Forum: Sustainable Development Goal 13 Committee

Student Officer(s): Minh Hoang, Eric Yiming Chen, Jina Song

Please refer to the UNISMUN Libguide for further research.

TOPIC (#2): The question of Carbon Capture and Storage (CCS) technologies as a means to mitigate climate change

I. Introduction to the Topic

Carbon emissions are the greatest culprit of climate change, accounting for 76% of the total amount of greenhouse gasses released into the atmosphere. Greenhouse gasses envelop the earth due to the continuous burning of fossil fuels; excessive amounts of these gasses attract heat. This heat traps the sun's radiation, increasing the temperature of the Earth in a blanketing effect. As a result, global warming has occurred and subjected many habitats, environments, and humans to rapid changes. Global warming results in heavy environmental consequences of droughts, wildfires, and more. The average climate of the earth is projected to continuously rise throughout time, which would further amplify and polarize the challenges brought forth by climate change. With these dire issues expanding throughout the entire world, in cities and countryside, agriculture-heavy, and the Antarctic region, seeking a solution to limit carbon emissions has grown to be increasingly vital.

Reducing carbon emissions has become a joint global goal. Despite the need and goal of a greener world, the heavy economic repercussions of such efforts have prevented major progress. Especially for less developed countries or financially disadvantaged states, investments in green energy or carbon capture and storage technologies are a tremendous challenge. Although international organizations such as the United Nations strive for a zero-carbon economy, many countries are under the pressure of shifting their policies.

Many developed nations are dedicating significant monetary support to the establishment of state-owned carbon capture and storage facilities. More than 140 countries are committed to zero-carbon emissions, despite some being the largest individual sources of pollution. While a commitment to reducing carbon emissions is evident in many nations, some hesitate to make

substantial progress, influenced by the economic advantages associated with the ongoing use of fossil fuels. However, many nations have made visible progress by shifting governmental policies, such as Morocco's lift on natural gas funding. At its core, national action taken to reduce carbon emissions through means such as governmental policies or technological advancements relies heavily on the initiation and leadership of the global community.

At a more local level, climate change can have profound impacts that vary with the nation's environmental circumstances. Severe heat resulting from climate change can amplify the risk of wildfires. Hotter temperatures result in the evaporation of water from the soil, drying out the vegetation and causing fires. Such severe wildfire crises, such as the 2020 California wildfire which resulted from a prolonged drought, had detrimental effects on the local community, economy, and environment. Climate change was found to increase the risk of rapid wildfire spread to up to 25%. Additionally, severely cold regions such as the Arctic experience substantial rises in temperature, resulting in the melting of the vast ice caps. Such drastic climate change results in the loss of habitats and endangered species.

In other local contexts, regions characterized by elevated carbon emissions may be confronted with heightened health risks. Research has shown heightened risks of respiratory challenges including but not limited to diseases such as asthma, along with potential challenges related to insufficient oxygen delivery. The impact of these severe health symptoms is particularly pronounced in proximity to areas with substantial carbon emission sources, such as factories or urban centers. Disturbingly, the continuation of these health hazards resulted in a staggering 8.7 million deaths recorded in the year 2021 alone. This underscores the urgent need for targeted interventions and comprehensive strategies to mitigate the serious health outcomes associated with high carbon emissions in specific geographical contexts.

II. Definition of Key Terms & Concepts

Carbon Footprint: The calculation of the total amount of carbon emitted by an individual, community, country, or the world. Tracking carbon footprints in more individualized circumstances has been a method of increasing environmental responsibility and commitment for companies and individuals in many countries.

Carbon Capture and Storage (CCS): The collecting of carbon dioxide from industrial processes and facilities to store in a safe area. The storage occurs in a sequestration in an underground carbon pool. Currently, there are approximately 40 fully operational CCSs around the world, with 50 additional facilities projected to operate by 2030.

Carbon Sequestration: The process of capturing carbon dioxide and storing it as a stable solid or dissolved form to prevent pollution or impact on the atmosphere. Carbon sequestration primarily occurs underground. Although this occurs naturally in many caves, new technologies have been developed to perform the sequestration as the last step of the CCS process.

Greenhouse Effect: The trapping of gasses such as carbon dioxide, nitrous oxide, and methane in the atmosphere, which creates heat. Such gasses envelop the earth's atmosphere and cause global warming.

Risk Management: A policy that producers, users, or governments often conduct to minimize and record the risk of certain technologies. Risk Management is a crucial step in implementing and utilizing CCS technologies due to its potential to harm the local environment if the facility is unstable.

Technological Readiness Level: A measure of determining how ready or mature a technology is for use. This scale is used to determine whether a technology is ready to be used in a 1-9 scale, and is significant because it predicts a technology's safety and effectiveness. CCS is currently at a mature technological readiness level fully ready for usage, as seen by previous successful trials and field tests.

III. Key Stakeholders

Arab League: The Arab League is an organization of 22 Arab nations, a powerful group of nations holding vast oil reserves in their national economy. This league is an economically self-sustained group that is moving forward to reduce carbon emissions resulting from fossil fuels. Collaborating with other international environmental organizations such as the GCC (Global Carbon Council), these nations are projecting to make progress in the coming years.

European Union Emissions Trade System (EU ETS): An official European Union sector that centers efforts on pursuing an economically and socially viable future for sustainable energy sources. As an intergovernmental organization of European nations, which includes the most active and economically capable practitioners of CCS, creates opportunities for improved solutions and support for less developed areas.

Global Carbon Council (GCC): This is an international organization that advocates and economically supports nations around the world to strive for lower carbon emissions. In collaboration with many intergovernmental organizations such as the World Sustainable Business Forum (WSBF) and domestic governments, the GCC is a major contributor to economically viable and equal carbon decrease movements.

International Energy Agency (IEA): An intergovernmental organization that provides guidelines, and statistics, and promotes global communication concerning energy. This organization is very significant to the energy sector because it is a widely recognized and historically established organization that provides energy information and data monitoring.

The Intergovernmental Panel on Climate Change (IPCC): A leading climate action group that performs regular assessments of climate change impacts. This organization is also a leading research organization committed to advancing knowledge on technologies for mitigating climate change. The World Meteorological Organization and the United Nations established this panel in 1988 as a means to focus on the world's rapidly changing environment, with 195 countries involved.

IV. Key Issues including Background Information

Humanitarian Crises: At the core of the carbon dioxide issue lies the inevitable connection between climate change and its far-reaching consequences. Over recent years, the undeniable trend of global warming has manifested in consistent increases in average temperatures worldwide. Although at a deceptively slight temperature increase of the overall world temperature, record heat has been a source of global attention these past years. According to the Intergovernmental Panel on Climate Change (IPCC), these temperature rises are leading to unmistakable changes in weather patterns, expanding the frequency and intensity of extreme events. This necessitates a profound adaptation in countries across the globe to cope with the transforming environment, altered natural resources, and more. These dramatic changes in climate, marked by prolonged droughts, rising ocean levels, and the looming threat of famines, pose severe challenges to the very fabric of human societies. For instance, regions like sub-Saharan Africa and parts of South Asia are already experiencing heightened vulnerabilities, with water scarcity and agricultural disruptions leading to food insecurities. The destruction caused by global warming has long been predicted to trigger mass humanitarian crises, particularly in less developed regions that lack the resources and infrastructure to mount effective responses to such calamities. Statistics from UTCAD show that in 2019, least-developed countries (LDCs) were accountable for only 4% of the world's carbon emissions. A paradoxical fact is that almost 70% of climate-related deaths occurred in LDCs.

Reliance on fossil fuel: Historically, fossil fuels have been utilized as a primary source of energy in the world since the Industrial Revolution, which occurred in the 19th century. While many countries that possess fossil fuels rely on their fuel export as a primary source of economic growth, they face criticism and scrutiny on the harmful consequences these fuels inflict on the environment. As the world collectively strives to transition towards a zero-carbon economy, countries heavily dependent on fossil fuel exports face the great risk of losing a central economic asset. Intriguingly, some of the key contributors to global carbon emissions are also at the forefront of sustainable technologies. Notably, nations like China, the United States, India, Russia, Japan, and Germany collectively account for a staggering 60% of the world's carbon emissions. The fuels and carbon emissions are less prevalent in developing countries where agriculture remains a primary source of economic gains. While these nations benefit from the

continuous use of fossil fuels, some of these nations have also been among the most dedicated pursuers of sustainable technologies. Additionally, many countries have begun to turn away from their reliance on fossil fuels through various methods such as the promotion of electric cars, solar panels, or hydroelectric power. However,

Economic Implications of moving towards zero-carbon emissions:

While there have been rapid technological advancements to decrease the world's reliance on fossil fuels, the greatest culprits of carbon emissions, there has been a lack of significant increase in adopting sustainable technologies. Renewable, lower-carbon energy sources such as hydroelectric power, solar power, or wind power are being used throughout the world, but are still responsible for less than 30%. Such renewable sources of energy carry high upfront costs compared to the continuous use of fossil fuels. However, once implemented, these technologies often have the lowest costs. For instance, hydroelectric power only costs $0.05 per kW, according to the HydroReview. Because many nations are unwilling or unable to completely commit to zero-emission energy sources, continuous carbon emissions are virtually inevitable. Especially as LDCs advance into more industrialized economics, the reliance on fossil fuels will need to be protected by carbon-capturing technology. The overwhelming majority of energy that relies on fossil fuels inadvertently results in high carbon emissions. Combined efforts of choosing alternative sources of energy and preventative measures for post-fossil fuel usage are being balanced and considered in the present world. As a complete removal of fossil fuel reliance is not viable in the current world, striking a balance and alternative methods to minimize the harm is critical.

V. Timeline of Resolutions, Treaties, and Events

Date	Description of event
1920	Early CO2 capture technologies were discovered and used minorly in natural gas reservoirs to separate CO2 to enhance oil recovery.

1970	CCS technologies were successfully utilized in gas processing plants in Texas, and the United States, and spread throughout the United States.
2005	Carbon Capture and Storage Association (CCSA) was established to spread and lead world CO2 capture facilities worldwide.
2015	The Paris Agreement was signed by the UN Climate Change Conference to commit international resources and cooperation to limit global warming.
2017	In the Petra Nova Plant, a Texas-based CO2 capture project became the most successful large-scale CO2 capturing technology.
2022	The capacity of CCS facilities worldwide increases by 44%, marking a surge in CCS utilization and planning.
2023	European Commission recognizes the need for CCS as part of the plan to achieve a net-zero, implementing more CCS technologies.

VI. Possible Challenges & Solutions

Carbon Sequestration Location: Carbon sequestration is required to be in a deep underground location in a stable environment. A critical environmental issue regarding the storage location is the amount of infrastructure, cost, and machinery required for the establishment of the facility. Especially because carbon leakage could have detrimental effects on the operators and the environment, building a strong and lasting infrastructure is a critical focus. However, areas lacking the technologies, engineers, or materials could suffer from inadequate and unsafe sequestration locations. Locating adequate facility areas remains a challenge for geographically disadvantaged nations with lower land areas, mountainous terrain, or earthquake-prone areas.

Groundwater pollution: As a major point in the risk assessment of CCS, the dangers of carbon leakage and groundwater pollution are crucial decisions before many states implement the technology. Constant maintenance is needed for effective mitigation of groundwater pollution, which could be a result of carbon leakage in sequestration facilities. Such maintenance requires incremental monitoring and repairs in increments which could be up to centuries long. Because many facilities hold carbon dioxide emissions rather than shifting them into more stable and friendly forms, such as mineralization into solid forms, the constant challenge of carbon sequestration is a major concern. Moreover, in the case of an unstable sequestration facility or the occurrence of natural disasters such as earthquakes, high levels of carbon leakage could have detrimental effects on the environment.

Economic: Carbon capture and sequestration can have varying cost levels depending on the distance and method of the technology maintenance, establishment, and materials needed. CCS technologies have yet to be widely deployed in higher-scale projects, but the current costs of the technology are high due to the complexity of the engineering and maintenance. Especially compared to other technologies aimed to lower carbon emissions such as solar and wind power, the costs of CCS are not economically advantageous. This poses debates and concerns amongst nations aiming to select the most effective path toward achieving zero carbon emission, and many CCS projects have been shut down due to the high economic toll. CCS has also been criticized for being inefficient and not mature enough to be a safe and reliable method of mitigating carbon emissions.

VII. Recommendations for Resolution Writing including Research

When writing your resolutions, you should first consider your country's position on this issue. Are they a major contributor to carbon technologies? Are they against it? After understanding your county's historical circumstances and priorities concerning the issue, you could consider the following issues explained above. First, you could try to address the issue through international, legally binding, or domestic methods. Because all nations have different opinions and stances, keeping your operative clauses more open and less forcing on the countries could help more nations be open to your resolution.

Delving into the objectives of specific countries, a country that is highly technologically and economically developed could propose to rapidly expand CCS technologies. One idea to minimize carbon emissions globally could be to propose economic incentives or global partnerships with less developed countries to expand CCS usage. To provide concrete evidence for such monetary funding, researching further into your country's past economic support for global issues could be beneficial. If your country is less developed, your resolutions could center around international support and trade regarding CCS technologies. Because adopting a vast CCS system would be nonviable for a less developed country, building partnerships to fund such technology would greatly benefit your country. Your research could evolve around international organizations for clean energy.

Furthermore, countries responsible for producing high levels of carbon emissions, such as oil-rich members of the Arab League, could take the position of being against CCS. This is because a global effort to achieve a net zero would mean that the Arab countries' primary source of income would be cut off in the future. If your country is heavily dependent on fossil fuels which produce carbon dioxide, your research could be centered on the negative effects of CCS. This could include economic inviability, lack of efficiency, or other methods to minimize CCS usage. To combat such drawbacks, you could research further about methods to ensure CCS safety, proposing international guidelines or regulations for its implementation.

VIII. Bibliography

Works Cited

"A Brief History of CCS and Current Status." *IEAGHG R&D Programme*, International Energy Association Greenhouse Gas R&D Programme, ieaghg.org/docs/General_Docs/Publications/Information_Sheets_for_CCS_2.pdf. Accessed 4 Jan. 2024.

Budinis, Sara, et al. "Carbon Capture, Utilisation and Storage." *IEA*, International Energy Association, 23 July 2023, www.iea.org/energy-system/carbon-capture-utilisation-and-storage. Accessed 4 Jan. 2024.

"Carbon Capture and Storage Can Help Us Beat Climate Change." *World Economic Forum*, 20 Dec. 2020, www.weforum.org/agenda/2020/12/carbon-capture-and-storage-can-help-us-beat-climate-change/. Accessed 5 Jan. 2024.

"Carbon Capture, Storage and Utilisation." *European Commission*, European Union, energy.ec.europa.eu/topics/oil-gas-and-coal/carbon-capture-storage-and-utilisation_en. Accessed 4 Jan. 2024.

Carter, Angela, et al. "Why the Cost of Carbon Capture and Storage Remains Persistently High." *International Institute for Sustainable Development*, 7 Sept. 2023, www.europarl.europa.eu/news/en/headlines/society/20230316STO77629/climate-change-the-greenhouse-gases-causing-global-warming. Accessed 4 Jan. 2024.

"For a Livable Climate: Net-zero Commitments Must Be Backed by Credible Action." *UN*, United Nations, www.un.org/en/climatechange/net-zero-coalition. Accessed 4 Jan. 2024.

Kulichenko, Nataliya, et al. "Capturing and Storing Carbon: The World Bank's Role." *World Bank Group*, openknowledge.worldbank.org/server/api/core/bitstreams/c9075932-a802-549e-9a50-1515790f6478/content. Accessed 4 Jan. 2024.

National Grid. "What Is Carbon Capture and Storage?" *National Grid*, 28 Feb. 2023, www.nationalgrid.com/stories/energy-explained/what-is-ccs-how-does-it-work. Accessed 4 Jan. 2024.

Parker, Grace. "Carbon, Capture, and Storage: History, Current State, and Obstacles for the Future (Part 1)." *Environmental Law Institute*, 27 Dec. 2021,

www.eli.org/vibrant-environment-blog/carbon-capture-and-storage-history-current-state-and-obstacles-future-part. Accessed 4 Jan. 2024.

Roser, Max. "Data Review: How Many People Die from Air Pollution?" *Our World in Data*, 25 Nov. 2021, ourworldindata.org/data-review-air-pollution-deaths#:~:text=(2021)%20in%20Environmental%20Research%3A,caused%20by%20burning%20fossil%20fuels. Accessed 4 Jan. 2024.

UNCTAD. "Smallest Footprints, Largest Impacts: Least Developed Countries Need a Just Sustainable Transition." *UNCTAD*, United Nations Conference on Trade and Development, unctad.org/topic/least-developed-countries/chart-october-2021. Accessed 4 Jan. 2024.

World Wild Life. "Effects of Climate Change." *WWL*, World Wild Life, www.worldwildlife.org/threats/effects-of-climate-change#:~:text=More%20frequent%20and%20intense%20drought,on%20people's%20livelihoods%20and%20communities.&text=As%20climate%20change%20worsens%2C%20dangerous,becoming%20more%20frequent%20or%20severe. Accessed 4 Jan. 2024.

IX: Additional Resources

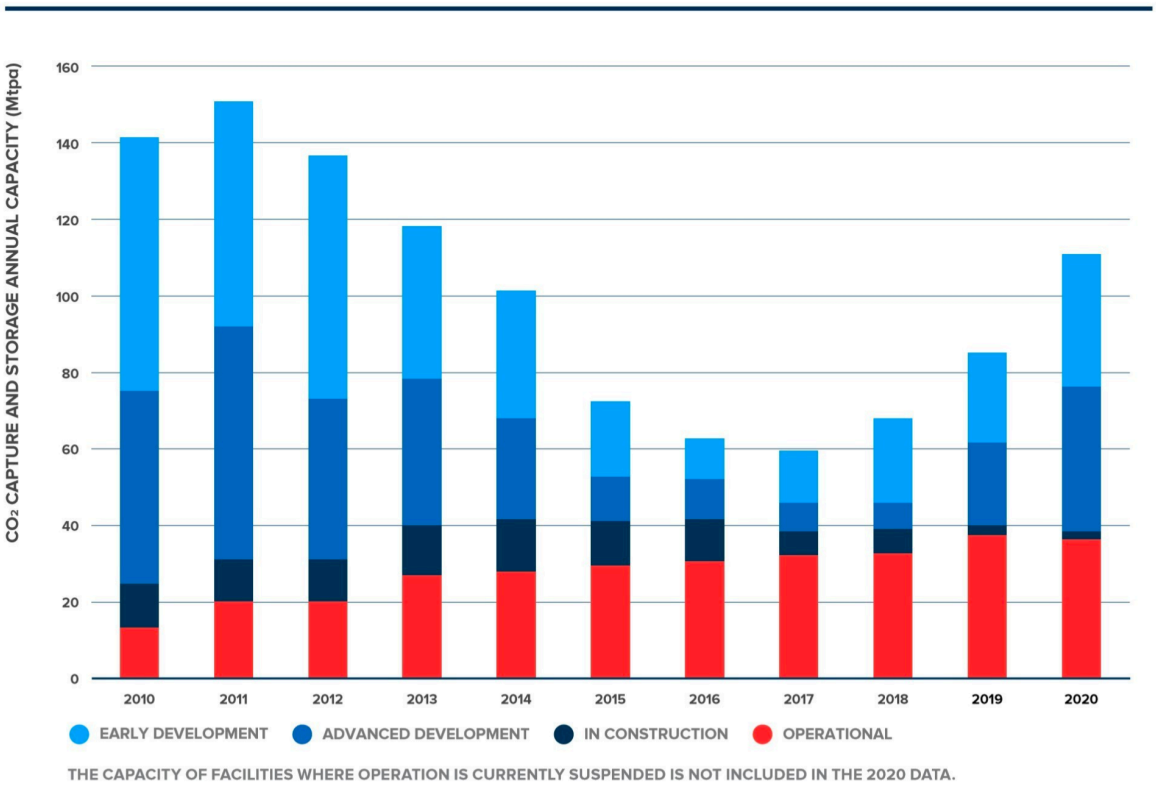

FIGURE 4 PIPELINE OF COMMERCIAL CCS FACILITIES FROM 2010 TO 2020: CCS CAPACITY[i]