

OCTOBER 2026



## **Carbon Management in Clean Energy Ministerial and Mission Innovation Countries:**

### **Current Status and Action Going Forward**

Document for release at the Minister – CEO roundtable on “Carbon Management for Energy Revolution”, at the 17<sup>th</sup> Clean Energy Ministerial and 11<sup>th</sup> Mission Innovation Ministerial meeting.

13 October 2026  
Riyadh, Saudi Arabia



## 1. GLOBAL STATUS OF CARBON MANAGEMENT: CLEAN ENERGY MINISTERIAL AND MISSION INNOVATION COUNTRIES LEAD THE WAY

Clean Energy Ministerial (CEM) and Mission Innovation (MI) countries have played a leading role in carbon management<sup>1</sup> research, development, demonstration, and deployment globally over the past 30 years. Since the Sleipner carbon capture and storage (CCS) project began in Norway in 1996, the deployment of carbon management technologies has significantly grown across regions and industries. In recent years, CCS projects have been joined by a growing number of technological carbon dioxide removal (CDR) projects, many still small in size, but displaying impressive growth rates.

As of 31 July 2026, there are 106 operating industry-scale projects in CEM and MI countries, with an additional 55 projects under construction. This represents over 90% of global total. In addition, over 600 projects are in earlier stages of development in CEM and MI countries.

|                               | Carbon management facilities<br>(number) |                 | CO <sub>2</sub> capture capacity<br>(million tonnes per annum) |                 |
|-------------------------------|------------------------------------------|-----------------|----------------------------------------------------------------|-----------------|
|                               | In operation                             | In construction | In operation                                                   | In construction |
| <b>CEM &amp; MI countries</b> | 106                                      | >50             | 66                                                             | >40             |
| <b>Share of global total</b>  | >90%                                     | >90%            | >90%                                                           | >80%            |

Table 1: Carbon management projects in CEM & MI Countries. Source: Global CCS Institute.

Proven carbon management technologies are decarbonizing hard-to-abate industries including fertilizer, cement, steel, chemicals, as well as the power sector, and have cumulatively captured and stored ca. 400 million tonnes of carbon dioxide (CO<sub>2</sub>) as of last year<sup>2</sup>.

There is also a growing number of operating carbon dioxide removal (CDR) projects including bio-energy with CCS (BECCS) and direct air capture (DAC), which can share common transport and storage infrastructure with industrial capture projects. MI and CEM countries represent 80% of all global novel CDR projects currently in operation<sup>3</sup>.

Today's operating carbon management projects in CEM and MI countries have an annual capture capacity of 66 million tonnes per annum (Mtpa), which will increase to over 100 Mtpa when the projects now under construction come online over the next few years.

<sup>1</sup> "Carbon management" comprises carbon capture and storage (CCS), carbon capture utilization and storage (CCUS), carbon dioxide removal (CDR), to an extent carbon capture and utilization (CCU), in their various combinations.

<sup>2</sup> <https://imperialcollegelondon.github.io/The-London-Register-of-Subsurface-CO2-Storage/>

<sup>3</sup> Data from "State of CDR" report, 3<sup>rd</sup> edition. Edwards, M. R., Geden, O., Gidden, M. J., Lamb, W. F., Minx, J. C., Nemet, G. F., Smith, S. M., Bellamy, R., Brutschin, E., Diaz Anadon, L., Fuss, S., Grassi, G., Johnstone, I., Lebling, K., Lunstrum, A., Müller-Hansen, F., Portugal-Pereira, J., Probst, B., Vaughan, N. E. (eds.) The State of Carbon Dioxide Removal 3rd Edition 2026.

While these are strong numbers, climate modelling by the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA) suggests that both CCS and CDR must scale to gigatonne per annum levels globally to help achieve net-zero ambitions, working synergistically alongside deployment of all other climate change mitigation tools and clean energy vectors.

Carbon management should be recognized not only as a climate solution, but also as a strategic industrial, economic, energy security and resilience opportunity that strengthens industrial competitiveness, resilient supply chains, and the development of future low-carbon commodity markets. CEM and MI countries are well positioned to continue their leadership and work together to accelerate deployment of carbon management.

Thanks in part to public-private collaboration through the CEM and other platforms, there are now successful business models, finance structures, insurance products, and standardized contracts available for some carbon management projects in several countries. In some countries private capital is now available and projects have secured non-recourse debt in countries that have sufficient durable, enabling policies. Voluntary markets and government procurement mechanisms are spurring early demand for CDR.

Many capture, transport, and storage technologies are technically proven, but commercial deployment of capital-intensive projects requires durable policies, coordinated planning, access to financing and de-risking mechanisms, and dependable revenue streams to enable investment. Policy and financing are key, interwoven enablers for – or constraints to – deployment. Increasingly, internationally recognized certification systems, robust monitoring, reporting and verification (MRV) methodologies, and carbon markets are becoming equally important enablers by providing confidence to investors and enabling the monetization of verified emission reductions and removals.

Support for carbon management through multilateral development banks (MDBs) and sovereign funds could further accelerate development of enabling policies and critical infrastructure projects in developing economies.

## **2. ACTION GOING FORWARD**

To build on their current leadership and success, CEM and MI governments, alongside their key partners and stakeholders, can consider several immediate actions to help accelerate the deployment of carbon management and help advance their common quest to reach gigatonne scale by 2030. These actions include:

- 1. Providing clear strategic direction for carbon management.** By enacting dedicated carbon management strategies and roadmaps and by explicitly including carbon capture, utilization and storage (CCUS) and CDR in their nationally determined contributions (NDCs) and long-term policies, governments can send a clear signal to investors on the need for carbon management to achieve desired goals. There is an opportunity to frame carbon management as

part of strategies for industrial competitiveness and economic diversification, rather than solely a climate policy instrument.

2. **Fostering innovation and technology scale-up.** While carbon management technologies have taken significant steps forward in terms of efficiency and cost reduction, it is vital to continue efforts in innovation. This is especially the case for novel CDR technologies and pre-commercial large-scale demonstrations of first-of-a-kind projects. Innovation should also focus on reducing overall CCUS and CDR system costs through integrated infrastructure, shared CO<sub>2</sub> transport and storage networks, MRV, and optimization of the complete carbon management value chain.
3. **Providing supportive and durable deployment policy frameworks and risk-sharing.** Government incentives continue to be required to enable scalable business models for the foreseeable future. In early stages the approach has typically been that of “technology-push”, involving demonstration funding, or support for front-end engineering and design (FEED) studies. As the sector matures in a given country or region, market-based policies and government-aided risk-sharing arrangements can enable project financing. It is also vital that carbon markets, both compliance and voluntary, appropriately include CCUS and CDR technologies. Enabling market rules, MRV and standards will build confidence for both sellers and buyers.
4. **Focusing efforts on carbon dioxide removal deployment.** Carbon dioxide removal durably removes CO<sub>2</sub> from the atmosphere and will be essential to achieving net-zero emissions. CDR will become increasingly important as the likelihood of overshooting global climate targets grows. Nature-based solutions alone cannot deliver the scale of removals required. Technological or “novel” CDR approaches will be needed, including biomass carbon removal and storage (BiCRS), direct air capture and storage (DACS), and carbon mineralisation, offering the potential for rapid removal and highly durable storage. However, novel CDR development and deployment remain far too slow to meet emerging needs. Accelerated action is required across the full innovation chain, from research and technology development through piloting, demonstration and large-scale deployment – contributing to achieving the MI CDR Mission’s goal of 100 Mtpa of CDR by 2030.
5. **Fostering national and regional CO<sub>2</sub> storage assessments** and storage capability development. Operating a functioning CO<sub>2</sub> storage site is the end-result of a significant effort that starts from national or regional level assessments of suitable geological structures and moves to site-specific assessment by industry. Governments have a key role to play in facilitating this process. Coordinated industry-government leadership can also enable strategic and shared infrastructure and hub development. The development of integrated carbon management hubs that combine multiple industrial emitters, shared transport infrastructure, storage resources, carbon utilization opportunities and CDR technologies can maximize economies of scale and reduce overall system costs.

6. **Providing sound legal and regulatory frameworks.** Laws and regulations are required to ensure the safety and integrity of the carbon management chain. Governments can share lessons learned and work to ensure legal and regulatory frameworks are fit for purpose. Clarity over long-term stewardship of stored CO<sub>2</sub> will provide investor confidence, and ensure that the insurance sector can play its part in risk management for CCUS and CDR.
7. **Building capacity and fostering financing in emerging economies.** Governments can collaborate and increase development funding resources (e.g. to MDBs) to map CO<sub>2</sub> storage potential especially in developing countries. Knowledge transfer should include practical implementation experience from operating projects and successful regulatory models, helping countries avoid repeating early deployment challenges.
8. **Procuring clean products and verified CO<sub>2</sub> removals.** Government procurement of low-emission products and CDR credits can stimulate CCUS and CDR deployment and early examples of such policies already exist. About half of the cement used globally is procured by the public sector<sup>4</sup>. Governments can also encourage industrial and customer demand for certified low-carbon industrial products including steel, cement, chemicals, hydrogen derivatives and sustainable fuels.
9. **Involving the finance and insurance sectors and fostering their leadership roles.** It is vital to include CCUS in sustainable finance taxonomies and transition finance frameworks. In collaboration with governments and project proponents, the insurance sector can also play a role in facilitating project financing by developing a range of insurance products for carbon management projects. Explicitly including carbon management in public-facing products and investments can help support a just transition pathways, local economic growth, and supply chain security. Blended finance models involving governments, sovereign wealth funds, multilateral development banks, commercial lenders and institutional investors will be critical to scaling projects globally.
10. **Advancing efforts to improve international alignment of emissions accounting methodologies and definitions.** Promoting harmonization and interoperability across carbon credit standards, product standards, accounting frameworks and compliance systems to reduce transaction costs will increase market transparency and build investor confidence. Greater alignment between domestic and international approaches can facilitate transactions, improve market liquidity and support international trade of CCUS and CDR-enabled low carbon products.

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<sup>4</sup> <https://gccassociation.org/news/new-report-identifies-the-nations-that-are-prioritising-green-public-procurement/>

11. **Knowledge-sharing on technologies, policies and other key enablers.** CEM CCUS and MI CDR provide useful, action-oriented platforms for member-to-member sharing and “mutual coaching”. In addition to helping accelerate carbon management within CEM and MI countries, such knowledge-sharing can support other countries just starting their carbon management journeys. Knowledge-sharing should increasingly include commercial models, carbon market development, project finance structures, certification approaches, and lessons learned from operating projects, alongside technology deployment.
12. **Fully engaging with local communities.** Carbon management projects offer significant economic and employment opportunities for local communities. Early engagement of local populations is critical, providing clear information, responding to local concerns and ensuring communities can share project benefits. This will facilitate project execution. Furthermore, informing the broader public on what carbon management is, including its role in achieving net zero targets, remains vital.

### 3. NEAR-TERM STRATEGIC OPPORTUNITIES

**CCUS as a vector for decarbonised energy for data centres:** There is a time-critical opportunity to deploy CCS on gas-fired power plants to avoid additional emissions associated with increasing clean and stable power demands by data centres across the world. Private-sector developers are naturally in the lead, but governments can support the deployment, enabling both energy and economic security and low emissions. Countries with strong state-owned enterprises may have a particularly attractive opportunity to deploy gas with CCUS, and accelerate deployment globally.

**Bringing advanced projects to final investment decisions:** There are currently nearly 300 projects at advanced stages of development in CEM and MI countries, representing a potential capture capacity of nearly 250 million tonnes per annum (Mtpa). Industry leadership and innovation, alongside ambitious government support for late-stage engineering and demonstrations, can help bridge current financing gaps that are preventing major CCUS and CDR projects from reaching FID, especially for first-of-a-kind projects. This next phase of projects will unlock lessons learned that will reduce costs, increase efficiencies, and pave the way to more widespread CCUS and CDR deployment around the world.

**Fostering low-carbon commodity markets:** Growing international demand for certified low-carbon commodities including hydrogen, ammonia, methanol, steel, cement and sustainable fuels creates an opportunity to accelerate carbon management deployment while strengthening industrial competitiveness and energy security. Governments can work towards internationally recognised certification systems and mutual recognition arrangements to facilitate global trade. This will support both decarbonization and future export competitiveness.

**Positioning carbon management at COP31:** Carbon management could be positioned as supporting several conference priorities under the Global Action Agenda at the upcoming COP31. The expressed priorities<sup>5</sup> include green industrial transformation, electrification, zero waste/circular economy and resilient cities, among others. CCUS and CDR are relevant for each of the priorities. Green industry requires a portfolio of solutions, including electrification, clean hydrogen, resource efficiency, and carbon management. Carbon management infrastructure is also an investment in economic resilience and long-term industrial competitiveness. Waste-to-energy with CCUS can provide reliable low-carbon energy, and deliver durable carbon removals while supporting cleaner, more resilient cities. Climate finance should ensure that emerging economies have access to the full portfolio of decarbonization technologies. Expressing a clear target for carbon management within the Global Action Agenda will send the appropriate signal to the private sector on the importance of investing in the development and deployment of CCUS and CDR technologies.

#### **4. CONTINUED COLLABORATION IS KEY**

The global carbon management community is working together to speed up progress. CEM CCUS and MI CDR are well-positioned – and were purposely stood up to – focus on the above critical issues. Their key partnerships with Global CCS Institute (GCCSI), International Energy Agency (IEA), IEA Greenhouse Gas Programme (IEAGHG), State of CDR and the Carbon Management Challenge, to name a few, will enable a highly collaborative approach to advance both CCUS and CDR and drive them towards gigatonne scale by 2030.

#### **ACKNOWLEDGEMENTS**

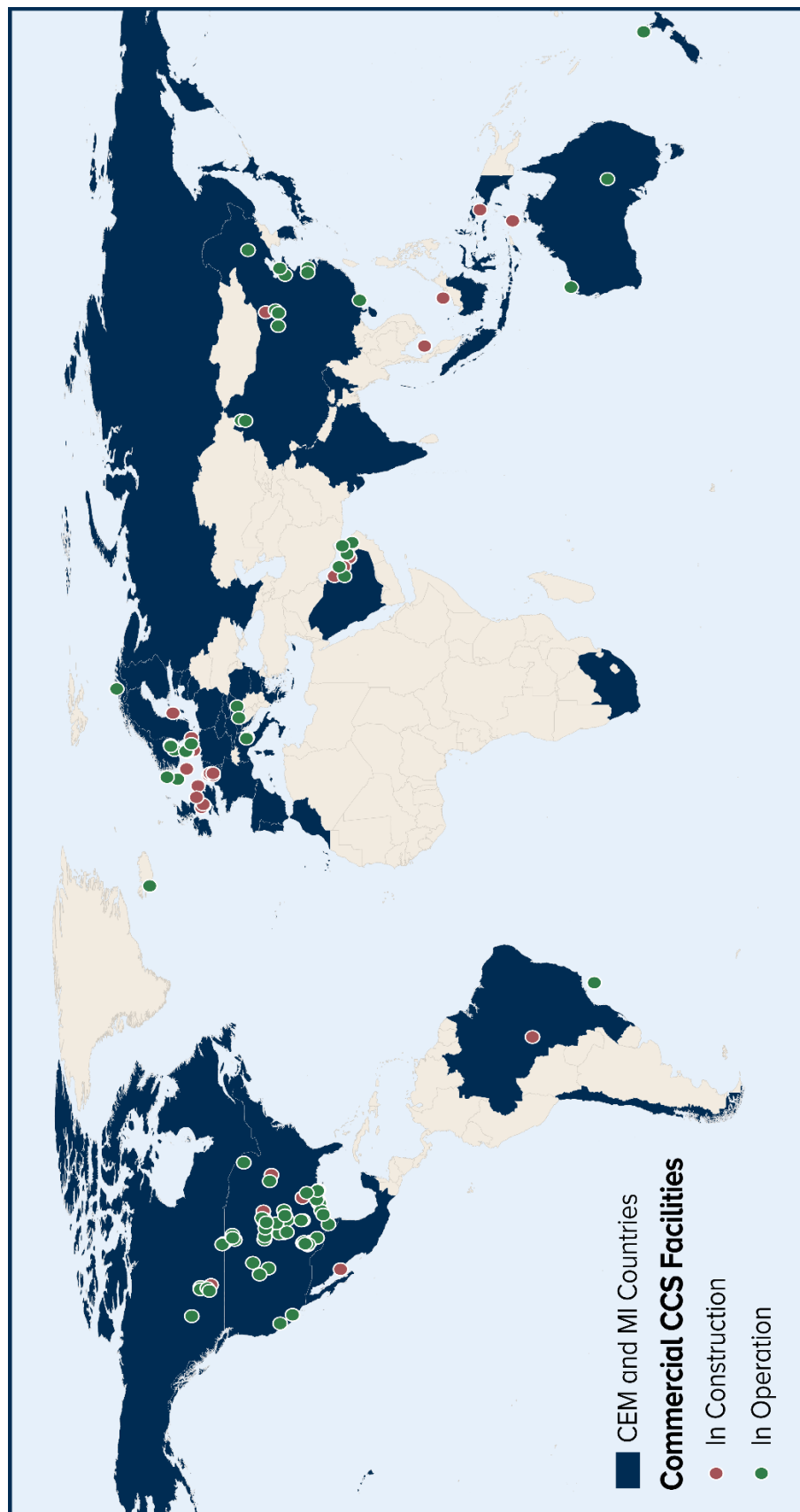
CEM CCUS Initiative and MI CDR Mission extend their gratitude to both Global CCS Institute and the State of CDR collective, who provided data and other major contributions to this report.

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<sup>5</sup> <https://cop31.tr/presidency-priorities>

## APPENDIX 1

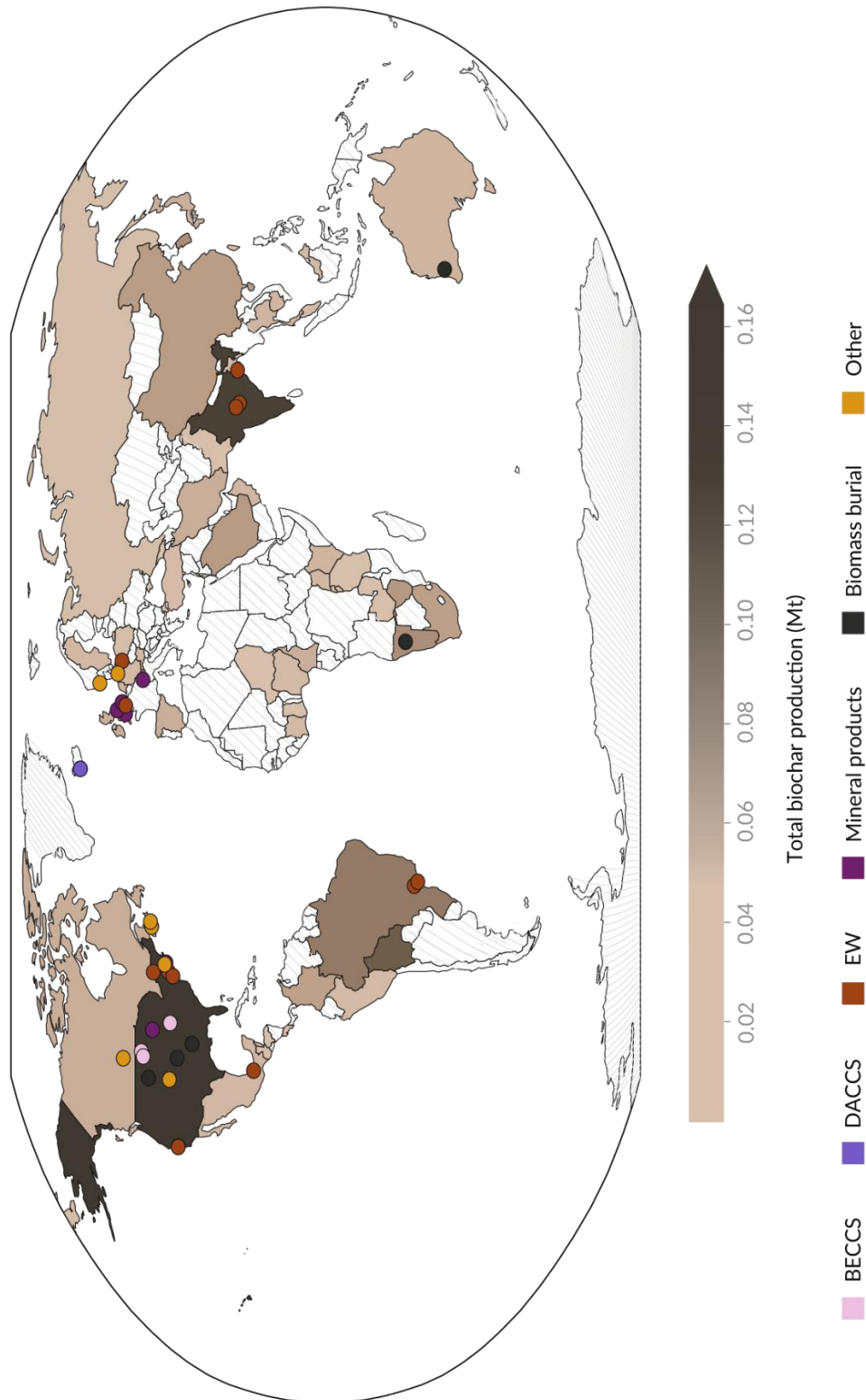
Map of carbon management projects in CEM and MI countries. Source: GCCSI 2026.



## APPENDIX 2

Novel CDR deployment in 2025: Global map depicting biochar produced in 2025 by location, with operational sites for other novel pathways also shown (represented by coloured dots).

Source: State of CDR, 3<sup>rd</sup> edition.



Legend: BECCS – Bioenergy with carbon capture and storage; DACCS – Direct air capture with CO<sub>2</sub> storage; EW – Enhanced weathering.