



GLOBAL CCS
INSTITUTE

BRIEF

CCS MILESTONES ON THE ROAD TO COP28

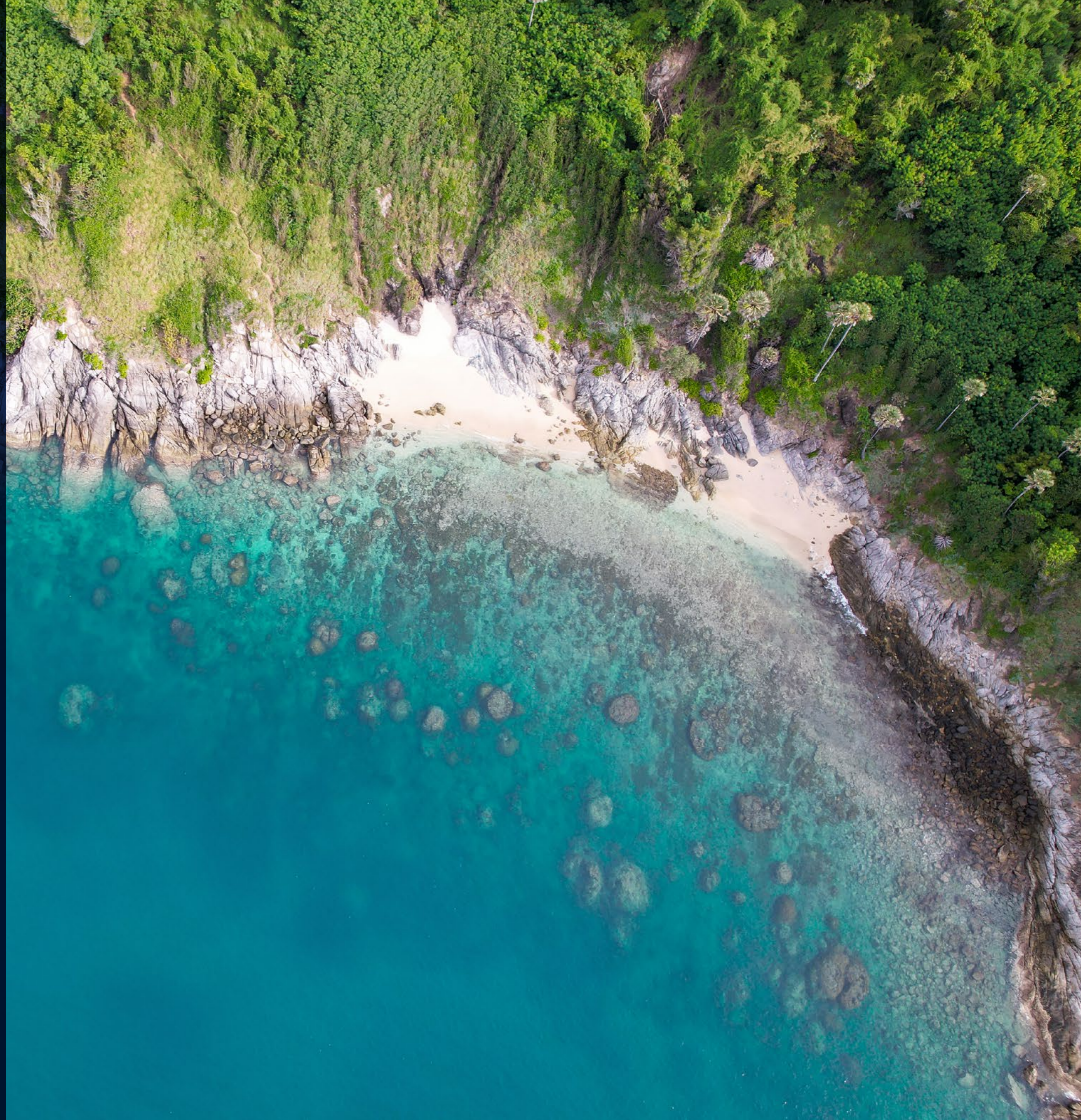
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JULY 2023

CONTENTS

1.0 CCS in Spring 2023	4
1.1 Scene setting	4
1.2 IPCC AR6 Synthesis Report	4
1.3 IEA Credible Pathways to 1.5°C Report	4
1.4 Carbon Management Challenge	5
1.5 G7 Hiroshima Leaders' Communiqué	5
2.0 Bonn Climate Change Conference, SB58	7
2.1 Overview	7
2.2 Mitigation work programme	7
2.3 Global Stocktake	8
2.4 Article 6	9
2.5 Forum on the implementation of response measures	10
3.0 Opportunities on the road to COP28	12
3.1 Calendar of events	12
3.2 Opportunities on the road to COP28	13
3.3 Get involved	13
4.0 Annexes	14



1.0 CCS IN SPRING 2023

1.1 SCENE SETTING

Momentum continues to build for carbon capture and storage (CCS) after last year's progress – when new projects were announced each month – in line with national climate-driven policies and the growing impetus to move to a net-zero emissions future. The Institute has reported that CCS is increasingly being included in government Nationally Determined Contributions (NDCs) and a 44% increase in the CO₂ capture capacity of CCS projects in the pipeline between 2021 and 2022 has also been documented.

However, the first half of 2023 saw multilateral attention with limited coherence on CCS, which has left a need and created opportunities for international action to shape its narrative and facilitate deployment in this critical decade of action.

1.2 IPCC AR6 SYNTHESIS REPORT

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) concluded in March 2023 with the publication of its Synthesis Report, culminating a 6-7 year reporting cycle. The report condenses thousands of pages of scientific research from the three Working Groups Assessment Reports¹ and crucially informs the world's first Global Stocktake at the upcoming 28th Conference of the Parties (COP28) hosted by the United Arab Emirates in Dubai from 30 November-12 December. The findings of the report include the following key statements on CCS:

- *“Net-zero CO₂ energy systems entail a substantial reduction in overall fossil fuel use, minimal use of unabated fossil fuels, and use of carbon capture and storage in the remaining fossil fuel systems”*
- *“The technical geological storage capacity is estimated to be on the order of 1,000 GtCO₂, which is more than the CO₂ storage requirements through 2100 to limit global warming to 1.5°C, although the regional availability of geological storage could be a limiting factor. If the geological storage site is appropriately selected and managed, it is estimated that the CO₂ can be permanently isolated from the atmosphere”*

- *“Currently, global rates of CCS deployment are far below those in modelled pathways limiting global warming to 1.5°C to 2°C”*
- *“CCS is an option to reduce emissions from large-scale fossil-based energy and industry sources provided geological storage is available. When CO₂ is captured directly from the atmosphere (DACCS), or from biomass (BECCS), CCS provides the storage component of these CDR methods”*
- *“Hard-to-abate residual GHG emissions (e.g., some emissions from agriculture, aviation, shipping, and industrial processes) remain and would need to be counterbalanced by deployment of CDR methods to achieve net zero CO₂ or GHG emissions”*

1.3 IEA CREDIBLE PATHWAYS TO 1.5°C REPORT

Through the release of the *Credible Pathways to 1.5°C Report* in April 2023, the International Energy Agency (IEA) outlined four pillars for action in the 2020s to keep the Paris Agreement's target within reach, with significant emphasis on CCS.

“Carbon Management” via CCUS for the energy sector is found in Pillar 1: net-zero CO₂ emissions by 2050. It is outlined that CCUS plays three important roles:

1. Providing a solution for hard-to-abate sectors such as cement
2. Contributing to the production of low-emission fuels, including synthetic fuels
3. Removing carbon dioxide from the atmosphere

Pillar 4 is dedicated to Carbon Management and includes CCS, CCU and CDR. The report outlines that even if clean technologies outside of carbon management are deployed aggressively, and even in a low overshoot scenario, carbon management will be needed to meet climate goals. The report establishes that 1.2 Gt of CO₂ capture will need to be implemented by 2030. The report also makes clear that CDR technologies do not remove the need for deep emission cuts from point-sources.

1.4 CARBON MANAGEMENT CHALLENGE

In tandem and framed with the IEA Credible Pathways to 1.5°C report, the Major Economies Forum (MEF)² meeting on Energy and Climate Change saw the announcement by US President Joe Biden of new efforts in four key areas to keep 1.5°C within reach. The first area announces steps to drive decarbonising energy, where the US released a new *National Innovation Pathway Report* for accelerating key clean technology innovations including CCS.

Significantly, the fourth area focuses on accelerating carbon capture and removal technologies, where the US President will invite other countries to join the COP28 Carbon Management Challenge (CMC), with the aim of unveiling at COP28 a suite of concrete announcements and goals, including a CO₂ storage target by 2030, that will accelerate CCUS and CDR internationally. At the MEF meeting, leaders from Australia, Canada, Egypt, the European Union (EU), Japan, Saudi Arabia, the UAE, Norway and Denmark joined in supporting the launch of this challenge.

The next step for the CMC is at the 14th Clean Energy Ministerial (CEM) in Goa, India, where there will be a roundtable discussion organised by the United States, Norway, Saudi Arabia and the CEM CCUS Initiative.

1.5 G7 HIROSHIMA LEADERS' COMMUNIQUÉ

The Group of Seven (G7) is an intergovernmental political forum consisting of France, the United States, the United Kingdom, Germany, Japan, Italy, and Canada, and the EU as a “non-enumerated member”. The G7 Summit is held annually for the leaders of the G7 member states. Invited countries and international organisations that are not G7 members may also participate in G7 meetings. At the end of the Leaders' Summit, host countries publish a communiqué, declaration or chair's statement that explains what agreements were reached by G7 members.

Through the Japan Presidency, the 49th G7 Summit was held in Hiroshima, where a Leaders³ Communiqué was released with the following language on CCS:

“We acknowledge that carbon capture, utilization and the 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”

This marks the first time CCS is put forward in such detail in a G7 Leaders outcome document, where previous mentions include the 2021 Carbis Bay Communiqué and the 2014 Brussels Declaration.

¹ WGI – The Physical Science Basis, WGII – Impacts, Adaptation and Vulnerability, WGIII – Mitigation of Climate Change, and the three Special Reports: Global Warming of 1.5°C, Climate Change and Land, The Ocean and Cryosphere in a Changing Climate.

² The MEF economies account for ~80% of global gross domestic product (GDP) and global greenhouse gas (GHG) emissions.

³ The leaders in attendance from the G7 were, in country name alphabet order, Prime Minister Justin Trudeau of Canada, President Emmanuel Macron of France, Chancellor Olaf Scholz of Germany, Prime Minister Giorgia Meloni of Italy, Prime Minister Fumio Kishida of Japan, Prime Minister Rishi Sunak of the United Kingdom, President Joe Biden of the United States and Commission President Ursula von der Leyen and Council President Charles Michel of the European Union. Invitees included leaders from Australia, Brazil, Comoros, Cook Islands, India, Indonesia, South Korea, Vietnam, as well as the heads of the IEA, International Monetary Fund (IMF), United Nations (UN), World Bank (WB), World Health Organization (WHO) and World Trade Organization (WTO).

“
Carbon capture, utilization and storage and carbon recycling technologies can be an important part of broad portfolio of decarbonization solutions
”

– G7 HIROSHIMA LEADERS’ COMMUNIQUÉ

2.0 BONN CLIMATE CHANGE CONFERENCE, SB58

2.1 OVERVIEW

The June 2023 Bonn Climate Change Conference represents the 58th session of the Subsidiary Bodies. The conference built on the mandates of COP27 in Sharm El-Sheikh last year⁴, and continued discussions to set the groundwork and prepare negotiation documents for adoption at COP28.

The conference opened with remarks from the United Nations Framework Convention of Climate Change (UNFCCC) Executive Secretary, who pointed to the latest World Meteorological Organization (WMO) and IPCC reports that make clear the acceleration of climate change and lagging behind of climate mitigation action. The two-week conference led to varying progress on agenda items, with particularly contentious discussions on issues including accelerated mitigation, climate finance and just energy transition.

Within the Bonn climate talks, CCS was addressed both inside and outside negotiating rooms. In negotiations, CCS is currently explicitly being discussed under the Global Stocktake and accelerated mitigation ambition and implementation work programme (known as the Mitigation Work Programme – MWP) and the Forum on the Implementation on Response Measures. In the Article 6 carbon markets negotiations, CCS is discussed in the context of “engineered” Carbon Dioxide Removals (CDR). The work programme on just transition pathways, a relatively new agenda item within the UNFCCC space, may involve CCS in future because of its linkages to socio-economic impacts in the energy sector as the world accelerates mitigation action. Outside negotiation rooms, CCS was referred to in fossil-fuel phase-out side events as well as CDR side-events on Article 6.

2.2 MITIGATION WORK PROGRAMME

First Global Dialogue and Investment-focused event – CCS sessions

Parties at COP27 established the MWP to urgently scale up mitigation ambition and implementation this decade. The decision includes holding at least two global dialogues and investment-focused events every year up to 2026, after which a decision on the continuation of the program will be made. Before each dialogue, topics are decided by the co-chairs (currently Egypt and France) based on submissions received. Submissions on the inclusion of CCS at the first global dialogue came in from Georgia, Liechtenstein, Monaco, Switzerland, the United Kingdom, Norway, Chile, Colombia, Costa Rica, Guatemala, Honduras, Panama, Paraguay, Peru, South Korea, Russia, the International Renewable Energy Agency (IRENA) and the Center for Climate and Energy Solutions (C2ES).

The weekend before negotiations began, CCS was therefore featured as one of the four topics at the First Global Dialogue and Investment-focused event, where the CEO of the Global CCS Institute, Jarad Daniels, was invited to present⁵ as a technical expert on CCS. After the presentation, Mr. Daniels was joined by Tim Dixon, General Manager of IEAGHG, to a day of sessions facilitated by Stig Svenningsen from the delegation of Norway to answer questions and hear comments from governments and NGOs.

A summary of views captured in the First Global Dialogue and Investment-focused event is found in Annex 1.

⁴ COP27 CCS outcomes briefing note can be found here: https://www.globalccsinstitute.com/wp-content/uploads/2022/11/COP-27-OUTCOMES_291122.pdf

⁵ See the Institute’s presentation at the event: https://unfccc.int/sites/default/files/resource/03_CCS_Jarad%20Daniels%20_CCS%20%20UNFCCC%20final_0.pdf

MWP negotiations track

The Bonn sessions saw a prolonged two-week process in the adoption of its agenda – where what is usually adopted in the first couple of days was adopted on the second last day. The crux of the agenda debate was a last-minute proposal to include more prominently the urgent scaling up of climate finance support from developed countries to developing countries. The compromise reached by Heads of Delegation led to not including this urgent finance scaling but to also drop the MWP agenda item, where the Supervisory Body Chairs would capture discussions in an informal note to take forward, since the MWP was on the provisional agenda before the conference started.

Although no conclusions were adopted at Bonn on the MWP, there is still the possibility it can continue as a COP28 agenda item, through consultations with Parties on a corresponding financial agenda item to allow for developing countries to accelerate mitigation action. In the work programme for just transition pathways room, it should be noted that there were diverging conversations on whether this element should be linked to the MWP.

MWP road to COP28

- Summary report on the First Global Dialogue by the Secretariat – August 2023
- Second Global Dialogue and Investment-focused event – September/October 2023

2.3 GLOBAL STOCKTAKE

The Paris Agreement's first Global Stocktake (GST) is a major outcome of COP28 and will inform the next round of Nationally Determined Contributions (NDCs) in this critical decade for climate action. The GST saw incremental progress at Bonn: the third and final technical dialogue of the GST concluded; a draft structure for the GST outcome document was agreed and the COP28 high-level events plan was brought forward.

The technical dialogue format followed previous sessions, which saw a poster session⁶, a World Café and thematic roundtables. Summary reports from the first two technical dialogues captured conversations on CCS, entailing both “potential benefits and adverse effects” in the first summary report⁷, with greater detail on the value of industry clusters, achieving circularity, use of direct air capture and decarbonisation synergies in the second summary report⁸, in addition to differing views on the technology.

There were informal opportunities presented at the World café to discuss CCS, with sessions on the implications of global energy mixes by sources in 2030/2035/2050 and hypothetical climate-ambitious options for an integrated energy company with a strong legacy in oil and gas, a multi-national cement company and a heavy machinery company.

At the more formal roundtables, CCS was mentioned in the mitigation roundtable as well as the finance, capacity building and technology roundtable. There were various views from the floor, with substantive interventions on CCS provided by Saudi Arabia on CCS in the IPCC report, CCS financing and the need to reduce barriers, as well as by the United States on carbon management. There were also forward-looking inventions related to CDR and abatement and storage technologies from the United Kingdom and India respectively. Environmental NGOs and Colombia took the floor with opposing views CCS.

- GST in-person workshop to develop outputs – October 2023

How CCS will be reflected in the final outcome of the GST will be further determined on the basis of the upcoming reports, a workshop, regional climate weeks⁹ and COP28 high-level events.

GST road to COP28

- Summary report of the third technical dialogue – August 2023
- Synthesis report on the technical assessment – September 2023

2.4 ARTICLE 6

Article 6 consists of two “cooperative approaches” for governments to generate and trade carbon credits in order to meet their NDCs: bilaterally through Article 6.2, and internationally through Article 6.4. Article 6.2 is already operational with an *interim platform* online since January 2023 while the centralized accounting and reporting platform is being decided. A steady increase in the Article 6 pilot project pipeline is being reported and updated by the *UNEP Copenhagen Climate Center*.

For Article 6.2, outstanding issues remain pertaining to the Article 6 database, including agreed electronic format, sequencing and timing of submissions, procedural actions and reviews, linkage with Article 6.4, accounting, nomenclatures as well as various administrative elements. Developing countries have also highlighted the need for rapid capacity building to enable them to contribute to the technical discussions.

In Article 6.4, Parties still have the outstanding issues of emissions avoidance (primarily related to forests), authorisations of carbon credits by host countries, and the varying levels of connection of registries required for the global transfer of units and data-sharing. Most relevant to CCS at the moment is the work by the Article 6.4 Supervisory Body on documents that will dictate how

CDR will be handled under the mechanism. This saw a wave of submissions between May-June 2023 from the CCS community in response to unbalanced meeting documents against technology-based removals (i.e. Direct Air Capture and Storage and Bioenergy Carbon Capture and Storage)¹⁰.

In an official UNFCCC side event on the status of implementation of the Article 6.4 mechanism, the Supervisory Body announced four new channels of communication: launching a mailing list to receive updates and notifications, a dedicated new email, webinars and a LinkedIn page. Also at the session, there was a focus on raising ambition and environmental integrity, scaling up finance and sustainable development as they relate to the Article 6.4 mechanism

Article 6 road to COP28

- Article 6.2
 - Submissions on outstanding issues before COP28
 - Technical paper on outstanding database and administrative issues before the hybrid workshop
 - Hybrid workshop to consider technical issues before COP28
- Article 6.4
 - Submissions on outstanding issues – September 2023
 - Technical Expert Dialogue to discuss outstanding issues before COP28
 - Next Article 6.4 Supervisory Body meeting to discuss removals – July 2023

⁶ The Institute's poster can be found here: <https://unfccc.int/sites/default/files/resource/COP27%20-%20A2%20Poster%20update%20-%20Digital%20use%20GCCSI.pdf>

⁷ The second summary report can be found here: https://unfccc.int/sites/default/files/resource/GST%20TD1_1_sreport_26_09_2022_Final.pdf

⁸ The second summary report can be found here: https://unfccc.int/sites/default/files/resource/TD1.2_GST_SummaryReport.pdf

⁹ See calendar of events section of this report

¹⁰ Link to the latest call for submissions in June 2023, including from the Institute, can be found here: <https://unfccc.int/node/628834>

2.5 FORUM ON THE IMPLEMENTATION OF RESPONSE MEASURES

The forum on the implementation of response measures takes into consideration the positive and negative cross-border impacts of mitigation policies and actions i.e. 'response measures'. This is guided by a workplan through Katowice Committee of Experts on the Impacts of Implementation of Response Measures (KCI), where CCS is found under Activity 5.

In the *background note* from COP27 on assessing the impacts of potential new businesses and industries, CCS is considered in the context of societal impacts through the creation and sustenance of jobs, indirect jobs in the supply chain, increase of skills and knowledge, stranded assets, employment stability and societal stability during the just transition to a net-zero economy. The economic topics found in the note include the deployment of CCS in multiple sectors, boosting clean economic growth, substantial flow-on effects, source of high-value spillovers that can stimulate innovation-led growth, extension of existing infrastructure, economic barriers for adoption and wide-ranging abatement costs. Environmental positive and negative impacts of CCS described in the note include air quality, water, efficiency, groundwater contamination, leakage and large-scale hazards.

In March 2023 the KCI published its *capacity building report* which reflects CCS through a collaboration with the Institute as a CTCN network member with link to a *joint-webinar* on BECCS. At Bonn, the KCI hosted a workshop for Activity 2 on the subject of just transition and economic diversification. Along with this, the mid-term review, which looks at matters concerning the relevance, coherence, effectiveness, efficiency, impact, risk management, sustainability and opportunities of the work plan, was scheduled to conclude, but no consensus was reached. Divergence was seen in the utility of the forum, with developing countries seeing the forum as a ceiling to mitigation measures with excessive negative socio-economic impacts, such as cross-border carbon taxes, while developed countries were open to discussing positive socio-economic impacts from mitigation measures such as the phase-out of fossil fuels.

Because no consensus was reached, milestones for the forum on the implementation of response measures are not defined, with high-level bilateral discussions expected to resolve the issue in the interim. Similar to the linkage made with the MWP, the work programme on just transition pathways negotiation room had diverging views on linking response measures.



Currently, global rates of CCS deployment are far below those in modelled pathways limiting global warming to 1.5°C



– IPCC AR6 SYNTHESIS REPORT

¹¹ View the Article 6.4 Supervisory Body webpage here: <https://unfccc.int/process-and-meetings/bodies/constituted-bodies/article-64-supervisory-body>

3.0 OPPORTUNITIES ON THE ROAD TO COP28

3.1 CALENDAR OF EVENTS

DATE	EVENT	LOCATION	CCS RELEVANCE
10 – 13 July	6th Meeting of the Article 6.4 Supervisory Body	Bonn, Germany	Work towards the guidance on carbon removals in international carbon market mechanism
19 – 22 July	14th Clean Energy Ministerial (CEM)	Goa, India	CCUS Initiative side-events, including on financing, CMC and decarbonising cement as well as other CCS side-events ¹²
19 – 22 July	18th Mission Innovation Meeting	Goa, India	CDR Launch Pad
22 July	Group of 20 (G20) ¹³ Energy Ministers Meeting	Goa, India	Political support if CCS included in outcome
4 – 8 September	Africa Climate Week	Nairobi, Kenya	Informs GST
9 – 10 September	G20 Leaders' Summit	New Delhi, India	Political support if CCS included in outcome
17 – 24 September	New York Climate Week	New York City, New York	Gathering of climate leaders with potential for CCS side-events
20 September	Climate Ambition Summit announced by UN Secretary General calling for an Acceleration Agenda for countries, especially G20, to cooperate to accelerate climate action	New York City, New York	Political support if CCS included in the outcome
8-12 October	Middle East and North Africa Climate Week	Riyadh, Saudi Arabia	Informs GST
23-27 October	Latin America and Caribbean Climate Week	Panama City, Panama	Informs GST
TBC	Asia-Pacific Climate Week	Johor, Malaysia	Informs GST

¹² The Institute's briefing note on IPCC AR6 Working Group 3 "Mitigation of Climate Change" can be found here: <https://www.globalccsinstitute.com/wp-content/uploads/2023/05/CCS-in-the-IPCC-Sixth-Assessment-AR6-Synthesis-Report-2-4.pdf>

¹³ The full list of the 2030 Breakthroughs targets are found here: https://racezero.unfccc.int/system/breakthroughs/?_gl=1*1a1zw66*_ga*MTA4MzY5NDY4MzY4Njg4MjE4ODIz*_ga_7ZZWT14N79*MTY4ODE0MzY4OS4yOS4xLjE2ODgxNDMzNTcuMC4wLjA

3.2 OPPORTUNITIES ON THE ROAD TO COP28

International cooperation

A major takeaway of the MWP first global dialogue and investment-focused event was the willingness and need from countries to cooperate on CCS. The following are collaboration areas that can be undertaken this decade on a global scale in conjunction with announcements made through the Carbon Management Challenge:

1. Alignment of methodologies and data for CO₂ storage assessments
2. Coordination on cross-border transfer of CO₂ for storage
3. Harmonisation of national and international rules on CDR
4. North-South and South-South international cooperation on capacity building and finance, focused on:
 - Establishing CCS Centres of Excellence in the Global South for knowledge sharing on policy and regulation, assessment for storage, accounting, monitoring, storage permitting, etc.
 - Funding CCS projects, including from MDBs and International (e.g. the World Bank, which has a CCS Trust Fund that expires this year) and the GCF (which has funding for CCS included in its governing instrument)

Outlook

There are strong policy signals and significant momentum for CCS from governments worldwide, although a level of coherence is still needed in the multilateral space to further facilitate the technology's deployment rate in this critical decade of action. Focus on the Global South in particular is needed for further understanding of various country positions and starting points in enhancing global cooperation. This is critical to shape the success of CCS as a key tool for climate change mitigation. This brings to light opportunities not just for North-South cooperation, but South-South cooperation as well to ensure the acceleration of decarbonisation of developing economies through the use of the technology.

¹⁴ The Institute's briefing note on IPCC AR6 Working Group 3 "Mitigation of Climate Change" can be found here: <https://www.globalccsinstitute.com/wp-content/uploads/2023/05/CCS-in-the-IPCC-Sixth-Assessment-AR6-Synthesis-Report-2-4.pdf>

¹⁵ The full list of the 2030 Breakthroughs targets are found here: https://racezero.unfccc.int/system/breakthroughs/?_gl=1*1a1zw66*_ga*MTA4MzY5NDY4MzY4Njg4MjE4ODIz*_ga_7ZZWT14N79*MTY4ODE0MzY4OS4yOS4xLjE2ODgxNDMzNTcuMC4wLjA

In the run-up to COP28, there is a unique opportunity to contribute to the CCS narrative for 2030, with several questions raised internationally on its scope of application, i.e. hard-to-abate industries vis-à-vis the oil & gas and power sectors. With a global 2030 CCS target with signatories attached on the horizon through the CMC, current global ambition on CCS deployment this decade will be further clarified.

The question 'how', not just 'how much', CCS is deployed is an emerging topic that needs further conversation and expansion. Weaving the Global Sustainable Development Goals (SDGs) with CCS will need to be further explored, where preliminary work has already been shown in IPCC AR6 on existing synergies and trade-offs¹⁴. In line with this, how CCS in various sectors will play into the just energy transition conversations is a developing story.

3.3 GET INVOLVED

Race to Zero

Private sector entities and other non-state actors can join the Race to Zero, led by the UN High-Level Champions and the largest global alliance that aims to take rigorous and immediate action to halve global emissions by 2030 and reach net zero by 2050. Joining requires meeting minimum participation criteria and includes *accelerators* for support, such as by the Global Cement and Concrete Association.

Support is also welcomed to achieve Climate Champion 2030 Breakthroughs for Industry, including a 2030 target for over 50 new CCS/U networks reaching FID by 2026, totalling 400 Mtpa in new capacity¹⁵.

To learn more, visit the *Race to Zero Campaign website*.

COP28 Programming

Applications for COP28 Presidency events programming can be done through the *Programming Request Form* for approval by the Programming Committee. Further information on COP28 can be found on the *official website*.

4.0 ANNEXES

ANNEX 1

COUNTRY	CCS VIEWS	
Brazil	CCS/CCU are matter of special interest for Brazil, guiding solution for hard-to-abate sector How the Global South should build capacity can address the use of these technologies Difficult to understand how we can deploy more efficiently; need to learn from pioneer countries and knowledge sharing through international and bilateral cooperation	●
Zimbabwe	Had previously thought CCS was too premature, need for more awareness raising Energy access in Africa is low and worrisome. CCS hasn't been advanced in the African continent and has potential to contribute significant emissions reductions. Allow CCS to evolve. CCS can be an alternative option to reduce emissions and accelerate mitigation implementation. Need to understand how it can then also contribute to economic development and understand the risks Capacity building needed in the infrastructure, technology transfer, technical level, policy and regulatory frameworks through exchange visits and collaborative partnerships	●
United States	IEA Credible Pathways to 1.5 Report and 2030 targets – Carbon Management is one of four pillars for action. We need about 1.2 GT captured by 2030 and the need to scale this up is stark and points to a need to look at technologies, scale and systematic infrastructure CCS project pipeline, question on how rapidly we expect projects to go online and which sectors/applications Extension permitting process in the US and important to knowledge share. Different opportunities to engage, international collaboration to better understand how we can scale up more quickly and work with more countries from different points of CCS development IRA tax credit for CO₂ removal , Bipartisan Infrastructure Law - \$10 billion for R&D include \$3.5 billion for carbon removal hub Need to look at CCU/CCS especially for hard-to-abate sectors like cement where there are no options yet Applications across industries Can't be substitute for other mitigation actions, must sharply decrease emissions into atmosphere and complement mitigation action	●
Japan	CCU/CCS is an important component of portfolio of decarbonisation solution . Carbon recycling fuels, e-fuel, e-methane can replace fossil products and CO ₂ . Emphasis on cement sector Sharing Japan experience in CCS with 2030 storage goals and cost reduction for transport and storage by 2050 Promote international cooperation – example of 2019 Asia CCS network where US, Australia, India and 10 Asian countries were invited	●

Trinidad & Tobago	Drafted policy for CCS/CCU , with legislative framework required Interested in receiving guidance on policy and regulatory requirements that may be needed to address issues on the technology itself, i.e. liability issues and risk assessment, permitting, regulate investments. Need more nuanced information on full development of these policies in draft form Amending existing environmental laws in exploration of storage sites , need to know what regulatory requirements needed to establish a storage site	●
Ukraine	CCS technology requires a business case Regional policies to scale up CCS storage , where Ukraine has large potential for CCS storage with many depleted oil and gas fields. Interest expressed by different international companies to store their CCS in Ukraine Carbon price is not high enough, unlikely to be reviewed before the war is over. Ukraine is interested in building after the war in a sustainable way EU can help development of CCS in developing countries	●
EU	Abatement technologies exist and science says they need to be deployed to reach net zero Use primarily in hard-to-abate sectors and provide for negative emissions with substantial reduction in fossil fuel use Regulation in place; on 26 March the EC proposed the Net Zero Industry Act that is planned to strengthen European manufacturing capacity of net zero technologies – included 50 MT capacity stored CO₂ by 2030 removes major barrier to CCS, making it economically viable On a member state level, Germany evaluated carbon management in hard-to-abate sectors , with safeguards, security and environmental integrity IPCC AR6 - quite some barriers that CCS is still facing, identifies the deployment of CCS has been lower than expected and still some doubts about it. Highlights low-cost alternatives such as renewables - sustainable development, human health, we will need to continue research for climate neutrality	●
Denmark	Setting up regulations Investing EUR5 billion to support storage of 3.2 MT CO₂ annually by 2030 Technology for hard-to-abate sectors , not for use in the fossil fuel energy sector	●
Switzerland	CCS/CCU key technology to reach net-zero emissions Mitigation comes first, opportunities to scale up CCS – concrete and waste Searching for more storage capacity , strongly looking for international cooperation and building up regulation . Crucial we work together to build up these technologies Two topics important: 1) Not to enforce lock-in situation , challenge to find business cases for those technologies when it is only used for hard-to-abate emissions 2) Swiss government discussed opportunities to finance CCS technologies, Polluters Pay Principles can serve as a clear price signal and can be combined with existing systems like ETS or carbon price in Switzerland	●

- ONGOING CCS POLICIES PROJECTS
- LIMITED OPENNESS TO CCS, IN SOME DEVELOPING COUNTRY CASES CAPACITY BUILDING AND SUPPORT NEEDED FOR IMPLEMENTATION
- NOT INTERESTED IN CCS

Singapore	CCS important part of our decarbonisation vision No geological storage sources within our borders. Feel strongly on importance of international cooperation to identify opportunities and develop what we call the rules of the road Need to talk about harmonising CCS with responsible approach to carbon accounting	●
Ethiopia	Very new to CCS, included it in updated NDC Need to learn more about sustainable development and socio-economic effects Quoting African Group coordinator: "If we use CCS to achieve Paris Agreement we need to have finance, technology transfer, capacity building and support for developing countries". Request developed countries to deliver the international cooperation	●
Argentina	What are best practices to upscale CCS? What are possible laws, framework, specifically linked to our hydrogen plans?	●
China	Both CCU and CCS are important technological options for reducing CO ₂ emissions in energy sector, provides a possible solution to existing fossil fuel base power and industrial plants that still play irreplaceable role until transition is complete R&D demonstration and industrial application of CCUS, we have made some progress Know main concerns of maturity and cost of technology . Technologies have this development progress; many new ones such as renewables also go through such process. Cost is related to scale of development and maturity of technology How can we create enabling conditions for such new technologies? We need available resources and technologies, developed countries can give some showcase on how these technologies can be applied in low cost and large scale . Developing countries lack such technologies and related resources	●
Brunei	Universal definition of CO₂ as a commodity to move bilateral partnerships MMRV – haven't fully understood risk, need best practice and lessons In trade agreements , the expectation for CCU or CCUS is that the 'U' should not be used for enhanced oil recovery, however this technology lends itself to hydrocarbon-dependent economies to transition	●
South Africa	Although looked at CCS, do not rank it as one of the highest and have other mitigation measures that will be much cheaper to implement in the short-term, whereas developed countries are implementation-ready for CCS	●

Malaysia	Have capacity to store 13.3 billion cubic meters CO₂ in maritime areas especially in South China Sea, country outside the Pacific Ring of Fire so low risk – one of reasons why Malaysia has put CCS as new economic stream and long term aspiration to go to net zero and achieve NDC Not part of London Protocol at the moment, need to assess implications for Malaysia and long-term impacts of storing CO ₂ , IPCC 2006 guidelines very clear – once stored, it is the country's responsibility CCS benefits from the carbon market mechanism , under VCM, planning to use CCS as one of the activities that can generate credits, which could be used to incentive these activities Utilisation not much technology that can be used, for blue hydrogen production, ammonia and others and conversion from captured CO ₂ to useful products CCS opening opportunity for other countries to store CO ₂ but also to decarbonise own industry – need to enable local industry to capture and store CO ₂ Several challenges – regulatory framework , only have government regulation for extraction for oil & gas through national oil & gas company, using that petroleum development act is not sufficient and doesn't cover activities to store CO ₂ , need to establish and enhance existing regulations for CCS R&D development on what type of ship to transport the CO₂ , currently being done by Malaysia and several partners Cost is high at the moment and sure in the future maybe will be much lower	●
Papua New Guinea	Hard to embrace due to lack of practical knowledge and experience and cost International Oil Companies (IOCs) operating in Papua New Guinea that advocate CCU and CCS have very strong leverage when it comes to getting the government to create an investment-friendly environment for them, NGOs don't agree because it goes in favor of the developer. It is timely to raise the profile in this level ; we are at the stage we need to recognise the importance of this technology Need support on policy and regulatory process South-South cooperation? Rely on this forum on how we can collaborate to assist us and prepare ourselves better	●
United Kingdom	CCS is essential to reach net zero Priority is to reduce GHG emissions from human activities and then use CCS to mitigate unavoidable emissions IPCCC recognises role that CCS has on counterbalancing emissions particularly for hard-to-abate like steel and cement Agree with US that CCS should complement and not replace mitigation action See role of CCUS in power sector , supporting renewable system in 2050 IPCC Synthesis Report that net zero energy systems entail a substantial reduction in overall fossil fuel use, minimal use of unabated fossil fuels, and use of carbon capture and storage in the remaining fossil fuel systems IEA estimates fossil fuels that do remain in 2050 include CCUS clearly shows that we should rapidly scale up mature technologies like solar and wind and at the same time phase out unabated fossil fuels and invest in developing solutions like CCS all as a package Questions on costs of CCS depending on application , where in some cases cost might be lower than alternatives and where CCS is most cost-effective working towards 1.5°C temperature goal Question on why CCS has not been used at scale yet and what are the barriers	●

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Saudi Arabia	<p>For us to solve the climate problem, we need to focus on emissions flows and stock in the atmosphere, renewables/energy efficiency helps to avoid emissions (emissions flows) while CCS helps both – reduce emissions and through DACCS, remove stock of emissions</p> <p>CCS industry ready for deployment since 1960s in the oil & gas industry across the world</p> <p>Interesting projects in Saudi Arabia and open for international collaboration</p> <p>Current deployment rates is good news, but looking at climate math we need more on gigaton scale</p> <p>Extended collaboration from all stakeholders, government, industry, finance</p> <p>Government has leading role for creating revenue streams</p> <p>The emergence of CCS hubs, where CO₂ transport and storage infrastructure is shared among various industry emitters has potential to speed up deployment rate. CO₂ storage infrastructure should be built as a public good for even small emitters to be able to plug in without taking risk in investing in CO₂ transport and storage infrastructure</p> <p>CCS has unique flexibility of reducing emissions in the power sector by providing dispatchable power</p> <p>CCS can help decarbonise most major industries such as cement, iron, steel, chemicals, hydrogen and provides a clear pathway for carbon removals through DACCS</p> <p>Value of CCS is more than emission reduction, Saudi has several industrial cities with CCS facilities, with 1000s of jobs related to the facilities and CCS is a way to maintain and create new jobs in those industrial clusters while extending the lifetime of existing infrastructure</p> <p>Extensive experience in oil & gas sector. Saudi Arabia has been running a CCS facility since 2015 that captures and stores 0.8 MTCO₂ per year safely, now building large-scale CCS hub in Eastern Province for 9 MTCO₂ per year by 2027 – this is just the beginning, and we need to reach the GT scale and Saudi will be building additional projects. Without CCS the targets of 1.5°C and net zero are difficult to reach</p> <p>A lot of genuine experience in US through the Inflation Reduction Act and EU through the Net Zero Industry Act where CCS policy has been developed to intensify deployment, CCS is no different than other clean energy technology and the recipes used to scale up renewables are applicable to CCS – i.e. feed-in tariffs, public procurement CCS obligations to mandate sector to produce a certain amount of goods or electricity through CCS, all these mechanism can part of the tool kit to enable CCS</p> <p>Most of the reports of the IEA and IPCC are telling us we have more than what is needed for storage capacity to reach 1.5°C and net zero with more than 1,000 GT of storage capacity underground</p> <p>Industries will have to rely on CCS; good example is cement industry, which is very important in developing world, as these countries build infrastructure for making cement where even a renewable powered cement industry will result in CO₂ emissions in the atmosphere as more than 50% of emissions are not related to any combustion of any fossil fuel and is just part of the chemical decomposition from calcium carbonate to calcium oxide process. This is similar in steel industry and natural gas</p> <p>Since the 1960s CCS is used for EOR but recently what is emerging is CO₂ storage into geological formations like saline aquifers, which is what we are doing in Saudi Arabia, with other examples worldwide, safely. This is reliable and CO₂ stays there for more than 1,000 years as ultimately it will mineralise in the reservoirs</p>	●
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Germany	<p>Echo US and UK; CCS should not postpone or be used as an alternative to mitigation</p> <p>Abatement technologies exist and will have to be deployed where there are no alternatives in hard-to-abate sector</p> <p>IPCC AR6 availability of storage – what we need for CDR alone is probably exceeding storage capacities</p> <p>Especially in the energy sector overall, we must make use of alternatives available already that provide multiple benefits to sustainable development, human health and reduction in fossil fuel use to achieve climate neutrality</p> <p>More research and innovation for countries that; want to achieve climate neutrality</p> <p>EU and German legislation on CCS; currently evaluating and conducting a carbon management strategy, where legislation in place is currently preventing CCS to be deployed – need to look into this with big steel and cement sectors, and need to find out best options for climate neutrality by 2045 with safeguards and standards that secure environmental integrity, permanent storage, regional capacities and public acceptance in Germany and the EU</p> <p>Net Zero Industry Act to discuss regulation on CCS and currently evaluating this to come up with a feasible solutions for CCS</p> <p>This is important and we need to look into it, but also focus on mitigation for 2030</p> <p>Keen to understand CCS cost stretch and numbers if enhanced oil recovery is subtracted</p>	●
Norway	<p>More than 20 years' experience on Norwegian continental shelf, expertise in petroleum industry</p> <p>Possibility for job creation and skill transfer</p> <p>Longship project – commercial carbon storage project</p> <p>Exploring possibility for CCS waste-to-energy plant, burning residual waste for district heating – there are many sources of energy not just from power plants</p> <p>Safety of storage raised and happy to share experience and technological insight</p> <p>Changed four laws for CCS, major undertaking and overhauled national laws</p> <p>Using UNFCCC system and IPCC guidelines for MRV</p>	●
Australia	<p>Need to agree role of CCS. Follow science and be realistic and pragmatic. Cannot be used as an excuse</p> <p>Scale of deployment to achieve net zero without mass renewable energy deployment is not realistic</p> <p>Talk hard-to-abate sector</p> <p>IRENA report, CCS is not for propping up continued fossil fuel use, does have a role where other technologies cannot</p> <p>Why CCS is not deployed at scale to date?</p> <p>Barriers need to be addressed, lead time on projects, limited operational experience</p>	●
France	<p>CCS cannot be used as a delay in action</p> <p>Looking at all the modeling and forecasts it will play a role until 2030</p> <p>The actions we need to take in this critical decade needs renewables phase in, phase out of fossil fuels</p> <p>CCS primarily in hard-to-abate where no alternatives are available</p> <p>We know scientific facts provided by IPCC we see clearly pointed out availabilities and benefits that do provide various benefits for sustainable development. We know deployment of renewables are much more cost efficient</p> <p>CCS is included in the Net-Zero Industry Act</p>	●
Kenya	<p>Looking towards nature-based solutions</p>	●

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Colombia	<p>Expensive engineered CCS in CDR solutions cause of concern</p> <p>Poor mitigation results</p> <p>Promotion of fossil-fuel subsidies</p> <p>Tool for greenwashing?</p> <p>Hard-to-abate sector</p> <p>How is such an expensive technology being financed so far?</p>	●
Marshall Island	<p>CCS is unlikely viable option</p> <p>Interested because of hard to abate</p> <p>Share concern as Columbia that CCS is extension of fossil fuel infrastructure</p> <p>Shipping emissions concerns</p>	●
Indonesia	<p>CCS is topical issue in Indonesia</p> <p>12.2 BT CO₂ capacity from depleted oil and gas reservoirs the rest is saline aquifers, by 2030 25 MTCO₂ potential</p> <p>How can we commercialise storage?</p> <p>CCS is not for power sector. However natural gas is part of the transition period. Current newly developed for natural gas unlikely to receive finance to proceed with the projects</p> <p>Hard-to-abate expansion discussion of CCS to answer the question if it is part of the transition period</p>	●
Bolivia	<p>CCS needs to be connected to new understanding of the world and not to isolate the relationship between human beings and nature</p> <p>Also have in the context of moratorium of geo-engineering techniques</p>	●
Grenada	<p>What is the definition of energy transformation and the role of CCS in that?</p>	●
Samoa	<p>In IPCC AR6 report, CCS/CCU are among options with highest cost and least potential to contribute to emission reductions by 2030. Seeing the status of CCS, it is moving forward and clear that it has been around for years</p> <p>As a small island nation, see opportunity for CCS/CCU and need to ensure environmental standards and involvement in the energy transition and conduct an assessment on level of scalability</p>	●
Cuba	<p>We are facing huge challenges in Cuba in moving forward our energy/mitigation agenda and want to consider all options</p> <p>Want to learn more about CCS/CCU, how can we apply it to a small country like Cuba with some experience in fuel exploration production, want to know about economic feasibility and options for ideas to bring home and ready to engage and how beyond this meeting we can continue the dialogue</p>	●

Malawi	<p>In least developed countries CCS seems remote, however willing to learn from countries that have used it before, because it is an opportunity for us for energy transformation and to enhance energy security</p> <p>Look at this not to be substitute for climate actions but should complement climate actions we have outlined in NDCs</p> <p>Several challenges we envisage associated with CCS, significant is high cost involved in implementing the technology, the process from capturing from emission sources needs a lot of energy, challenge for least developed countries, need lessons and best practices from existing programs on safety.</p> <p>Small-sized private sector, mobilising domestic resources at scale needed in challenge and don't have financial or technical capacities to deliver</p> <p>Insufficient infrastructure in rural areas and further complicates energy security</p> <p>Policy and regulatory frameworks may not be conducive for attracting such investment, lack energy efficiency technology and have infrastructure gaps</p> <p>International cooperation to enhance such technologies for such energy transformation is key</p>	●
Panama	<p>Lack of practical knowledge and experience</p> <p>Concerns related to cost, impacts of storing carbon, understanding availability of storage in different countries, the scale of storage needed in the long-term</p> <p>Worth taking a look at, focus should be on reducing emissions</p>	●
Mexico	<p>Important to learn more about regulations, any experiences in MRV</p> <p>Build co-benefits with CCS with SDGs 3, 9 and 8, would like to know more how experiences are there. Don't have CCS in Mexico but would like to know more about it</p>	●

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