GLOBAL CCS INSTITUTE

Suggested topics for the Sharm el-Sheikh mitigation ambition and implementation work programme

The Global Carbon Capture and Storage Institute (GCCSI) is pleased to submit inputs to the Sharm el-Sheikh mitigation ambition and implementation work programme (MWP) on suggested topics in line with the scope of the work programme referred to in paragraph 4 of FCCC/PA/CMA/2022/L.17, para. 12 to be discussed under the dialogues.

Following on the discussions in 2023 on carbon capture, utilization and storage (CCUS), and in light of outcome of the first global stocktake in the UAE Consensus, there is a need for the use of CCUS in hard-to-abate sectors and CCS transport and storage networks to be discussed in a comprehensive and balanced manner.

While last year's discussions on CCUS were fruitful, a common thread expressed in interventions was that international cooperation on the technology is welcomed by several Parties. As reflected in the conversations in Bonn, CCUS is currently found to be politically, technically and financially more mature in countries such as the United States, Japan, Norway and the EU, and significantly progressing in countries such as Brazil, Saudi Arabia, Indonesia and China, with expressions of interest and/or early development in countries such as Brunei, Argentina, Papua New Guinea, Ethiopia and Zimbabwe. CCUS has also been shown to be increasingly mentioned in Nationally Determined Contributions (NDCs), as reported in the Global CCS Institute's annual Global Status Report, where last year's newcomers include Andorra, Singapore, Türkiye, Turkmenistan, the UK and Vietnam.

The upcoming global dialogues are aimed to be enhanced and expanded, with the participation of Non-Party Stakeholders encouraged through the High-Level Champions. The inclusion of the High-Level Champions is especially relevant for CCUS as they, with the Marrakech Partnership for Global Action, have developed a target of over 50 new CCS/U networks reaching FID by 2026, totalling 400 Mtpa in new capacity, as found in the 2030 Breakthroughs, which was launched in COP26.

Proposed thematic topic 1: CCUS in the hard-to-abate sector

According to the International Energy Agency (IEA), heavy industry sectors – steel, cement and chemicals – account for around 6 Gt (or around 70% of industrial emissions), meaning that reaching net zero emissions is impossible without dramatic reductions in emissions from these industries. Yet, demand for these products is set to grow in the context of a sustainable future for the energy system, given their extensive use in the construction of wind farms, nuclear power plants, transmission lines, electric vehicles and other clean energy infrastructure[1]. CCUS is a proven mitigation pathway for key industrial applications in these heavy emitting, hard-to-abate industries, as follows:

1. **Cement**: the cement industry is highly CO_2 emissions intensive where CO_2 emissions are an unavoidable by-product in cement manufacturing. On top of this, cement is produced at a temperature well above 600˚C, which is typically produced by the combustion of fossil fuels. The IEA estimates that in the Sustainable Development Scenario, close to one CCUS-equipped cement facility need come online per week between now and 2030, accelerating to 6 per month on average in the period 2030-70. Much of this capacity is retrofitted to existing plants or those currently under construction. This deployment hinges on a matching expansion of CO_2 transport and storage infrastructure[2]. CCUS is identified as a key-lever in the Global Cement and Concrete Association (GCCA) Roadmap to 2050 – 1 year on, accounting for 35% of emissions reductions by 2050 with a goal set for 10 fully operational CCUS facilities by 2030. There are now over 35

[1] https://www.iea.org/reports/achieving-net-zero-heavy-industry-sectors-in-g7-members/executive-summary
[2] https://www.iea.org/reports/ccus-in-clean-energy-transitions/ccus-in-the-transition-to-net-zero-emissions

projects publicly announced and underway with the GCCA member network, with up to a hundred more in the pipeline. These include the world's first cement CCS project is under construction at the Norcem cement plant in Brevik, Norway. Part of the Longship network, this project is intended to capture 400,000 tonnes per year of CO_2 and is expected to be operational in 2024. Cement is also proving to be an active sector for new CO_2 innovations.

2. **Iron and Steel**: There is one operational CCS plant in this sector, located at the Emirates Steel facility in Abu Dhabi, with a capture capacity of 800,000 tonnes per year of CO_2, significantly reducing the emissions of its host Direct Reduced Iron facility. Alternative, non-carbon-based ironmaking pathways are also in development, based on hydrogen as a reductant. These may form a basis for new iron and steelmaking facilities into the future. If successful, they could become another use for decarbonised hydrogen – including hydrogen produced from natural gas with CCS, known as 'blue hydrogen'.

3. **Chemicals**: This sector is a significant emitter of CO_2 especially when it comes to ammonia, a very important industrial chemical involved in the production of fertilisers, plastics, synthetic fibres, dyes, pharmaceuticals, cleaning products and garden fertilisers. Ammonia is synthesised using a reaction of nitrogen and hydrogen. Almost all the hydrogen used in ammonia production today is produced from fossil fuels, primarily with steam-methane reforming. A shift to decarbonised hydrogen, including blue hydrogen in large utility scale hydrogen plants, would enable deep decarbonisation of this essential sector.

Proposed thematic topic 2: CCUS transport and storage networks

From a social standpoint, emissions intense industries often develop in clusters due to resource, infrastructure, transport, workforce and supplier availability. Many local communities rely on these clusters to support their employment and local economy and CCUS can help protect jobs and communities by transforming these emissions-intense industries. In recent years, CCS transport and storage networks have emerged in various global jurisdictions. Such networks provide the benefit of reduced cost and commercial risk. Networks are typically established in industrial areas where a number of large emitters are located and, as such, will serve to accelerate mitigation in hard-to-abate industries and contribute significantly to domestic regional economies. Related to this, the transport of CO_2 from one country to another also highlights the need for an internationally and regionally focused approach to CCUS networking.

The continued growth to enable CCS to move to gigatonne scales globally, will depend on more CO_2 transport and storage over the coming decades. A discussion on CCUS networks in the MWP would also be a productive way to engage the private sector. Examples of existing CCS network projects include:

- ✓ **Iceland**: The Coda project leverages the low-cost basalt storage available in Iceland. This CO_2 terminal will enable CO_2 to be shipped from across Northwestern and Western Europe. CO_2 port infrastructure like Coda is expected to become a common feature of coastal CCS networks.

- ✓ **Norway**: The government's Northern Lights Project is the first ever cross-border, open-source CO_2 transport and storage infrastructure network and offers companies across Europe the opportunity to store their CO_2 safely and permanently underground. Phase one of the project will be completed in mid-2024 with a capacity of up to 1.5 million tonnes of CO_2 per year for 25 years. The Northern Lights network includes dedicated carriers shuttling CO_2 from particular individual CO_2 capture facilities in Oslo and Brevik. These early ships were adapted from existing LPG carrier designs.

- ✓ **Netherlands:** Supported by EU funding, the Porthos project aims to collect carbon dioxide from industry in the Rotterdam port area and transport it to storage locations under the North Sea. Porthos will act as an open-access utility for industries that have no viable decarbonization alternatives.

- ✓ **United Kingdom**: The East Coast Cluster is working to aggregate CO_2 captured from a multitude of industrial and energy facilities. In addition to these onshore pipeline networks, supporting infrastructure in the form of offshore pipelines and offshore storage facilities is being developed under the Northern Endurance Partnership. This large-scale offshore storage project will become essential infrastructure for the entire Humber and Teesside industrial region, enabling up to 27 Mtpa of captured CO_2 to be stored cost effectively.

- ✓ **United States**: The Houston Ship Channel CCS infrastructure project will involve the development of shared CO_2 pipelines in the Houston Ship Channel, with the use of shared infrastructure (pipelines and offshore storage wells in the Gulf of Mexico) to greatly improve the economics of CO_2 transport and storage in the region.