GLOBAL CCS INSTITUTE

BRIEF

SIX KEY COP28 OUTCOMES FOR CCS

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EXECUTIVE SUMMARY

The United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP) is convened for governments to assess global efforts to advance the Paris Agreement goals and take decisions to facilitate effective implementation. Global awareness of the impacts of climate change has seen the COP increase in size to become the UN's largest annual meeting.

The 28th Conference of the Parties (COP28) was held in Dubai, UAE from 30 November to 12 December and saw 150+ heads of state attend its opening, along with tens of thousands of representatives from government, civil society, intergovernmental and non-governmental organisations (IGOs and NGOs), and the media. Outside negotiations, side events were held throughout the two weeks of COP on a wide range of climate and environment-related topics.

How CCS is reflected in the UNFCCC negotiation process is crucial to understanding the consensus of global governments on the technology and its applications, and can provide political signals that stimulate policy and investment.

The six key outcomes of COP28 for CCS were:

1. **The importance of scaling carbon management technologies was reaffirmed**
   The COP28 UAE Presidency co-hosted the high-level event "Carbon Management: Essential Pillar to Keep 1.5 Alive" with the Carbon Management Challenge (CMC) co-sponsor governments of Brazil, Canada, Indonesia, the United Kingdom (UK), and the United States (US). The event was attended by ministers, high-level representatives, the International Energy Agency (IEA) and the Asian Development Bank, which reaffirmed the importance of scaling carbon management technologies.

   More than 20 nations joined the roundtable, which saw the announcement of six new country joiners to the CMC, each with diverse energy supply profiles and from both developed and emerging economies. Secretary John F. Kerry, US Presidential Envoy, and Xie Zhenhua, China's Special Envoy for Climate Change, also participated in the event, complementing their recent announcement to advance at least five large-scale cooperative CCUS projects each by 2030.

2. **CCUS features in the Paris Agreement's first Global Stocktake**
   CCUS, particularly in hard-to-abate sectors, features in the Paris Agreement's first Global Stocktake outcome in The UAE Consensus as part of a list of zero and low emissions technologies for Parties to take action on and accelerate. The text also includes pivotal language calling on Parties to transition away from fossil fuels.

   The UAE Consensus represents a significant step not only for the impact on climate change mitigation but also as a demonstration of the multi-lateral process' ability to unify nations with a shared ambition towards a more harmonious and inclusive vision for the Earth's ecology and energy sources. The outcomes of The UAE Consensus will inform the next round of nationally determined contributions (NDCs) due in 2025, which are currently seeing year-on-year growth of countries including CCS as part of their mitigation action plans.

3. **CCUS is a main theme of the Mitigation Action and Implementation Work Programme (MWP)**
   The adopted decision and published MWP report by the secretariat included a summary of country's views on key findings, opportunities, barriers, and actionable solutions for technology. This summarises

the work done at the first global dialogue and investment event at June's Bonn Climate Change Conference, where the Global CCS Institute and IEA GHG, facilitated by the government of Norway, provided technical expertise for governments on CCS issues.

The MWP is a way for governments, NGOs, and the private sector to engage on cross-cutting topics on CCS financing, policy, and implementation. Upcoming global dialogues are aimed to be enhanced and expanded, with the participation of Non-Party Stakeholders encouraged through the High-Level Champions, who connect the work of governments with the many voluntary and collaborative actions taken by cities, regions, businesses, and investors.

4. **The Global Decarbonization Accelerator (GDA) needs CCS applications in a variety of industries**
   The GDA was launched as part of the COP28 Presidency Action Agenda and aims to speed up the energy transition and drastically reduce global emissions. The GDA includes three key components for CCS; the Oil & Gas Decarbonization Charter (OGDC), the Industrial Transition Accelerator (ITA) and the Hydrogen Declaration of Intent on the Mutual Recognition of Certification Schemes. Partners for these initiatives respectively include the Oil and Gas Climate Initiative (OGCI), Bloomberg Philanthropies/Mission Possible Partnership (MPP) and the International Standards Organization (ISO).

5. **The new Cement and Concrete Breakthrough will need CCS for planned emissions reductions**
   Expanding the COP26 Breakthrough Agenda, the Emirates Breakthroughs included the launch of the Cement and Concrete Breakthrough, co-chaired by Canada and the UAE, and will enable countries to share best practices on a range of policies and other measures to decarbonise the cement and concrete sector. It will engage a variety of partners at the global level. The countries that joined the Cement and Concrete Breakthrough Initiative include Germany, Japan, Ireland, and the UK. It will engage a variety of partners at the global level, including the Global Cement and Concrete Association (GCCA), which has CCS and CCUS accounting for 36% of planned CO_2 emissions reductions.

6. **New avenues for youth engagement are emerging as CCS matures in the climate mitigation space**
   A series of opportunities for youth engagement on energy topics including CCS were held around the venue. On Energy/Industry, Just Transition and Indigenous Peoples Day, the COP Presidency, Youth Climate Champion and YOUNGO Energy Working Group co-hosted a "Youth Ambition Majlis Raising Collective Impact Towards Net Zero". The event provided youth with science-based knowledge on relevant technologies for the energy transition as well as experts with youth perspectives on eco-anxiety and their key priorities for the transition. Participants included prominent youth activities, indigenous peoples, academics, business and finance leaders as well as regional and international NGOs and non-profits.

What didn't make it?

The much-anticipated operationalisation of the international carbon market mechanism ended with no agreement at COP28, further delaying the potential for carbon credits that can be generated using CCS through a UN-recognised scheme.

What's next?

- The 15th Clean Energy Ministerial (CEM-15) in Foz do Iguaçu, Brazil in September 2024 represents the next CMC milestone and opportunity to garner further endorsement from countries. Following new language on abatement technologies found in this year's New Delhi Declaration, Brazil is also hosting the Group of 20 (G20) in Rio de Janiero in November 2024, where further consensus can clarify the role of abatement technologies in climate mitigation.
- The UAE Consensus launched the "Roadmap to Mission 1.5", which aims to involve a set of activities to significantly enhance international cooperation and the international enabling environment to

stimulate action and ambition in the upcoming round of NDCs, and will be guided by the presidencies of COP28, COP29 and COP30.

- Submissions for suggested topics for next year's MWP global dialogues are due on 1 February 2024.
- The Article 6.4 recommendation on removals methodologies document, most relevant for CCS because of the implications for Direct Air Capture and Storage (DACS) and Bioenergy Carbon Capture and Storage (BECCS), aims to be adopted next year.

What's needed?

- Engagement between the private sector and CMC joiner countries, where an overarching platform for carbon management technologies can create the enabling environment to allow for policy, infrastructure, and financing priorities to be consistently raised within the political agenda.
- International clarity and refinement on the definition of "unabated" as it relates to CCS, with current UN text pointed to language found in the latest IPCC report, which refers exclusively to CO_2 from the power sector with methane abatement included.
- CCS community alignment on various platforms and initiatives aimed towards decarbonisation, including but not limited to working with the High-Level Champions, the Breakthrough Agenda, the GDA, the Green Climate Fund (GCF) and Mission Innovation Net Zero Industries Mission (NZIM).
- Further context of CCS in relation to the Sustainable Development Goals and the just energy transition with tripartite dialogues with government, the private sector, and local communities, including Indigenous Peoples.
- A conscious approach that helps nurture youth and their engagement on climate mitigation technologies is needed to help further collective understanding of the use of CCS and its performance in supporting the environment and society.

SCENE SETTING

Following the publication of the Institute's report CCS Milestones on the Road to COP28, several helpful hints emerged for what could be delivered in Dubai:

- A couple of weeks before the COP, the UNFCCC Secretariat published an annual report by the secretariat on the Sharm el-Sheikh Mitigation Ambition and Implementation Work Programme (MWP). The report is based on the 2023 global dialogues and investment focused events. One of the dialogues focused on CCUS and was supported by technical expertise provided by the Global CCS Institute and IEA GHG and was facilitated by the government of Norway.

  Key findings from the report discuss experiences, projects and upcoming policies on the technology from countries including Norway, Saudi Arabia, Japan, the EU, Germany, Trinidad and Tobago, Denmark, and Argentina. The report shows balanced views including the use of CCU and CCS as a complement, rather than a substitute, for other low-cost mitigation options such as renewable energy power generation.

  The report also indicates views of the technology as a necessary option for achieving net zero emissions in cement, hydrogen, steel, and fertiliser production, as well as opportunities for regional carbon storage hubs to reduce costs through shared infrastructure.

- After the G7 Hiroshima Leaders' Communique[1] in May, the Group of 20 (G20) text from the New Delhi Declaration in September saw further elaboration on CCS in the climate mitigation space. Here, efforts to pursue the tripling of renewables were given demonstrable ambition among other abatement technologies, in line with national circumstances by 2030[2].

  This builds on the 14th Clean Energy Ministerial (CEM-14) held in Goa in July, where the Indian Government Ministerial Chairs[3] stated that *"seeking to be the torch bearer for other emerging economies traversing their pathways towards the clean energy transition, India is transforming the energy landscape of the country by accelerating clean energy innovation and deployment for critical technologies – from smart grids and renewables, to clean hydrogen, CCUS, industrial decarbonisation, bioresources, clean energy materials, energy storage, and more."*

  At that CEM meeting, the Carbon Management Challenge (CMC) also hosted its first high-level roundtable since its launch by US President Joe Biden at the Major Economies Forum in April, where the governments of Brazil and Sweden announced they were joining the challenge with existing members Australia, Canada, Denmark, Egypt, the European Commission, Iceland, Japan, Norway, Saudi Arabia and the UAE.

[1] The 2023 G7 communique states: *"We acknowledge that Carbon Capture, Utilization and Storage (CCUS)/carbon recycling technologies can be an important part of a broad portfolio of decarbonization solutions to reduce emissions from industrial sources that cannot be avoided otherwise and that the deployment of carbon dioxide removal (CDR) processes with robust social and environmental safeguard, have an essential role to play in counterbalancing residual emissions from sectors that are unlikely to achieve full decarbonization."*

[2] The 2023 G20 declaration states: *"Will pursue and encourage efforts to triple renewable energy capacity globally through existing targets and policies, as well as demonstrate similar ambition with respect to other zero and low-emission technologies, including abatement and removal technologies, in line with national circumstances by 2030."*

[3] Minister Shri Raj Kumar Singh (Honourable Minister of Power and Ministry of New & Renewable Energy) and Minister Dr. Jitendra Singh (Honourable Minister of Science & Technology)

A QUESTION OF ABATEMENT

By the end of November, the stage was set on what was expected to be the biggest Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) since COP21 when the Paris Agreement was negotiated, agreed and adopted.

With a Presidency eager for a high-level achievement, the curtain raiser saw the operationalisation and financing of the much advocated for Loss and Damage Fund[4]. With that spur in momentum, the Presidency went on with a host of announcements, most notably The Global Renewable Energy and Energy Efficiency Pledge to triple renewables and double energy efficiency by 2030, with 132 country signatories by the end of COP.

Included in the first sentence of the Global Renewables and Energy Efficiency pledge is the recognition that the global community "*moves towards energy systems free of unabated fossil fuels well ahead of and by mid-century*".

The inclusion of this caveat so early in the text can be seen to signal that renewables are to serve as a replacement for unabated fossil fuels. With key countries such as India, China and Saudi Arabia missing in the pledge, herein lay the crux of the matter on fossil fuel phase down/out, where clarity was needed on whether the expansion of renewables would serve to replace fossil fuels or not.

A key on possible parameters is found at the footnote of the pledge, where the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) definition of "unabated fossil fuels" is referenced as follows: *"unabated fossil fuels' refers to fossil fuels produced and used without interventions that substantially reduce the amount of GHG emitted throughout the life cycle; for example, capturing 90% or more CO_2 from power plants, or 50-80% of fugitive methane emissions from energy supply".*

The definition found in the sixth and latest cycle of IPCC report (IPCC AR6) – based on the literature and contributions of thousands of scientists that undergo a rigorous review process until finally accepted by the 196-member government – poses a predicament. The text refers exclusively to CO_2 from the power sector, with methane abatement mentioned separated by a mere comma, further diluting the definition. In an atmosphere where every piece of punctuation counts and no globally accepted definition for abatement, how CCS will be reflected in the much anticipated Global Stocktake was left in the shadows.

Moving into the two weeks of COP28, the question remained whether further refinement, balance and consensus for CCS could be found for Parties of the Paris Agreement.

CARBON MANAGEMENT HIGH-LEVEL ROUNDTABLE

During Energy/Industry, Just Transition and Indigenous Peoples Day on 5 December, the COP28 Presidency in partnership with the Carbon Management Challenge (CMC) co-sponsors Brazil, Canada, Indonesia, the UK, and the US convened the event Carbon Management: Essential Pillar to Keep 1.5°C

[4] The Loss and Damage Fund addresses "locked-in" levels of warming impacts in vulnerable communities being hit by extreme weather events, such as storms and floods, reduced agricultural productivity, and rising sea levels.

Alive, a roundtable of ministers and high-level representatives from over 20 nations. China, Kenya, Denmark, Senegal, Japan, Bahrain, Iceland, Mozambique, Romania, and Sweden joined the roundtable and reaffirmed the importance of scaling carbon management technologies, including carbon capture, utilisation and storage and direct air capture globally this decade.

Participants aim to raise ambition by supporting a global goal of advancing carbon management projects that will reach gigaton scale by 2030, where the CMC is focused on the principle that collectively managing 1 Gigaton (Gt) or more of CO_2 annually will play a vital role in addressing the shared climate challenge.

CMC countries represent global diversity and include members from all major regions of the world, countries with different energy supply profiles from developed and emerging economies. At the event, six additional countries[5] announced their membership, and along with Indonesia joining just before COP28, this brought the total number of signatories to 19 countries plus the European Commission[6]. The IEA and the Asian Development Bank were also present at the event and provided updates on the urgent need for carbon management in developed and emerging economies.

Collectively managing 1 Gt of carbon annually through abatement technologies needs striving to achieve. Last month, the Institute published the Global Status of CCS 2023 report, which outlines that reaching global climate goals will require a massive scale-up of CCS. Bringing the world closer to reaching the target, the roundtable saw the participation of both Secretary John F. Kerry, US Presidential Envoy, and China Special Envoy for Climate Change Xie Zhenhua, and served to complement November's Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis between the two countries, through which they aim to advance at least five large-scale cooperative CCUS projects each by 2030, including from industrial and energy sources.

Going forward, work still needs to be done on the CMC government level on national target setting, deployment strategies (i.e. CO_2 storage hubs and transboundary storage), financing, policy levers and monitoring, reporting, and verification. In the context of the UAE Consensus, CMC countries will need to seek the appropriate balance for the integration of carbon management technologies, particularly in hard-to-abate sectors, in broader mitigation portfolios that triple renewable energy capacity, phasedown unabated coal, transition away from fossil fuels, cut non-CO_2 greenhouse gas emissions, and halt and reverse deforestation, based on their national circumstances.

The participation of China would be significant for the CMC. With Xie Zhenhua stating that *"China will closely watch the progress of the Carbon Management Challenge and is also willing to collaborate with CMC by sharing and exchanging experiences"*, momentum can be gathered towards China joining during the next CMC milestone at CEM-15 in Foz do Iguaçu, Brazil in September 2024. This corroborates with the roundtable agenda at COP28, where scene-setting and introductory remarks on the CMC were delivered by the government of Brazil.

With the next G20 in Rio De Janeiro in November 2024 and COP30 in 2025 scheduled in the country, much of the narrative and multi-lateral progress in CCS and the CMC will be determined by Brazil's role as a presidency in these international processes.

Engaging with the private sector will also be critical for the success of the CMC as we head towards 2030, where an overarching platform for carbon management technologies can create the enabling environment to allow for policy, infrastructure, and financing priorities to be consistently raised within the political agenda.

[5] Kenya, Iceland, Mozambique, Netherlands, Romania and Senegal
[6] www.carbonmanagementchallenge.org/countries

THE UAE CONSENSUS

The first Global Stocktake under the Paris Agreement process was two years in the making, with three technical dialogues consisting of a series of roundtables, informal world cafés, video and poster sessions on top of innumerable government bilaterals, working groups, huddles, and an Arabian majlis. With the findings of IPCC AR6 clearly showing that humanity needs to get on track to limiting warming to 1.5°C, with CCS involved in all pathways that don't require a significant reduction in global energy demand, including scenarios with heavy reliance on renewables[7], COP28 was expected to deliver the necessary political signals to course-correct and achieve the goals of the Paris Agreement.

Carbon management approaches were found in the textual building blocks by the co-chairs that were handed over to the UAE Presidency at the end of the first week of COP to pursue with the Parties. In the first Presidency draft of the Global Stocktake published 11 December, this was translated to carbon capture, utilisation and storage being featured as part of a list of zero and low emissions technologies for Parties to take action on and accelerate. It was also mentioned that the technologies are to enhance efforts towards the *"substitution of unabated fossil fuels in energy systems"* – new wording and a reflection of the Global Renewables and Energy Efficiency Pledge text.

With no sign of phasing out or down fossil fuels in the draft, along with language considered 'red-lines' for many Parties, another day of deliberations, going over the allotted time for COP28, was needed. On 13 December, the second Presidency draft of the Global Stocktake was adopted as part of The UAE Consensus. The text features the pivotal language in paragraph 28, which calls on Parties to contribute to a list of global efforts including: *"Transitioning away from fossil fuels in energy systems, in a just, orderly, and equitable manner, accelerating action in this critical decade, as at to achieve net zero by 2050 in keeping with the science".*

In the following line, the same list of technologies as the first draft is found, with adopted text notably adding focus on the use of CCUS in hard-to-abate sectors, as follows: *"Accelerating zero-and low-emission technologies, including, inter alia, renewables, nuclear, abatement and removal technologies such as carbon capture utilisation and storage, particularly in hard-to-abate sectors, and low-carbon hydrogen production".*

The text on abatement technologies can be seen as a step forward since the G20, however no agreed definition of abatement has been agreed. The inclusion of removals with abatement needs careful attention, as both have synergistic common features such as CO_2 transport and storage infrastructure. However, it is worth noting that the capture costs, business models, and purpose of the two forms of abatement technologies differ. Through an expansion of paragraphs providing wider context for energy systems, the UAE Consensus text managed to find common ground through a nuanced balance of available technology options, and thus further refined the scope of CCS technology application in hard-to-abate sectors, in the context of tripling renewable energy capacity and transitioning away from fossil fuels.

The focus on hard-to-abate sectors was also supported by the joint COP28 Presidency and Global CCS Institute event during Energy/Industry, Just Transition and Indigenous Peoples Day on 5 December, which focused on driving emission reductions in these sectors and was supported by panellists from the US Department of Energy (US DOE), Clean Air Task Force (CATF) and the Global Cement and Concrete Association (GCCA).

[7] CCS in the latest IPCC report "Mitigation of Climate Change" Global CCS Institute, 2022

The UAE Consensus represents a significant step not only for the impact on climate change mitigation but also as a demonstration of the multi-lateral process' ability to unify nations with a shared ambition towards a more harmonious and inclusive vision that brings together the earth's ecology and energy sources.

Action will now need to follow consensus, where efforts on platforms such as the CMC and CEM CCUS will need to be accelerated in line with domestic mitigation measures worldwide. This can also be complemented by working with the growing number of countries that include CCS in their current NDCs where the UAE Consensus also includes the launch of the "Roadmap to Mission 1.5" in paragraph 191.

This was first introduced by Brazil at October's Pre-COP in Abu Dhabi and involves a set of activities to significantly enhance international cooperation and the international enabling environment to stimulate action and ambition in the upcoming round of nationally determined contributions (NDCs), due in 2025, and will be guided by the Presidencies of COP28, COP29 and COP30 – UAE, Azerbaijan, and Brazil, known as the "troika". The next Global Stocktake may be presided over by India, with Prime Minister Narendra Modi proposing to host COP33 during his statement at the Leaders' Summit at the start of COP28.

With CCS now adopted into UNFCCC text, international attention towards its implementation will need to take on a more holistic, global approach. The contributions of CCS will need to be put further into the context with the Sustainable Development Goals and the just energy transition. This can be supported by the work of the MWP and can effectively involve tripartite dialogues with government, the private sector and local communities, including Indigenous Peoples, mentioned in the report by the secretariat. This is actionable in line with paragraph 186, which invites relevant work programmes to integrate relevant outcomes of the first Global Stocktake in planning their future work.

MITIGATION AMBITION AND IMPLEMENTATION WORK PROGRAMME DECISION

CCS continues to be referenced in COP28 decision text. Carbon capture, utilisation and storage is found in paragraph (vi) on the first page of the MWP decision. The text notes the key findings, opportunities, barriers and actionable solutions for CCS summarised in the welcomed report by the secretariat, as well as the information in the report on associated mitigation policies and measures, financing issues, technology and capacity, and sustainable development and socioeconomic impacts.

The MWP is a way for governments, NGOs, and the private sector to engage on cross-cutting topics on CCS financing, policy and implementation. As a next step in the overall process, submissions for suggested topics for next year's global dialogues are due on 1 February 2024, with topics announced by 1 March 2024 for additional views. The suggested topics should be based on broad thematic areas relevant to urgently scaling up mitigation ambition and implementation by 2030 and include all sectors covered in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, thematic areas in Working Group III to IPCC AR6, as well as relevant enabling conditions, technologies, just transitions and cross-cutting issues.

The upcoming dialogues are aimed to be enhanced and expanded, with the participation of Non-Party Stakeholders encouraged through the High-Level Champions, who connect the work of governments with the many voluntary and collaborative actions taken by cities, regions, businesses, and investors. The

inclusion of the High-Level Champions is relevant for CCS as they have a 2030 target of over 50 new CCS/U networks reaching FID by 2026, totalling 400 Mtpa in new capacity in their 2030 Breakthroughs, launched in COP26.

There is a shift to enhance investment-focused events in the MWP, with a view to unlocking finance, including through presentations by Parties to potential financiers, and by inviting more multilateral development banks, financial, institutions and representatives of relevant multilateral climate funds, including the Green Climate Fund (GCF). It should be noted here that CCS features in the governing instrument of the GCF, but there is yet to be climate finance towards a CCS project through the fund.

COP28 UAE PRESIDENCY ACTION AGENDA – THE GLOBAL DECARBONISATION ACCELERATOR

The Global Decarbonisation Accelerator (GDA) is one of the landmark initiatives of the Presidency Action Agenda and is designed to speed up the energy transition and drastically reduce global emissions. The GDA establishes a cross-sectoral ecosystem that aims to activate decarbonisation of Industry, Energy and Transport Sectors by facilitating access to key enablers such as policymaking and standards, financing, infrastructure & technology. The GDA includes three key components for CCS; the Oil & Gas Decarbonisation Charter (OGDC), the Industrial Transition Accelerator (ITA) and the Hydrogen Declaration of Intent on the Mutual Recognition of Certification Schemes.

The OGDC was launched by the COP28 UAE Presidency and the Kingdom of Saudi Arabia with 50 oil and gas companies joining the charter to speed up climate action within the industry. Signatory companies represent over 40% of global oil production, with National Oil Companies (NOCs) representing over 60% of signatories. The OGDC commits to achieve net zero emissions by 2050 for Scope 1 and 2 and includes investing in the energy system of the future through renewables, low carbon fuels, CCS, hydrogen, energy storage and others.

Going forward, the Oil and Gas Climate Initiative (OGCI) will be the primary support for OGDC ambitions. Concurrently, the ITA, backed by $30 million from Bloomberg Philanthropies and the COP28 Presidency, works across energy, heavy industry and transport sectors, finance, and public policy to unlock investment to rapidly scale the implementation and delivery of emission reduction projects. The ITA Secretariat will be hosted by Mission Possible Partnership (MPP).

The Hydrogen Declaration of Intent on the Mutual Recognition of Certification Schemes is underpinned by the launch of the International Standards Organization (ISO) methodology for hydrogen (TS 19870) to determine the carbon footprint of a hydrogen product. It offers requirements and evaluation methods applied to numerous hydrogen production methods including electrolysis, SMR with CCS, co-production, coal gasification with CCS, auto-thermal reforming with CCS and hydrogen as a co-product in industrial applications. With over 40 countries endorsing the declaration at COP28, this was a milestone step for unlocking cleaner forms of hydrogen within the market.

EMIRATES BREAKTHROUGHS

The Emirates Breakthroughs saw the continuation of the Breakthrough Agenda, the UK COP26 Presidency-initiated programme to decarbonise the power, road transport, steel, hydrogen and agricultural sectors in line with the Paris Agreement, known as the Glasgow Breakthroughs. Since COP27, the Breakthrough Agenda has been overseen by Mission Innovation (MI) and CEM, with the backing of the High-Level Champions.

The Emirates Breakthroughs launched two additional breakthrough initiatives at COP28: Buildings, and Cement and Concrete. With the launch of the two additional breakthrough initiatives at COP28, the Breakthrough Agenda now covers sectors responsible for more than 60% of global emissions. The Cement and Concrete Breakthrough was launched with Canada and the UAE as co-chairs and will enable countries to share best practices on a range of policies and other measures to decarbonise the cement and concrete sector. It will engage a variety of partners at the global level, including the GCCA, which has CCS and CCUS accounting for 36% of planned CO_2 emission reductions in the GCCA 2050 Roadmap for Net Zero Carbon Concrete. The countries that joined the Cement and Concrete Breakthrough Initiative include Germany, Japan, Ireland and the UK.

The Emirates Breakthroughs also released the 2024 Priority Actions for all sectors in its Breakthrough Agenda Report 2030. Under cement, the report mentions that early technologies have been a focus for collaboration efforts, with established networks for sharing learning on CCUS, including from the Global CCS Institute and the CEM CCUS Initiative, both of which cooperate with GCCA to scale up CCUS deployment in the cement and concrete industry.

Beyond this, the report discusses Mission Innovation Net Zero Industries Mission (NZIM), launched in 2022, co-led by Austria and Australia, with eight other government members. NZIM aims to accelerate novel industry technologies' time to commercialisation through improved national and multinational co-ordination of R&D efforts and includes CCUS as part of its plan priority innovation topics. The Breakthrough Agenda Report also highlights that in 2022, global investments in energy transition technologies – renewable energy, energy efficiency, electrified transport and heat, energy storage, hydrogen, and CCS reached USD 1.3 trillion, an increase of 19% from the previous year. With that being said, the report states that annual investments must triple until 2030 to meet the Paris Agreement goals.

YOUTH ENGAGEMENT ON CCS

Promoting pragmatic debate is critical when young people engage on climate change issues. Science and solutions like CCS serve a greater role in upskilling energy systems literacy for young people across the world who are passionate about making energy systems better. There were a series of opportunities for youth engagement on energy topics, including CCS.

On Energy/Industry, Just Transition and Indigenous Peoples Day, the COP Presidency, Youth Climate Champion and YOUNGO Energy Working Group co-hosted a "Youth Ambition Majlis Raising Collective Impact Towards Net-Zero". Rooted in long-standing traditions and values, the majlis is an inclusive way of hosting a curated group of climate leaders to discuss a specific climate change challenge, and co-design clear and actionable solutions.

The event provided youth with science-based knowledge on relevant technologies for the energy transition as well as experts with youth perspectives on eco-anxiety and their key priorities for the

transition. This event offered an opportunity for enhanced clarity and impact for both youth and high-level participants, and to leverage their perspectives during negotiations and side conversations. Participants included prominent youth activities, indigenous peoples, academics, business and finance leaders as well as regional and international NGOs and non-profits.

With active youth engagement on energy and climate, a conscious approach that helps nurture youth and their engagement on climate mitigation technologies is needed to help further collective understanding of the use of CCS and its performance in supporting the environment and society.

RULE 16 FOR ARTICLE 6

Although there were many significant developments for CCS this year at COP28, Articles 6.2 and 6.4 were not agreed and was therefore automatically pushed to next year's round of negotiations, in a process known as the application of Rule 16 in the UNFCCC Draft Rules of Procedure. For Article 6.4, this means the delay of an international carbon market mechanism, with political issues remaining on the authorisation of credits and various transfer mechanisms with work still to be done on the 'sustainable development tool'.

On the recommendation on removals methodologies document specifically, most relevant for CCS because of the implications for Direct Air Capture and Storage (DACS) and Bioenergy Carbon Capture and Storage (BECCS), it was agreed that further work is needed with the aim to adopt the recommendations next year.

Article 6.2, a bilateral/multilateral process for countries to trade credits stagnated on issues with the confidentiality of carbon trades and authorisations. Article 6.8 Non Market Approaches (NMAs), pushed by Parties who fundamentally disagree with market mechanisms, came out with diluted text on the definition of NMAs, where a draft to push domestic fiscal measures like carbon pricing did not go through.

Next year's COP29 will be held in Baku, Azerbaijan on 11-22 November, with the interim Bonn Climate Conference to be held on 3-13 June.