amended.
- Work on further regulations continues, a new regulation on CO2 pipelines is in consultation

Carbon Management Forum and Action Plan

- The Carbon Management Forum has been established as a new format for stakeholder consultation
- Work on a Carbon Management Action Plan is underway. Via the Carbon Management Forum, input to the plan has been collected also from relevant stakeholders.

Germany – CDR

Vision and strategy for CDR

- In 2026, the Federal Government will present **a long-term strategy for negative emissions,** outlining the role of negative emissions and the ramp-up of the necessary technologies in Germany.
- This strategy will also form the basis for the **targets for industrial CDR** pursuant to Section 3b of the federal climate law.

CDR Innovation and deployment policies and programmes

- Funds in the federal budget are earmarked for CDR: Starting in 2027, the Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety (BMUKN) will invest in the technology market ramp-up of novel and industrial CDR to utilize the climate and economic opportunities offered by negative emissions in two ways:
  - Direct **financial support for CDR-Projects**.
  - **Market Incentive Program** to strengthen the voluntary market for negative emissions.
- Two Research Programmes of the Federal Ministry of Research, Technology and Space (BMFTR), called **CDRmare** and **CDRterra,** dealing with marine and terrestrial CDR methods, respectively, are being continued in second phases.

Notable CDR Projects

- NeoCarbon GmbH combines DAC with CO_2-storage through carbonation in concrete.
- Phlair GmbH electrochemical direct air capture (DAC) system
- Ucaneo Biotech GmbH energy-efficient electrochemical DAC technology
- MVV Biogas GmbH BioCCUS-project: CO_2 separated during biogas upgrading is purified, liquefied, and subsequently carbonated in mineral materials
- MVV Umwelt GmbH – CELINA-Project: Instead of incinerating waste, the contained carbon is converted into a feedstock for basic chemicals.

European Union – CCUS

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☐

Member of Carbon Management Challenge ☑

Current EU strategy for CCUS

- The industrial carbon management strategy (COM/2024/62) of 6 February 2024

Deployment policies and programmes in place:

- NZIA Regulation: 50 Mtpa storage target for 2030 with investment obligation; 44 Oil&Gas companies are obliged to invest in storage sites in the EU.
- CCS Directive: 5 storage permits awarded in 3 EEA states, 6 permits ongoing (as of 08/26)
- Carbon Removals and Carbon Farming Regulation
- Deployment decarbonised and low carbon fuels (Renewables Directive / ReFuelEU Aviation / FuelEU Maritime
- Finance: EU Innovation Fund, TEN-E and Connecting Europe Facility, Horizon 2020 and Horizon Europe, Recovery and Resilience Facility/RePowerEU, NextGenerationEU.

Priorities going forward:

- Implementation of industrial carbon management strategy:
  - Capturing and storing CO_2: NZIA implementation, CO_2 storage atlas
  - Framework and support for removing CO_2 from atmosphere
  - CO_2 aggregation platform
  - Framework for accounting carbon utilisation
  - Legislative initiative for an EU CO_2 market and transport infrastructure
  - Standardisation of CO_2 streams

41 CCS and CCU projects co-funded from the Innovation Fund (examples):

- CUSTARD (IT), GeZero (D), IFESTOS (HE), IRIS (HE), KOdeCO (HR), EVEREST (D), GO4ZERO (B), Columbus (B), CCPILOT4CCS (NL), CO2nrcEAT (B), Carbon2Business (D), ANRAV (BG), Coda Terminal (IS), AIR (SE), HySkies (SE), GO4ECOPLANET (PL), CalCC (F), Olympus (HE), K6 Program (F), Beccs Stockholm (SE), Kairos@C (B), AGGREGACO2 (ES), Silverstone (IS), (...)

CO2 transportation projects on the 1th PCI/PMI list:

- Aramis (NL), Bifrost(DK), CO2TransPorts (NL), Norne(DK), EU2NSEA(NO), ECO2CEE(PL), CCS Baltic Consortium(LT), Pycasso(FR), Prinos(EL), Callisto(FR), Geothermal CCS (HR), Delta Rhine Corridor (NL), Northern Lights (NO), Nautilus (FR)

Operational large-scale CCUS projects:

- Yara Sluiskil (NL), Greensand (DK)

European Union – CDR

CDR Innovation and deployment policies and programmes

- An **EU certification framework for carbon removals** was adopted on 6 December 2024 to ensure the environmental integrity of certified carbon removals. In February 2025, the Commission adopted a set of methodologies under the Carbon Removal and Carbon Farming Regulation (CRCF) to certify activities that permanently remove CO2 from the atmosphere. This covers three types of permanent carbon removal: Direct air capture with carbon storage ('DACCS'), Biogenic emissions capture with carbon storage ('BioCCS'), and Biochar carbon removal ('BCR').
- The new **EU CRCF Buyers' Club** for carbon removals and carbon farming brings together buyers and suppliers of certified carbon removal and carbon farming units and helps aggregate demand for CRCF-certified units. The Buyers' Club will aim to deliver long-term/multi-year offtakes for a few large projects and bring them to Final Investment Decision by strategically leveraging the EU funding pipeline and prioritizing the ETS Innovation Fund and dedicated funding from Member States.
- The EC proposed in 2026 to formally integrate permanent, domestic carbon removals (starting with BioCCS and DACCS) directly into the **EU Emissions Trading System** (ETS). The Union-wide quantity of allowances in the ETS shall be increased by 250 million allowances. Those allowances shall be made available to the Commission to auction them from 2031 to 2040. This shall generate revenues for the purchase by the Commission of an equivalent amount of generated domestic permanent carbon removal units.
- in parallel, the European Commission will continue to boost EU **research, innovation and early-of-a-kind demonstration** for novel industrial technologies to remove CO2 under Horizon Europe and the ETS Innovation Fund. The Horizon Europe 2027 call for proposals – which will open in December 2026 – will support the demonstration of advanced Direct Air capture technologies. The call specifically encourages international cooperation with member countries of the Mission Innovation Carbon Dioxide Removal Mission.

Vision and strategy for CDR

- CDR is instrumental to balance out around 400 million tonnes CO2 equivalent of residual emissions in hard-to-abate sectors to reach net-zero economy-wide GHG emissions by 2050.
- The European Commission has proposed measures to support the development of carbon removals, in line with the EU's 2040 climate ambition and the goal to reach climate neutrality by 2050 and negative emissions thereafter.

Notable CDR Projects

- CarbFix2; AirInMotion; DDAC; C-DAC; CAPTURE; EcoFuel
- BECCS Stockholm, Danube Removal, Innozhero, CapturEste, Ambassador

Japan – CCUS

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☑

Member of Carbon Management Challenge ☑

Key climate policy targets

- Achievement of carbon neutrality in 2050.
- Reduction of domestic GHG emissions by 46% in FY2030 from that of FY2013 level.

CCS business Act of May 2024

- Ensure the adequate business environment and public safety for CCS business in Japan.
- Implement safety & business regulations for business operators of pipeline transportation and storage.
- Designate suitable areas for CCS as “specified areas” and grant licenses for exploratory drilling to qualified businesses.
    - Specified areas: Tomakomai Area CCS (offshore of Tomakomai, Hokkaido), designated on Feb. 21, 2025; and Metropolitan Area CCS (offshore Kujukuri, Chiba), designated on Sep. 17, 2025
    - Exploration drilling permits: Tomakomai CCS (Sep. 2025) and Metropolitan Area CCS (Apr. 2026).

Support scheme for domestic pipeline CCS programs

- An interim report on the CCS support scheme was finalized on June 26, 2026.
- CfD-based FID support could start as early as FY2027.

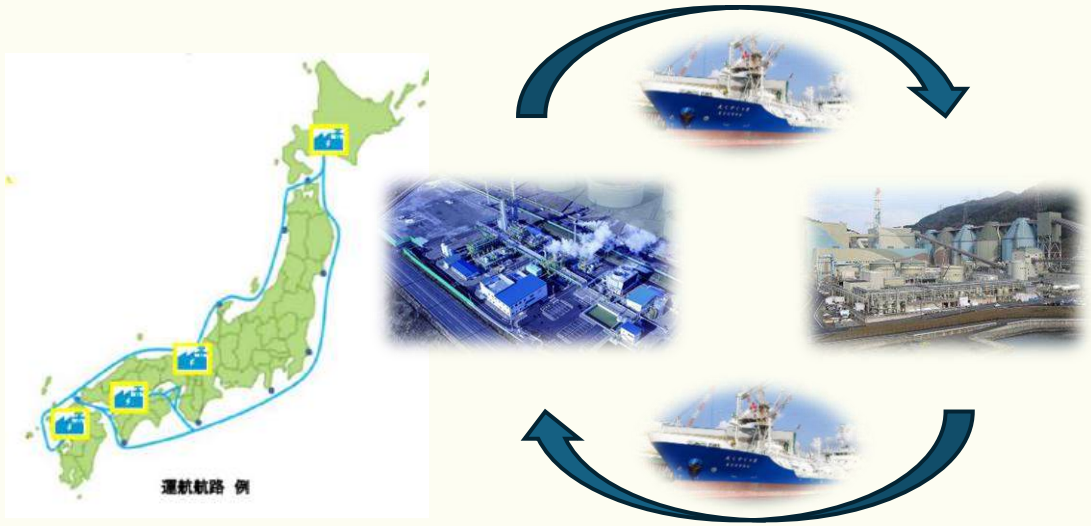
CCU/carbon recycling

- The Carbon Recycling Roadmap was established in Jun, 2024. (https://www.nedo.go.jp/carbon-recycling/2023/en/230927.pdf)
- A R&D and demonstration base for promoting Carbon Recycling technologies in Osaki-Kamijima island in Hiroshima prefecture (established in Sep, 2022).

Priorities going forward

- CCS business projects to be started in early 2030s.
- Leveraging Asia CCUS Network to accelerate CCUS throughout Asia-Pacific. Next Asia CCUS Network Forum will be held on December 2026, in Tokyo (Japan).

Demonstration of L-CO2 transportation from 2024



Current large-scale CCUS projects:

- Demonstration project for ship transportation of liquefied CO_2: establishing ship transport technologies and building a demonstration ship.
- 9 full value chain pilot CCS projects for business model development (Advanced CCS Program)

Potential future projects:

- CCS business projects to be started in early 2030s

Japan – CDR

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Current government strategy for CDR:

- As articulated in the 7th Strategic Energy Plan, published in February 2025, the government recognizes that CDR is "necessary as a means to offset residual emissions" and plans to improve the environment, create markets, and accelerate technology development.
- Meeting Japan's 2050 carbon neutrality goal necessitates the annual removal of several hundred million tonnes of CO2 via CDR technologies, to balance the approximately 50 to 240 million tonnes of residual emissions projected each year. Therefore, the Ministry of Economy, Trade and Industry (METI) has formulated the Study Group for Creating Markets of Negative Emissions Technologies in 2023 and conducted technological and business analysis both domestically and internationally and identified key factors for CDR development.
- The government recently revised its Green Transformation (GX) strategy, to shift industry towards sustainable structure, and issued "GX2040 Vision". The GX2040 Vision highlights CDR's potential to create new industries in local areas as indicated by leading examples in Japan. The government plans to explore CDR policies to expand efforts beyond research and development to regional revitalization through the creation of new industries.
- METI supports the development of carbon credit projects, including CDR, under the Joint Crediting Mechanism (JCM). METI provides support for project development through feasibility studies and demonstration projects. Japan is also advancing international rulemaking, including the CCS/CCUS Guidelines adopted jointly with Indonesia, to facilitate future implementation of projects under the JCM.

Innovation programmes:

- Mission Innovation CDR – Japan is a core mission member of this global initiative, actively engaging in data and knowledge sharing. Japan hosted a hybrid workshop titled "CDR Mission Tokyo Workshop II: Exploring Practical Pathways for Innovation and Scale-up" in September 2026, and an online workshop titled "CDR Launchpad Workshop: Accelerating Demonstration and Deployment of Carbon Dioxide Removal" in early 2026.
- Green Innovation Fund – Government initiative to continuously support companies and other organizations in pursuing carbon neutrality by 2050, including CDR.
- Moonshot Research and Development Program < Goal 4 "Realization of sustainable resource circulation to recover the global environment by 2050" > - Government supports challenging research and development to achieve Moonshot Goal 4 including CDR.
- Global South Future-Oriented Co-Creation Project - Government subsidy program to support companies with technologies such as CDR to conduct demonstrations or feasibility studies in the Global South.

CDR projects under development / execution:

- Development of a common LCA/TEA methodology in DAC - Case studies of 10 different locations, considering regional climate and financial conditions has been published.
- Development of high-functional biochar, etc. - Production and application of highly functional biochar from agricultural by-products as part of the Green Innovation Fund projects.

CDR Initiative:

- The Japan CDR Coalition is a multi-stakeholder(Over 90 as of September 2026) organization dedicated to advancing CDR through the development of the CDR Industrialization Roadmap and strategic initiatives that support the sustainable growth of Japan and the global CDR market.





Mexico – CCUS

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☐

Member of Carbon Management Challenge ☐

Current government strategy for CCUS

- CCUS will be approached under the national decarbonization strategy as one of the long-term climate mitigation technologies towards net-zero for key sectors (O&G, cement, chemicals, steel).

Deployment policies and programmes in place

- The Electricity Sector Law recognizes thermal electricity with CCS or biosequestration as clean energy, subject to national efficiency and emissions criteria.
- The Energy Planning and Transition Law classifies CCS as a Clean Technology, enabling its consideration in planning, innovation, and support mechanisms. A dedicated framework for the full CCS value chain and long-term liability is still required.
- PEMEX identifies CCS as a potential low-carbon business opportunity, initially targeting concentrated CO_2 streams from gas processing and petrochemical operations. However, no public projects with final investment decisions, committed financing, and execution schedules have yet been identified.
- Mexico has a legal basis for CCS, but no comprehensive deployment policy, national storage target, quantified contribution under NDC 3.0, or complete regulatory framework. Industry pathways recognize its potential for deep decarbonisation, while MeCCS and the Mexican Congress are assessing the policy conditions needed to support CCS and other industrial decarbonisation options.

Priorities going forward

- Advance discussions and work with the Congress and industrial actors on national plans for decarbonization, including CCS.
- Planning and design of pilot projects.
- Identification and development of financial mechanisms.
- Creation of cross-sectoral and inter-institutional groups focused on CCS-related activities.

Current large-scale projects

- Currently, there are no large-scale CCS/CCUS projects in Mexico.

Potential future projects

- A demonstration project for CO_2-EOR and storage using industrial emissions sources from the chemical sector in northeast Mexico (under evaluation).
- Potential pilot projects linked to industrial activities.



Netherlands – CCUS

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☐

Member of Carbon Management Challenge ☐

Current government strategy for CCUS

- CCS important technology to reduce CO_2 emissions in industry
- CCS only when no cost-effective alternatives
- De-risking CCS projects by providing financial support
- Large scale deployment of CCS before 2030
- Fossil CCS as a transition technology but CO_2 storage necessary for negative emissions

Deployment policies and programmes in place

- Subsidy scheme for CO_2 reduction in industry (SDE++), covers unprofitable top (total cost for capture, transport and storage minus ETS price) for a period of 15 years.
- CCUS feasibility studies (pre-FEED) and FEED studies (subsidy support)
- Subsidies for R&D program (R&D, pilots, demonstration)
- EU (Horizon Europe, CEF, Innovation Fund)
- Project procedure (permitting coordination)

Priorities going forward:

- Successful realization of the first projects
- Implementation of the EU Net Zero Industry Act
- Roll-out of the EU Industrial Carbon Management Strategy
- Maximize learning from projects going into operation

Projects in further stages of development 2025:

- **Yara Sluiskil (NL) / Northern Lights (NOR)**: capture and liquid transport of CO_2 for storage in Norway. Definitive contract signed 2023, operational shipments from 2026.
- **Porthos**: in construction phase, operation start in 2027, capture from 4 industrial sources with support from the SDE++, storage in P-18 gas fields offshore.
- **Aramis**: operation foreseen by 2031, max capacity 22 Mtons/ year (open access), launch phase of 7.5 mtpa (3 stores). Capture from several industrial sources. Dutch emitters supported through SDE++, storage in depleted gas fields offshore (North Sea). CO2next will provide a liquid CO_2 entry terminal.
- **Multiple transport/infrastructure initiatives: Delta Rhine Corridor, Delta Schelde Connection, Carbon Collectors (shipping solution), Abeona, Kompas.**



Netherlands – CDR

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Vision and strategy for CDR

- The Netherlands considers CDR as a vital second pilar of climate mitigation policy, next to emissions reduction.
- CDR necessary to reach climate neutrality by 2050 (likely 20-25 Mtpa in NL) and net negative emissions beyond.
- Spring 2025: the Netherlands published Roadmap on CDR, with key principles for developing policy:
    1. Not at the expense of emission reduction.
    2. Permanent removals for fossil and long-lived GHGs; temporarily removals for short-lives GHGs.
    3. Based on robust methodologies and MRV.
    4. CDR aligned with other policies (CCU, circular economy, agriculture, global sustainability)
    5. National CDR policies to complement EU policies.
- Need for governance to create demand, support innovation and set enabling conditions:
    - Focus at EU level on creating demand for scaling up CDR: start of procurement programme for early scaling up followed by linkage to EU-ETS.
    - Focus at national level on supporting innovation and early scale-up of broad portfolio of CDR options.
    - Focus internationally on accounting rules/MRV.

Current CDR Policies and projects

- Policies supporting enhanced natural sinks (forestry, peat land management)
- National programme for biobased building of €200 million (including supply chain from agriculture and forestry)
- Selected projects:
    - Mineralisation: Paebbl
    - DAC: Skytree
    - Marine CDR: Pure Carbon Blue

CDR Innovation and deployment policies and programs

- Support programme for demos and pilots of CO_2 and energy technologies including CDR (DEI+)
- Support programmes for early small scale CDR technologies (BECCS, DACCS) (SDE++)
- National programme to stimulate R&D and scale up of CDR-technologies (€50 million)

Nigeria – CCUS

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☐

Member of Carbon Management Challenge ☑

Updated key climate policy targets:

- National Technology Action Plan (NTAP) for Climate Change Mitigation and Adaptation in key economic sectors approved by the Federal Executive Council on 3rd May, 2023 to serve as Technology roadmap for meeting Nigeria's NDC commitment under the Paris Agreement
- CCUS prioritized as a key technology in the NTAP in line with Government's CCUS strategy development programme of 2021 (Developed by IEA and Government of Nigeria)
- Revised NDC - NDC 3.0 to include CCUS as key decarbonisation levers. Current commitment:20% unconditional and 47% conditional targets by 2030
- Net Zero target (Energy Transition) by 2060
- Long-Term Emissions Reduction Plan to achieve 50% by 2050 using a climate technology led approach

Current government strategies for CCUS development:

- Launch of the National Geological Atlas Map aimed at providing an overview of the country's potential for CO_2 storage and establishing a starting point to support the identification of CCS opportunities
- Increase focus on local capacity building
- Pilot demonstration subject to a clear, defined and robust policy, regulatory and incentive frameworks

Deployment policies, programmes and frameworks in place

- Energy Transition Plan
- National Technology Action Plan for Climate Change Mitigation and Adaptation
- Advanced stage in Carbon Market development - leveraging on article 6, VCM and carbon tax

Priorities going forward:

- Policy direction, Legal and regulatory frameworks
- Institutional capacity development / increase stakeholder engagement for broader awareness creation and acceptance
- Incentive mechanisms to support private sector participation

Current large-scale CCUS projects:

N/A

Potential future projects:

- Some pipeline projects being considered but dependent on strong PLR frameworks in place as well as local capacity deepening

Norway – CCUS

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☑

Member of Carbon Management Challenge ☑

Current government strategy for CCUS

- Cost-efficient development of CCS projects
- Facilitate large-scale storage opportunities at the NCS
- Focus on decarbonization of industry and low carbon H_2
- Establish CO_2 infrastructure
- Share knowledge and experience

Deployment policies and programmes in place

- R&D – Norwegian Research Council and Climit
- Test Centre Mongstad, world's largest t.c. for CO_2 capture
- Norway has as of Aug 2026 entered into 7 MOUs/Agreements related to the cross-border transportation of CO_2 for permanent storage under the London protocol: Denmark, Sweden, Finland, France, Switzerland, Belgium and the Netherlands
- Financial support for the Longship project
- State enterprise Gassnova, knowledge hub
- CO_2 tax and the European Trading Scheme

Priorities going forward

- Establish a business case for CO_2-storage
- Continue discussions on X-B CO2 transport with new countries
- New acreage for CO_2 storage

CCS projects in operation

- **Sleipner**
- **Snøhvit**
- **Longship:**
  - Capture at a cement plant (Heidelberg Materials)
  - The Northern Lights (transport and Storage at the NCS)

CCS Projects under construction

- Hafslund Celsio Waste-to-Energy Oslo
- Transport of CO_2 from Ørsted in Denmark and Yara in the Netherlands to NL

Cross-border projects under consideration, EU projects of mutual interest under the EU TEN-E Regulation

- Northern Lights part 2, CO_2 cross-border connection project between several European capture initiatives, transport by ship to storage on the NCS
- EU2NSEA, cross-border CO_2 network developed by Belgium, Norway and Germany, with a view to storage at the NCS
- Nautilus CCS, Emissions from Le Havre, Dunkirk, Duisburg and Rogaland, to be captured and transported by ships to various sinks in the North Sea

Norway – CDR

Ambitions within CDR

- Norway is opening several storage sites in the North Sea for permanent storing of CO_2
- Norway has biomass available from e.g. forest, agriculture and marine resources
- Political ambition within Bioeconomy and CDR
- Relevant competence and market players;
  - Industrial Activities on Biogenic CO_2 with CCS and within Direct Air Capture (DAC)
  - R&D community with national- and international projects focusing on bioCCS and DAC

CDR Innovation and deployment policies and programmes

- Funding of the Longship CCS and CDR demonstration project
- Policy implement systems like CLIMIT, ENOVA, Research Council, and Innovation Norway

Notable CDR Projects

- **Hafslund Celio Waste-to-Energy** plant in Oslo is part of the Longship full scale demonstration project. The Oslo CCS project has secured long-term carbon removal offtake agreements, including 1.1 million tonnes over ten years with Microsoft and an agreement facilitated by the Frontier coalition.
- **Inherit Carbon Solutions** began operating Europe's first BECCS in Norway in 2026. The project is financed by multi-year offtake agreement with Microsoft for carbon removal credits. CO_2 is stored at Northern Lights by truck delivery, and the CO_2 is captured from biogas production at wastewater treatment plant for city of Oslo. The project is delivering world's first Article 6.2 BECCS credits under Norway and Switzerland pilot scheme. Inherit has a portfolio of similar projects in the Scandinavia under development.
- **Removr** and **GreenCap Solutions** have secured private- and state funding for piloting their innovating DAC technologies
  https://greencap-solutions.com/greencap-solutions-selected-by-the-arctic-direct-air-capture-initiative/
  Norway backing Removr's efforts to industrialise DAC - TCM



Source: Hafslund Celsio Waste-to-Energy plant in Oslo
Sketch showing the facility with CCS



Source: Inherit Carbon Solutions

Saudi Arabia – CCUS

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☑

Member of Carbon Management Challenge ☑

The Kingdom aims to reduce emissions through investing in carbon capture, utilization, and sequestration infrastructure

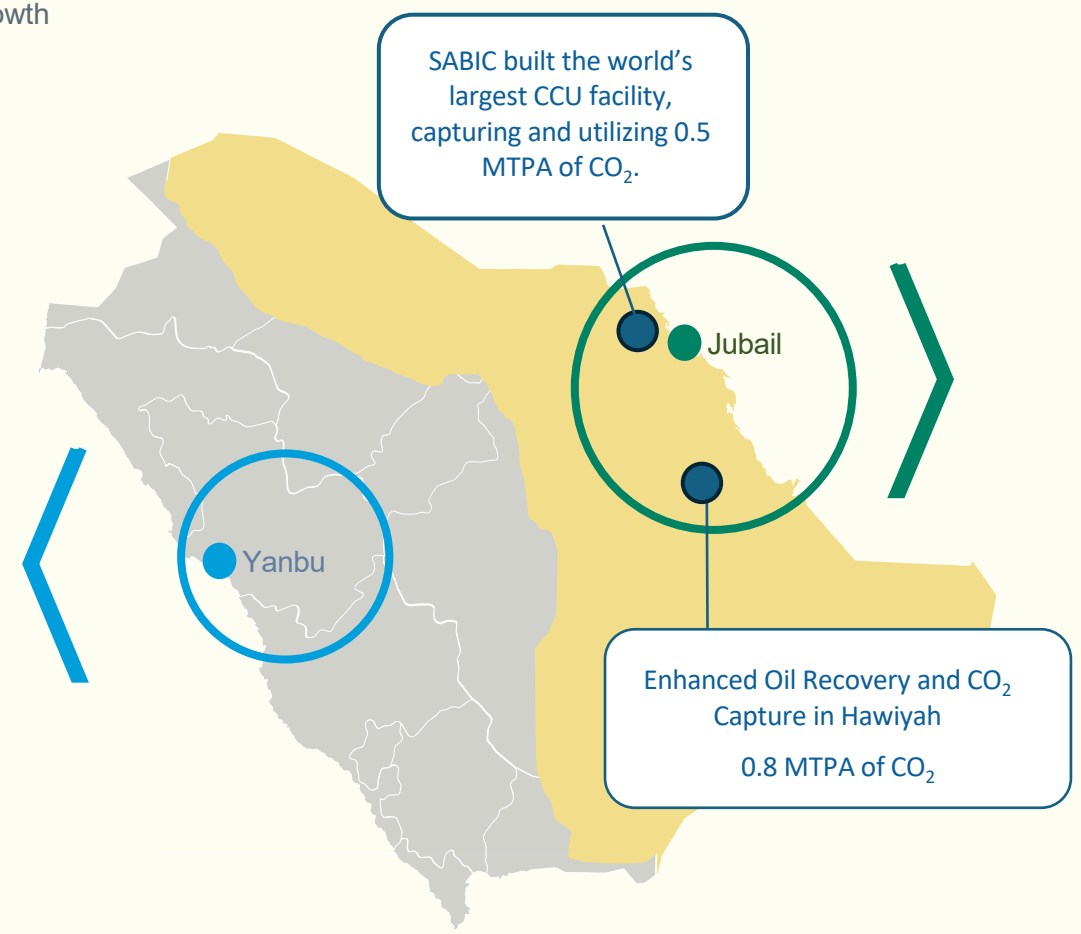
The Kingdom of Saudi Arabia is embracing the Circular Carbon Economy (CCE) as a comprehensive and pragmatic framework to mitigate climate change and reduce CO_2 emissions while supporting sustainable economic growth

CCU Hub in the West



An MoU was signed between the Ministry of Energy and Royal Commission for Jubail and Yanbu to deploy carbon capture and utilization hub in Yanbu Industrial City.

At its initial phase, the project is expected to utilize captured CO_2 from industrial facilities to produce value added products, such as green methanol and low-carbon urea.



CCS Hub in the East



Deploy one of the world's largest CCS hubs in the Eastern region with a capacity reaching 9 Mtpa by 2028. Engineering designs have been completed, and site preparation is already in progress.

وزارة الطاقة MINISTRY OF ENERGY

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Saudi Arabia – CCUS

The Kingdom has launched multiple pilots and commercial projects across a wide range of CCUS technologies, backed by policy that channels demand toward captured CO_2. See selected initiatives across the CO_2 value chain:



Direct Air Capture (DAC)

The Kingdom completed a feasibility study to assess local deployment of DAC technology.

1st Phase (2025): The Kingdom's first DAC test unit ran at KAPSARC in Riyadh with Climeworks, proving performance under dry climatic conditions.

2nd Phase (2026): Completed in Jubail with the Royal Commission for Jubail and Yanbu (RCJY), testing performance in humid conditions within an industrial setting.



Carbon-Cured Concrete (CCC)

Deployed across multiple projects in Saudi Arabia, driving adoption of low-carbon construction.

Captured CO_2 is injected during curing, where it mineralizes and is permanently stored — strengthening the mix while cutting emissions.

Each m^3 of concrete stores 7–11 kg of CO_2.

With Ministry of Energy support, Saudi Arabian Standards Organization (SASO) issued the first quality mark for carbon-cured concrete.



CCU Project at Petro Rabigh & Ma'aden

Petro Rabigh & Gulf Cryo: CO_2 capture and purification from the MEG plant for industrial and food-grade applications across Saudi Arabia.

Location: Rabigh, Saudi Arabia
Status: Operational — producing ~ 300 t/day.

Ma'aden & Gulf Cryo: CO_2 capture and purification from phosphate operations for industrial and food-grade applications.

Location: Ras Al Khair, Saudi Arabia
Status: Commissioning — producing ~220-300 t/day.

CO_2 Utilization Policy

The Ministry of Energy is implementing a policy that limits diesel-based CO_2 production and replaces it with captured CO_2 from industrial facilities. This approach reduces emissions, improves efficiency, and creates additional economic value from existing resources.

Outcomes:

- Reuse of 70 $ktCO_2$ per year.
- Avoidance of 292 thousand barrels of diesel consumption per year.
- Annual government cost savings of SAR 51 million.
- Reduction of 150 $ktCO_2e$ emissions per year.

South Africa – CCUS

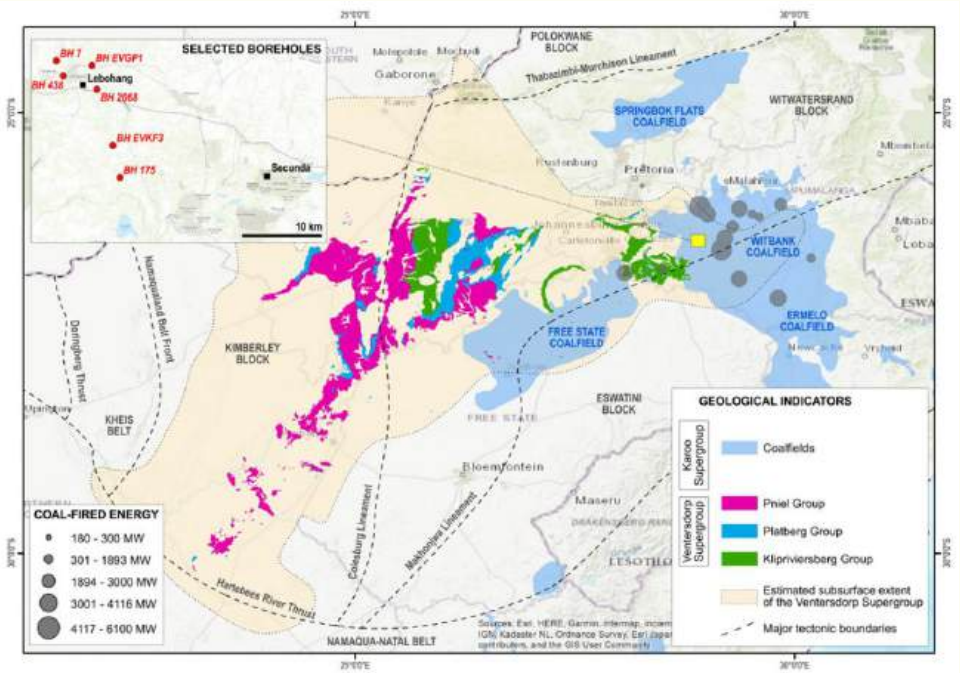
GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☐

Member of Carbon Management Challenge ☐

Current strategy for CCUS

- CCUS identified as a key enabler of the Just Transition in SA as part of 2050 developmental goals.
- The pilot CO_2 injection project FEED study was completed in 2024.
- Implementation, is in progress & target for execution of pilot scale injection is planned for the 2026/27 financial year.
- Request for Proposal (RFP) for an EPCm for the Pilot Injection has been published.
- Appointment & Implementation of the Pilot Injection is scheduled to start in Q4 2026.



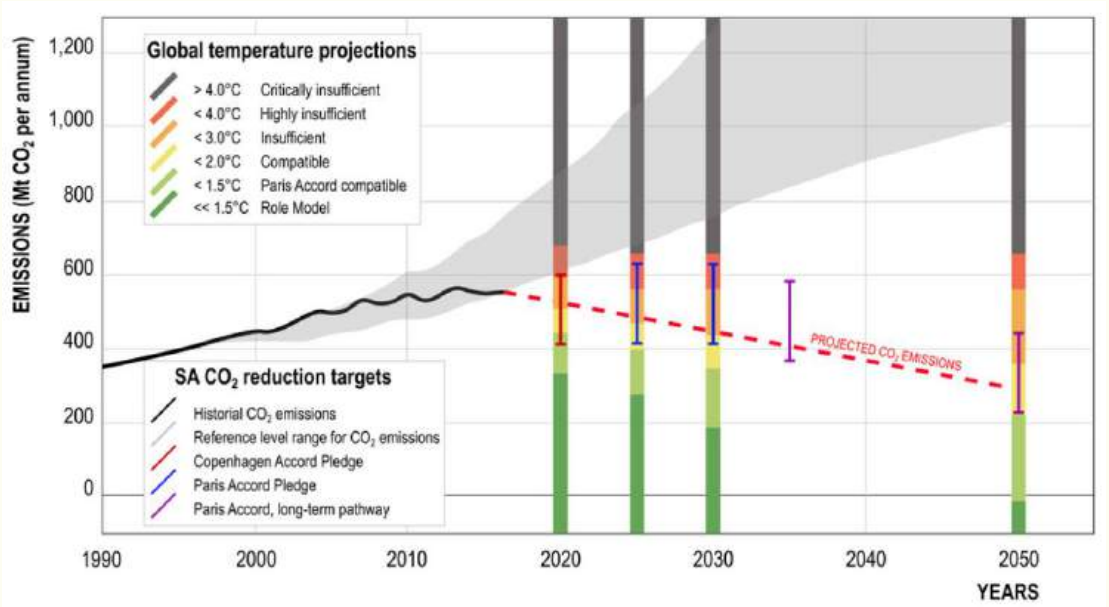
Regional map of pilot site, Mpumalanga, South Africa

Priorities for the implementation of CCUS

- Integrated geoscience research and focus on utilisation and socioeconomic aspects.

Future programmes:

- Pilot CO_2 injection into Basalt lavas & Deep saline aquifers in fracture systems near major point-source CO_2 emitters and large coalfields.
- Adaption of current coal-fired fleet.
- Researching opportunities for CO_2 utilisation"



Overview of CO_2 projections for South Africa



South Africa – CDR

Vision and Government strategy for CDR

- South Africa's greenhouse gas (GHG) reduction policy is multifaceted, encompassing legislation, policy frameworks, and specific targets. Key components include: the Climate Change Act, the Carbon Tax Act, and the National Climate Change Response Policy (NCCRP), all aiming to mitigate climate change and transition towards a low-carbon economy.

CDR Innovation and deployment policies and programmes:

- *Climate Change Act*: This landmark legislation provides a comprehensive framework for both adaptation to and mitigation of climate change. It outlines how South Africa aims to achieve a just transition to a low-carbon economy.
- *National Climate Change Response Policy (NCCRP)*:This policy outlines South Africa's commitment to sustainable development and climate change mitigation, emphasizing cleaner energy production and better resource management.

Emission Reduction Targets:

- *Nationally Determined Contributions (NDCs)*: South Africa has committed to reducing its greenhouse gas emissions to a fixed target range of 350-420 MtCO2e by 2030.
- *"Fair Share" Contribution*: These targets are based on South Africa's assessment of its "fair share" of global emissions.
- *Integrated Resource Plan 2023 (IRP 2023)*: This plan charts South Africa's long-term energy strategy, including the transition towards renewable energy sources.
- *Just Transition Framework*: South Africa is also developing a Just Transition framework to ensure a fair and equitable transition to a low-carbon economy, particularly for workers and equitable transition from a carbon emissions intensive to a low-carbon emissions economy, particularly for workers and communities dependent on fossil fuels.

Additional Measures

- *Carbon Pricing:* The government is strengthening its carbon tax policy by progressively increasing the carbon tax rates between 2023 and 2030.
- *Sector-Specific Strategies*: South Africa is developing sector-specific strategies to address emissions from different parts of the economy, including the building sectors.

The Just Energy Transition Partnership

- The JET IP gives effect to the historic Just Energy Transition Partnership (JETP) which was forged at the COP26 Climate Summit in 2021 between South Africa and France, Germany, United Kingdom, United States, and the European Union. The JETP followed engagements between the parties on the unique economic and social challenges of transitioning South Africa's fossil fuel dependent economy in a just manner.
- The Political Declaration provides that the international partners will mobilise an initial US$8.5 billion between 2023 and 2027, subject to agreement on an investment framework. This catalytic financing is intended to leverage a much greater level of resources from both private and public sources.
- The JETP Political Declaration says the government's aim to "establish an ambitious long-term partnership to support South Africa's pathway to low emissions and climate resilient development, to accelerate the just transition and the decarbonisation of the electricity system, and to develop new economic opportunities such as green hydrogen and electric vehicles amongst other interventions to support South Africa's shift towards a low carbon future."
- The JETP identifies three priority areas to support the economy of the future: the electricity sector, New Energy Vehicles (NEV) and Green Hydrogen.



UAE – CCUS

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☑

Member of Carbon Management Challenge ☑

Key climate policy targets

- UAE Net Zero by 2050 strategic initiative and currently UAE working on the National Net Zero Strategy 2050
- 2nd Nationally Determined Contribution – NDC on 2020 with United Arab Emirates (UAE) presents an economy-wide emission reduction target relative to BAU. The country projects the BAU scenario to reach 310MtCO2 in 2030. The country aims to reduce 23.5% by 2030, relative to the BAU scenario (UAE NDC, 2020).
- UAE Hydrogen Leadership roadmap (2021)
- 2024: UAE submit its 3rd Nationally Determined Contribution (NDC)

Current government initiatives/strategy for CCUS

- Hosted a CCUS Workshop that brought together the finance sector as well as industry to accelerate financing and deployment of CCUS projects.
- 2023: Launch the Updating the National Energy Strategy 2050 in partnership with Khalifa University (KU) and the International Renewable Energy Agency (IRENA)
- 2023: Launch the National Hydrogen Strategy which will include the CCUS/CCS hubs
- 2023: Hydrogen Regulatory framework (Abu Dhabi launches the Low-Carbon Hydrogen Policy)
- 2024: The UAE first certified CO2 storage site in the Middle East for carbon capture and storage project

Deployment policies and programmes in place

- ADNOC Announces Comprehensive 2030 Sustainability Goals and CCUS expansion capacity of 500% in the next 10 years.
- 2023 – UAE Announce Carbon Capture and Mineralization (CCM) technology project to eliminate CO2 from the atmosphere was announced. Fujairah pilot will be the region's first CCM project by ADNOC, 44.01's Earthshot prize-winning and include FNRC and Masdar, the pilot technology that permanently mineralizes carbon dioxide (CO2) within rock formations found in the Emirate of Fujairah and it will be, due to commence in January 2023, The project will be powered by solar energy supplied by Masdar. A successful pilot would open the possibility of mineralizing billions of tons of captured CO2 across the region.
- 2023 - The UAE Allocates 15 Billion to Low-Carbon Solutions
- Hosting the MENA headquarters of the Global Carbon Capture and Storage Institute at Masdar city underlines the UAE's commitment to practical solutions to climate challenges.

Priorities going forward:

- Development of CCUS Policy/Regulatory Framework.
- Continuous support towards the CCUS Initiative.

CURRENT LARGE-SCALE CCUS PROJECTS

- Al Reyadah Plant: which is the largest carbon capture steel project, that captures 800,000 tonnes of CO2 that is injected for EOR.

FUTURE PROJECTS

Expansion of CCUS initiatives

- Key carbon management projects to reach our goal of capturing 10 million tonnes of CO_2 by 2030, including at our gas processing plant in Habshan and our gas mega-project, Hail and Ghasha – taking our committed investment to nearly 4 million tonnes of CO_2 capture per year. The equivalent of a forest area that is twice the size of the UAE.
- With innovators and industry leaders, we are also investing in technology with scale-up potential, including:
- A pilot to turn CO_2 into rock
- The world's first fully sequestered CO_2 injection well in a carbonate saline aquifer
- Modular carbon capture technology deployed at Fertiglobe
- We've also entered a partnership with Oxy to develop the region's first world-scale Direct Air Capture (DAC) project.



UAE: Hydrogen and CCUS initiatives

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Low carbon hydrogen oases and clean energy precincts

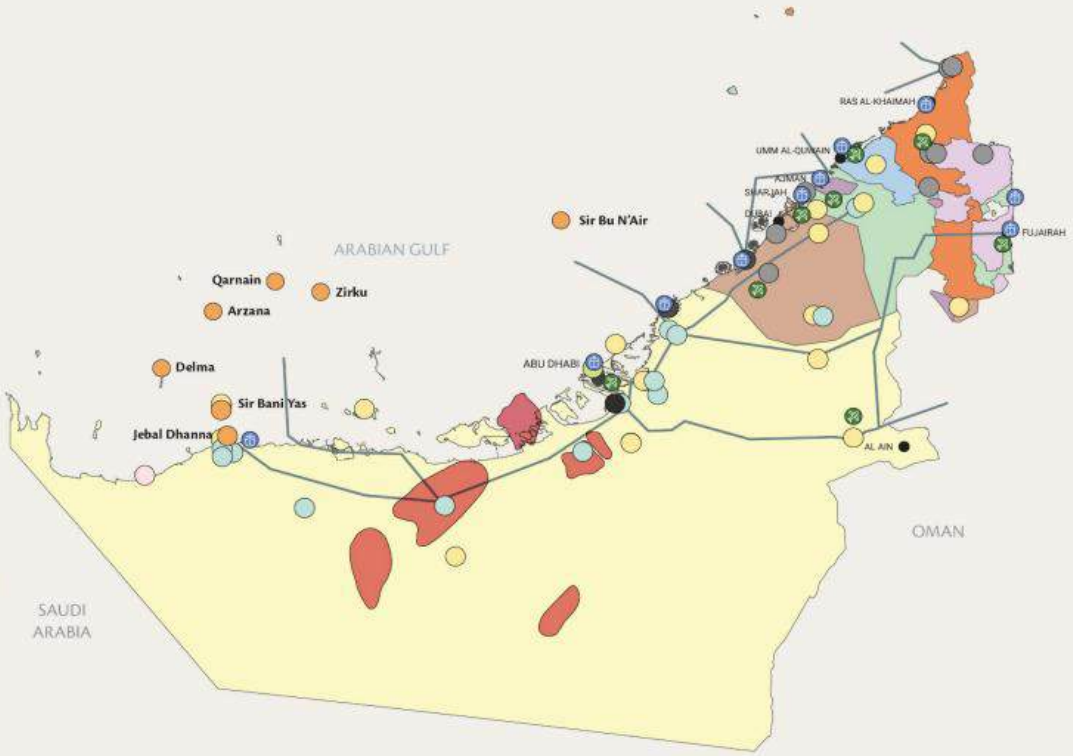
These hubs and clusters will play an important part in establishing a hydrogen value chain in the UAE.

The UAE will establish hydrogen oases as a practical approach to accelerating industry adoption of hydrogen, cultivating a supply chain, and enabling infrastructure. The oases will support demand generation and optimisation of development costs through co-locating production and end-use applications in clusters, removing network barriers, and providing commercial opportunities to test and validate technologies. Clusters are being adopted globally as best-practice for scaling the supply chain while minimising infrastructure costs.

The hydrogen oases will consider existing and new pipelines for distribution, depleted oil wells for carbon storage, and potential connections to salt caverns for high-volume storage. The RES capacity coming online over the next few decades, as detailed in the UAE Energy Strategy 2050, poses another challenge for existing grid networks. Grid requirements for low carbon hydrogen will need to be considered for long-term hydrogen production in parallel with decarbonising the grids.

Concentrations of the industry provide the most opportunity for UAE to establish and scale hydrogen oases within a short timeframe. Ruwais and KIZAD are existing industrial clusters with storage capacity that could be suitable areas for hydrogen oases. Abu Dhabi Department of Energy is pursuing clean energy clusters and hydrogen oases isolated from the broader UAE electricity system, creating micro-systems that avoid grid management problems. This accelerates and simplifies planning, given that co-location of hydrogen use, and renewable electric generation may not always be practical or technically possible.

The UAE will focus collaborative efforts towards establishing the oases by ensuring a clear policy timeline, financing and allocation of resources, and transparency of information to investors and developers.



Cement
Lafarge Emirates Cement
Sharjah Cement Factory
Union Cement Company
Ras Al Khaimah Co. for White Cement
Fujairah Cement Industries
National Cement Company
Gulf Cement
Star Cement
Pioneer Cement
Ras Al Khaimah Cement Company
Emirates Cement Factory

Tentative CCUS sink
Bab
Bu Hasa
Asab
Rumitha
Shanayel
Al Dabbiya
Aluminum
DUBAL
EMAL

Potential Cavern
Delma
Sir Bani Yas
Arzana
Qarnain
Zirku
Sir Bu N'Air
Jebal Dhanna

Nuclear Plants
Barakah

Fertilisers
Ruwais Fertilizer Plant

Iron, Steel and Aluminium
Emirates Steel
Emirates Global Aluminium Al Taweelah
Emirates Global Aluminium Jebel Ali

Clean Energy Projects
Hatta Hydroelectric plant
Sir Bani Yas wind farm
Al Dhafra Solar Project
Shams 1 CSP Plant
Noor Abu Dhabi Solar Project
Masdar City Station
MBR Solar Park
Umm Al Quwain Solar Project
Landfill Solar Project
Ras Al Khaimah Solar PV
Al Nurai Floating PV, Abu Dhabi
Murawah Island Solar Project
Warsan WastetoEnergy Project
Sharjah WastetoEnergy Project
AlDhafra landfill
Al Ain Bioenergy
Dubai Waste Management Center

Hydrogen and Ammonia
TaziRuwais chemical hub
Masdar Demonstration plant
UAE Hydrogen Hub
Mohammed bin Rashid Al Maktoum Solar Park
Abu Dhabi, Khalifa Industrial Zone
TAQA & Abu Dhabi Ports
TAQA & Emirates Steel
Sharjah WastetoH2 Plant
ADNOC & TAQA
Ruwais Ammonia (FERTIL I and II)
Ruwais Hydrogen Plant
CO2 pilot injection Rumaitha field
Al Reyadah CCUS plant (Emirates Steel) Phase I

Emirates
Abu Dhabi
Dubai
Sharjah
Ajman
Umm Al Quwain
Ras Al Khaimah
Fujairah

United Kingdom – CCUS (1/2)

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Carbon management in NDC ☑

Member of Carbon Management Challenge ☑

Current government strategy for CCUS:

- The UK is committed to progressing CCUS as part of our **2050 Net Zero Strategy,** using industrial "clusters" to capture and store CO2 to help us meet our legally binding target of 78% emissions reductions by 2035 and **net zero by 2050**.
- The UK has potential to store more than **78 billion tonnes of carbon dioxide in its continental shelf,** one of the largest storage potentials in Europe.
- In 2023, the UK passed **the Energy Act** - the largest piece of energy legislation in UK history, which includes provisions for the CCUS business models and the regulator for the sector in the UK.
- In December 2023, the previous government published the document "**Carbon Capture, Usage and Storage: A Vision to Establish a Competitive Market**". This document is widely known as the **CCUS Vision**. This set an ambition to transition to a self sustaining CCUS sector in the UK
- As part of the UK's **Industrial Strategy**, published June 2025, the Clean Energy Industries Sector Plan backs CCUS, including Greenhouse Gas Removals, as a frontier technology. It clarifies how Government will capitalise on the enormous growth potential while protecting and creating good jobs nationwide through the net zero transition.

Deployment and programmes:

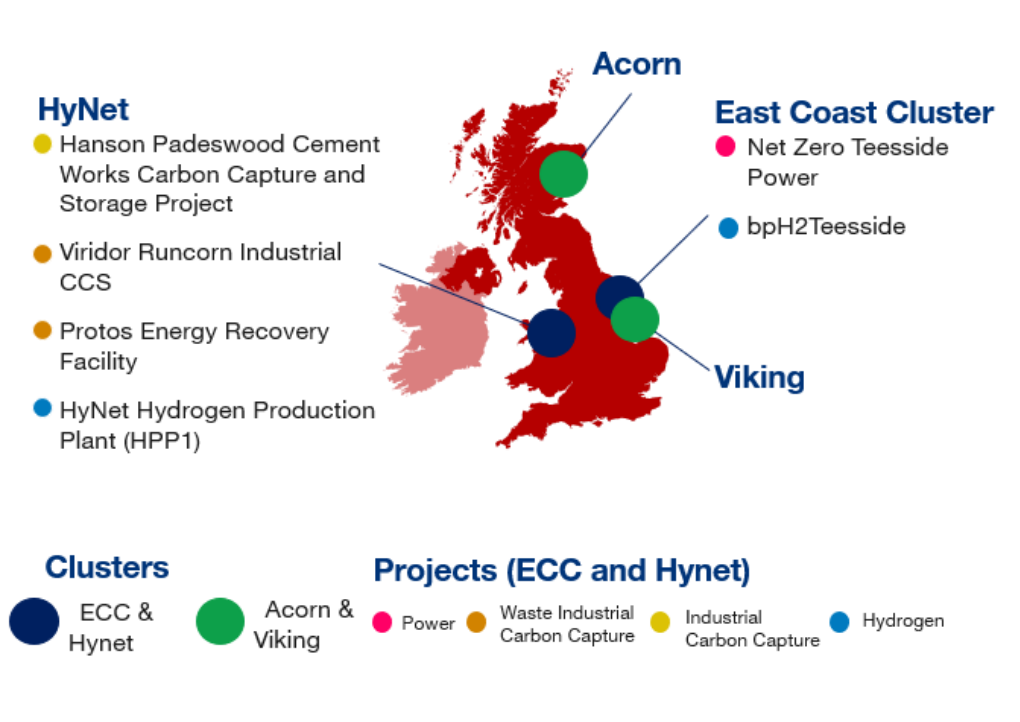
- Published updates on the CCUS **business models** to provide long-term sight of revenue models and a stable investment environment.
- Launched **National Wealth Fund**, including £1 billion for CCUS.
- **Industrial Decarbonisation and Hydrogen Revenue Support scheme** funds business models for low carbon hydrogen production and industrial carbon capture that give investors long-term revenue certainty.
- CCUS Innovation 2.0 projects:
  - Nuada - testing metal organic framework compounds at small scale in Energy from Waste simulated flue gases.
  - Econic Technologies – production of surfactants from CO2 feedstock

United Kingdom – CCUS (2/2)

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Projects under deployment:

- Clusters announced as **HyNet, East Coast Cluster (ECC), Acorn and Viking** and **8 projects originally confirmed** to progress to negotiations to form the first two CCUS clusters (HyNet and ECC).
- In the Spending Review, the Government allocated £9.4 billion in capital budgets over the Spending Review period. Alongside other CCUS ambitions, this will maximise deployment to fill the storage capacity of the HyNet and East Coast clusters.
- The East Coast Cluster (ECC) reached financial close in December 2024 and the HyNet Transport and Storage Network, operated by Liverpool Bay CCS, in April 2025.
- In September 2025, we signed contracts with the first two capture projects in the HyNet Cluster, Padeswood the UK's first ever carbon capture-enabled cement plant and Protos the UK's first full-scale carbon capture-enabled waste-to-energy facilities.
- An updated HyNet Project Negotiation List was announced in August 2025, with an additional 6 projects joining HyNet negotiations to fill the remaining network capacity.
- UK remains committed to the expansion of the East Coast Cluster (including the Humber) consistent with affordability and value for money. The government has also announced its support for the Acorn and Viking clusters and is providing the development funding to advance their delivery. Final investment decision later this Parliament, subject to conditions.
- The CCSA tracks CCUS projects: https://www.ccsassociation.org/capture-projects/



United Kingdom – CDR

GIGATONNE BY 2030 CAMPAIGN BY CEM CCUS & MI CDR

Current government strategy for CDR:

- Government is committed to developing and deploying Greenhouse Gas Removals (GGR), also known as CDR, at scale in the UK, recognising the important role they play in achieving net zero by offsetting residual emissions from hard-to-abate sectors.
- The UK's independent Climate Change Committee (CCC) recognise the importance of GGRs to achieve net zero targets, estimating 35.8MtCO2/pa of CDR will be required by 2050.
- To support the development and deployment of GGRs in the UK, the government is -
  - Developing a GGR Business Model to incentivise private investment in GGR projects based on a contractual revenue guarantee mechanism (contract for difference like approach - CfD).
  - Working with the British Standards Institution to develop technology-specific methodologies, which will form part of the UK GGR Standard that projects supported under the business models will be required to use.
  - Signalled its intention to include engineered GGRs in the UK ETS and published a consultation on the integration of GGRs.
  - Invited GGR and Power BECCS projects to apply to the expansion of the HyNet cluster
  - Announced an Independent Review to consider how GGRs can assist the UK in meeting our net zero targets out to 2050.
  - Published six Principles for Voluntary Carbon and Nature Market (VCNM) Integrity to support organisations engaged in action towards net zero, and a VCNM consultation, seeking to clarify and test proposed policy and governance framework to boost market confidence.

Innovation programmes:

- The UK committed up to £100m into CDR innovation in 2020, these projects are now completing with 12 pilots installed, dominated by biochar and DAC. Additionally, a GGR Research hub has been established with 5 research demonstrators
- Mission Innovation CDR – The UK is a supporting member of this global initiative, providing data on CDR / CCUS projects and biomass stocks for global mapping, participated in webinars on policy, BECCS and Biochar, presented on Lifecycle Carbon Accounting, mentored a winning student team in the SMART-CDR challenge and presented at the Climit Summit, Norway 2025.

CDR projects under development / execution:

- Mission Zero, Direct Air Capture, CO2 into building materials, operational
- Blackbull Biochar – providing heat and power from woodchip to local industrial sites, and certified CDR biochar to farms
- Lapwing Energy – Reverse coal, burying biochar within peatland restoration, heat and power used for farming
- Severn Wye Biochar – Community based energy solutions with permanent storage of biochar.
- HyNet expansion projects progressing to negotiations will be announced in due course
- Various pilots on biomass power plants, AD biofuel plants and Energy from Waste sites



Mission Zero – DAC – CO2 to OCO sustainable construction products

GIGATONNE BY 2030

CAMPAIGN BY
CEM CCUS & MI CDR

MI
CARBON DIOXIDE REMOVAL
MISSION

CARBON CAPTURE UTILIZATION & STORAGE
AN INITIATIVE OF THE CLEAN ENERGY MINISTERIAL