

A Legal Reflection on the Deployment of Carbon Capture and Storage in Developing Countries Through the Lens of Differentiation under the Paris Agreement

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ABSTRACT

Some developing countries are keen on using carbon capture and storage to mitigate climate change, partly as a result of the climate commitments made by States under the Paris Agreement. One of the main pillars of the Agreement, which determines the climate duties and rights of States, is the concept of differentiation. The Agreement articulates the principle of common but differentiated responsibilities and respective capabilities in the light of different national circumstances by customizing commitments to the specificities of each of the Durban pillars—mitigation, adaptation, finance, technology and capacity-building. This article considers to what extent the modernized concept of differentiation is reflected in the provisions on mitigation, financial and technical supports and capacity building under the Agreement and how this may influence the deployment of carbon capture and storage in developing countries. While the Agreement represents a significant shift away from the traditional differentiation approach, the obligation to provide financial and technological support for mitigation efforts continues to fall predominantly on developed states. The innovative endeavours pertaining to expanding the mitigation commitments to both parties, the concept of ‘progression’, encouraging ‘other Parties’ to provide finance voluntarily, and introducing funding goals may have a positive influence on carbon capture and storage development projects in the future.

INTRODUCTION

Differentiation is a primary component of the international climate change regime as it determines the level of responsibility developed and developing countries have to take on¹. Differentiation between

parties under the United Nations Framework Convention on Climate Change² (UNFCCC) is founded on the principle of common but differentiated responsibilities and respective capabilities (CBDRRC) and an acknowledgement

¹ Benito Müller, Niklas Höhne and Christian Ellermann, ‘Differentiating (Historic) Responsibilities for Climate Change’ (2009) 9 Climate Policy 593; Pieter Pauw, Kennedy Mbeva and Harro van Asselt, ‘Subtle Differentiation of Countries’

Responsibilities under the Paris Agreement’ (2019) 5 Palgrave Communications 86.

² United Nations Framework Convention on Climate Change, New York, 9 May 1992, in force 21 March 1994.

that developed countries should lead the global effort to address climate change³. This positive discrimination in favour of developing countries has resulted in bifurcated obligations and processes⁴. The Kyoto Protocol⁵ went considerably further in this direction by establishing a rigorous binary differentiation system in which only Annex I parties had legally binding mitigation obligations⁶.

Two decades later, bifurcated and binary differentiation between parties proved to be controversial topics throughout the climate negotiations⁷. This was mainly due to the increasing change in differences between individual countries as well as national circumstances⁸. The Paris Agreement⁹ (hereinafter the ‘Agreement’) developed a new approach to addressing the differences between developed and developing countries by establishing core obligations for all parties, modernizing the principle of common but differentiated responsibilities by adding the concept of ‘in the light of different national circumstances’

(CBDRRC-NC)¹⁰ and addressing differentiation in a variety of ways¹¹.

The Agreement articulates the CBDRRC-NC by customizing commitments to the specificities of each of the Durban pillars—mitigation, adaptation, finance, technology and capacity-building—rather than by tailoring commitments to categories of parties¹². This modernized concept altered developed countries’ rights and duties as contributors to the international reaction to climate change and as receivers of support (in forms of finance, technology development and transfer and capacity-building)¹³ under the Agreement as compared to its predecessors (UNFCCC and the Kyoto Protocol).

Countries’ mitigation contributions are primarily located in their nationally determined contributions (NDCs)¹⁴. As a tool to ensure the achievement of their mitigation commitments under the Agreement, a number of countries, mainly developing ones, have featured carbon capture and storage (CCS) in their NDCs¹⁵. CCS can reduce emissions from energy-

³ *ibid* Art. 3.1.

⁴ Christina Voigt and Felipe Ferreira, ‘Differentiation in the Paris Agreement’ (2016) 6 *Climate Law* 58.

⁵ Kyoto Protocol to the United Nations Framework Convention on Climate Change, Kyoto, 11 December 1997, in force 16 February 2005.

⁶ Voigt and Ferreira (n 5).

⁷ Alexander Thompson, ‘Emerging Powers and Differentiation in Global Climate Institutions’ (2020) 11 *Global Policy* 61.

⁸ Harro van Asselt, Michael Mehling and Clarisse Kehler Siebert, ‘The Changing Architecture of International Climate Change Law’ in Geert Van Calster, Wim Vandenberghe and Leonie Reins (eds), *Research Handbook on Climate Change Mitigation Law* (Edward Elgar Publishing 2015) 17–18 <<http://www.elgaronline.com/view/9781849803809.xml>> accessed 17 September 2021.

⁹ Paris Agreement to the United Nations Framework Convention on Climate Change, Paris, 12 December 2015, in force 4 November 2016; ‘Adoption of the Paris Agreement’, UNFCCC Dec. 1/CP.21 2015.

¹⁰ The additional phrase was presented in order to ensure an adaptation of differentiation and equity, which suited the various groups and parties involved in the negotiation process.

¹¹ Ralph Bodle and Sebastian Oberthür, ‘Legal Form of the Paris Agreement and Nature of Its Obligations’ in Daniel R Klein and others (eds), *The Paris agreement on climate change: analysis and commentary* (Oxford University Press 2017) 97.

¹² Lavanya Rajamani and Emmanuel Guerin, ‘Central Concepts in the Paris Agreement and How They Evolved’ in Daniel Klein (ed), *The Paris Agreement on climate change: Analysis and commentary* (Oxford University Press 2017) 84.

¹³ Decision 1/CP.17, Establishment of an Ad Hoc Working Group on the Durban Platform for Enhanced Action, FCCC/CP/2011/9/Add.1 (15 March 2012) para 5

¹⁴ The Paris Agreement Art. 4.2.

¹⁵ Reza Maddahi, ‘Carbon Capture and Storage under the Paris Agreement: A Legal Appraisal of Compatibility and Opportunities’ (2019) 31 *Environmental Law and Management* 183.

intensive industries (e.g. cement, steel and chemicals) and power plants (e.g. coal and gas facilities)¹⁶. It can also be used for carbon removal from the atmosphere by providing the foundation for technology-based carbon removal, including direct air capture with carbon storage (DACCS) and bio-energy with carbon capture and storage (BECCS)¹⁷. A significant number of studies have concluded that developed countries should take the lead in establishing CCS and create a stronger framework of incentives for action in developing countries¹⁸. Deploying CCS in developing countries, as a mitigation option, is effected through the modernized approach of differentiation under the Agreement, which presents a new set of opportunities and obligations. The Agreement's provisions regarding mitigation, finance, technology transfer and capacity building are the most relevant in relation to CCS. This article engages in a close analysis of legal discourse and considers to what extent the issue-specific trend towards further differentiation has expanded to the (contested) issue areas, i.e. mitigation, supports and capacity building. It also explores developing countries' most relevant rights and duties under the Agreement in order to

demonstrate the extent to which the new approach to differentiation may impact the drivers of CCS under the Agreement as compared to its predecessors, the UNFCCC and Kyoto Protocol.

1. CCS as a tool for tackling climate change

Global climate change authorities such as the Intergovernmental Panel on Climate Change (IPCC) have addressed the role that some technologies will need to play to limit global warming from 1.5°C to 2°C.

In its Special Report titled 'Global Warming of 1.5°C' (2018), the IPCC states that 'Studies have shown the importance of CCS for deep mitigation pathways (Krey and others 2014a; Kriegler and others 2014b), based on its multiple roles to limit fossil fuel emissions in electricity generation, liquids production, and industrial applications along with the projected ability to remove CO₂ from the atmosphere when combined with bioenergy. This remains a valid finding for those 1.5°C and 2°C pathways that do not radically reduce energy demand or do not offer carbon-neutral alternatives to liquids and gases that do not rely on bioenergy'¹⁹. It also notes that '[i]n energy-intensive processing industries, 1.5°C-

¹⁶ Bert Metz and Intergovernmental Panel on Climate Change (eds), IPCC Special Report on Carbon Dioxide Capture and Storage (Cambridge University Press, for the Intergovernmental Panel on Climate Change 2005).

¹⁷ Eve Tamme, 'Carbon Removal with CCS Technologies' (Global CCS Institute 2021) 4 <<https://www.globalccsinstitute.com/wp-content/uploads/2021/02/Carbon-Removal-with-CCS-Technologies.pdf>>.

¹⁸ Hengwei Liu and Kelly Sims Gallagher, 'Catalyzing Strategic Transformation to a Low-Carbon Economy: A CCS Roadmap for China' (2010) 38 Energy Policy 59; David G Ockwell and others, 'Key Policy Considerations for Facilitating Low Carbon Technology Transfer to Developing Countries' (2008) 36 Energy Policy 4104; Amit Garg and PR

Shukla, 'Coal and Energy Security for India: Role of Carbon Dioxide (CO₂) Capture and Storage (CCS)' (2009) 34 Energy 1032.

¹⁹ IPCC, 'Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty' (IPCC 2018) 134 <https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf> accessed 13 November 2019.

compatible trajectories require radical technology innovation through maximum electrification, shift to other low emissions energy carriers such as hydrogen or biomass, integration of carbon capture and storage (CCS) and innovations for carbon capture and utilization (CCU)²⁰.

The IPCC's Fifth Assessment Report (AR5 Synthesis Report: Climate Change 2014) argues that 'many models cannot reach 450 ppm CO₂-eq concentration by 2100 in the absence of carbon dioxide capture and storage (CCS)'²¹. It adds that '[s]cenarios that are likely to maintain warming at below 2°C include more rapid improvements in energy efficiency and a tripling to nearly a quadrupling of the share of zero- and low-carbon energy supply from renewable energy, nuclear energy and fossil energy with carbon dioxide capture and storage (CCS) or BECCS [Bioenergy with Carbon Capture and Storage] by the year 2050'²².

Currently, 24 developing countries are involved in different stages of deployment of CCS projects. Their efforts include capacity development, pre-investment and planning activities and project operation or development. Most of them are at the early stage of scoping out the opportunities and potential for CCS²³. A further seven nations have expressed 'early interest', for example by identifying CCS in their technology needs assessments under the UNFCCC²⁴. Moreover, nine developing countries have added CCS to their NDCs²⁵.

1.1 CCS and the interests of developing countries

Developing countries are the most vulnerable vis-a-vis the climate change crisis²⁶. Anthropogenic emissions of greenhouse gases (GHGs), primarily carbon dioxide (CO₂)²⁷ from fossil fuel combustion and industrial processes, are major contributors to climate change,²⁸ prompting the need to stabilize the amount of CO₂ in the atmosphere²⁹. In spite of that, in 2013, coal, gas, and oil accounted for 81% of

²⁰ *ibid* 460.

²¹ IPCC, Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (RK Pachauri and Leo Mayer eds, Intergovernmental Panel on Climate Change 2015) 28 <https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf>.

²² *ibid* 82.

²³ Francisco Almendra and others, 'CCS Demonstration in Developing Countries: Priorities for a Financing Mechanism for Carbon Dioxide Capture and Storage' (World resources institute 2011) <https://files.wri.org/d8/s3fs-public/ccs_demonstration_in_developing_countries.pdf>.

²⁴ 'Technology Needs Assessment Country Reports' <<https://unfccc.int/tclear/tna/reports.html>> accessed 5 September 2021.

²⁵ Maddahi (n 16).

²⁶ James J McCarthy and Intergovernmental Panel on Climate Change (eds), 'Vulnerability to Climate Change and Reasons for Concern: A Synthesis', Climate change 2001: impacts, adaptation, and vulnerability: contribution of

Working Group II to the third assessment report of the Intergovernmental Panel on Climate Change (Cambridge University Press 2001) 916.

²⁷ M Stuiver and PD Quay, 'Atmospheric 14C Changes Resulting from Fossil Fuel CO₂ Release and Cosmic Ray Flux Variability' (1981) 53 Earth and Planetary Science Letters 349; SA Montzka, EJ Dlugokencky and JH Butler, 'Non-CO₂ Greenhouse Gases and Climate Change' (2011) 476 Nature 43, 43.

²⁸ IPCC, 'Summary for Policymakers', Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (IPCC 2018) 5 <https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_HR.pdf> accessed 13 November 2019; IPCC, Climate Change 2014 (n 22) 4.

²⁹ IPCC, Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (Core Writing Team, Rajendra K Pachauri and Andy Reisinger eds, IPCC 2007) 66 <https://www.ipcc.ch/site/assets/uploads/2018/02/ar4_syr_full_report.pdf>.

worldwide primary energy consumption³⁰. If the dependency on fossil fuels for economic growth stays unaltered, substantially larger quantities of CO₂ will be generated in developing countries³¹.

To meet climate change targets, the world must drastically reduce the use of fossil fuels³². However, such a fundamental shift as decarbonizing the world economy will be felt differently in different parts of the world³³. The strong correlation between economic development and energy consumption³⁴ highlights the issue of how GHG emissions of fossil fuels should be reduced in developing countries.

Fossil fuel emissions should be managed in developing countries without neglecting national development plans. CCS, among other options, facilitates the achievement of these two goals. Although the idea of prolonging the use of fossil fuels faces serious opposition in some quarters,³⁵ CCS may help developing countries to progressively transition away from the use of fossil fuels to meet energy and industrial needs with minimal

interruption to their long-term development goals³⁶. This strategy may allow developing countries to make the transition to a low-carbon economy during the next 15 to 50 years³⁷. By offering a solution to the dilemma as to how to manage fossil fuel emissions without hampering national development, CCS plays a significant role in bringing developing nations to the climate change negotiating table while still allowing them to rely on fossil fuels for a given period in order to facilitate a gradual and just transition to renewable energy sources³⁸.

1.2 Barriers to the large-scale deployment of offshore CCS

Deployment of large-scale CCS projects has been slow. The Global CCS Institute – a think tank that seeks to promote CCS – has identified 38 large-scale CCS projects around the world that are currently in operation, under construction, or at various stages of development planning³⁹. Two large scale CCS facilities are in operation in Europe,⁴⁰ capturing a total of 1.55 Mtpa CO₂ for offshore geological

³⁰ International Energy Agency, World Energy Outlook 2019 (2019) <<https://www.iea.org/topics/world-energy-outlook>>.

³¹ Xia Cao, 'Climate Change and Energy Development: Implications for Developing Countries' (2003) 29 Resources Policy 61, 61.

³² Dan Welsby and others, 'Unextractable Fossil Fuels in a 1.5 °C World' (2021) 597 Nature 230; Victoria R Clark and Howard J Herzog, 'Can "Stranded" Fossil Fuel Reserves Drive CCS Deployment?' (2014) 63 Energy Procedia 7261.

³³ Victoria R Nalule, 'Transitioning to a Low Carbon Economy: Is Africa Ready to Bid Farewell to Fossil Fuels?' in Geoffrey Wood and Keith Baker (eds), The Palgrave Handbook of Managing Fossil Fuels and Energy Transitions (Springer International Publishing 2020) <http://link.springer.com/10.1007/978-3-030-28076-5_10> accessed 28 April 2021.

³⁴ Jeff Tollefson, 'Can the World Kick Its Fossil-Fuel Addiction Fast Enough?' (2018) 556 Nature 422, 422; Vijaya Ramachandran, 'Blanket Bans on Fossil-Fuel Funds Will Entrench Poverty' (2021) 592 Nature 489.

³⁵ NOAH friends of the earth Denmark, '10 Arguments against CCS' <http://ccs-info.org/ten_arg.pdf> accessed 16 September 2021.

³⁶ Filip Johnsson, Jan Kjærstad and Johan Rootzén, 'The Threat to Climate Change Mitigation Posed by the Abundance of Fossil Fuels' (2019) 19 Climate Policy 258.

³⁷ MoonSook Park, 'Study On Legal Systems For Transboundary CCS Implementation And Transboundary Environmental Liability Regarding CCS' (2020) 16 Loyola University Chicago International Law Review 45.

³⁸ Almendra and others (n 24).

³⁹ 'The Global Status of CCS: 2016 Summary Report' (Global CCS Institute 2016) 7 <<https://www.globalccsinstitute.com/archive/hub/publications/201158/global-status-ccs-2016-summary-report.pdf>>.

⁴⁰ Two operational projects are in Norway: the Sleipner CO₂ Storage Project and Snøhvit CO₂ Storage Project.

storage as of 2019⁴¹. Looking into the future, only a few NDCs feature CCS as a priority area⁴². The Global CCS Institute estimates that more than 2000 large-scale CCS installations must be deployed by 2050 in order to achieve climate mitigation goals under the Agreement⁴³.

Although CCS is viewed a key technique to significantly reduce global CO₂ emissions a number of challenges must be addressed before large-scale CCS implementation can occur, particularly in developing countries⁴⁴. Fundamental doubts seem to remain among communities and policymakers about the viability and effectiveness of CCS deployment⁴⁵. Some countries view CCS as an appropriate bridging technology towards a low or zero emission future as it allows for ongoing use of fossil fuels without further exacerbating climate change⁴⁶. However, other countries, together with various NGOs and

environmentalists, see this as a negative feature and criticize the use of CCS on the grounds, inter alia, that it prolongs the world's fossil fuel dependency, may be a barrier to greater utilization of renewable power⁴⁷ and can be linked to leakage and environmental risks⁴⁸.

Against this backdrop, scaling up the usage of CCS to meet climate ambitions is a significant challenge. The existence of adequate geo-storage capacity for the captured CO₂ is a fundamental requirement for the success of CCS projects⁴⁹. Furthermore, other factors that can help bring CCS projects into operation include secure funding⁵⁰ and social awareness and acceptance,⁵¹ as well as supportive

⁴¹ 'CCS Facility Data from the Global CCS Institute Database CO2RE.' <<https://co2re.co/FacilityData>> accessed 5 March 2021.

⁴² To access all NDCs and INDCs, see 'NDC Registry' <<https://www4.unfccc.int/sites/NDCStaging/Pages/Home.aspx>> last accessed 3 October 2021.

⁴³ 'Carbon Capture and Storage: Challenges, Enablers and Opportunities for Deployment' (Global CCS Institute, 30 July 2020) <<https://www.globalccsinstitute.com/news-media/insights/carbon-capture-and-storage-challenges-enablers-and-opportunities-for-deployment/>> accessed 18 August 2020.

⁴⁴ Metz and Intergovernmental Panel on Climate Change (n 17) 36; Ying Fan, Lei Zhu and Xiaobing Zhang, 'Analysis of Global CCS Technology, Regulations and Its Potential for Emission Reduction with Focus on China' (2011) 2 *Advances in Climate Change Research* 57, 58.

⁴⁵ PS Ringrose and TA Meckel, 'Maturing Global CO₂ Storage Resources on Offshore Continental Margins to Achieve 2DS Emissions Reductions' (2019) 9 *Scientific Reports* 17944, 1.

⁴⁶ Zhihua Zhang and Donald Huisigh, 'Carbon Dioxide Storage Schemes: Technology, Assessment and Deployment' (2017) 142 *Journal of Cleaner Production* 1055, 1055; Sara Budinis and others, 'An Assessment of CCS Costs, Barriers and Potential' (2018) 22 *Energy Strategy Reviews* 61, 61.

⁴⁷ 'What Is Carbon Capture and Storage?' (Center for International Environmental Law) <<https://www.ciel.org/issue/carbon-capture-and-storage/>> accessed 4 October 2021; Paul Upham and Thomas Roberts, 'Public Perceptions of CCS: Emergent Themes in Pan-European Focus Groups and

Implications for Communications' (2011) 5 *International Journal of Greenhouse Gas Control* 1359; DM Reiner and others, 'American Exceptionalism? Similarities and Differences in National Attitudes Toward Energy Policy and Global Warming' (2006) 40 *Environmental Science & Technology* 2093.

⁴⁸ Yuanrong Zhou, 'Carbon Capture and Storage: A Lot of Eggs in a Potentially Leaky Basket | International Council on Clean Transportation' (17 January 2020) <<https://theicct.org/blog/staff/carbon-capture-storage-and-leakage>> accessed 20 September 2021.

⁴⁹ Mai Bui and others, 'Carbon Capture and Storage (CCS): The Way Forward' (2018) 11 *Energy & Environmental Science* 1062, 1065; Budinis and others (n 47) 65.

⁵⁰ IPCC, 'Global Warming of 1.5°C' (n 20) 136; Ringrose and Meckel (n 46)

1. The recent CCS Feasibility report done by the Shand which is based on an independent study of the construction and design of SaskPower's 'Boundary Dam 3 CCS project', demonstrated a significant reduction of up to 67% per tonne of captured CO₂. For further information on this report, see International CCS Knowledge Center, 'The Shand CCS Feasibility Study; Public Report' (International CCS Knowledge Center 2018) <https://ccsknowledge.com/pub/documents/publications/Shand%20CCS%20Feasibility%20Study%20Public%20_Full%20Report_NOV2018.pdf> accessed 29 November 2019.

⁵¹ Vayos Karayannis, Georgios Charalampides and Evangelia Lakioti, 'Socio-Economic Aspects of CCS Technologies' (2014) 14 *Procedia Economics and Finance* 295.

policy and legislative frameworks⁵². In some cases, failure can be attributed to technical constraints⁵³.

1.3 Next steps towards implementation of CCS

Developing countries and other countries that have an interest in CCS could broaden support for this mitigation tool by underlining its role in realizing the Agreement's long-term objectives. In addition, developing countries could put in place well-thought-out legal and regulatory frameworks at national level that support CCS. Obviously, without appropriate legal and policy infrastructure in place at national level, international financial and technological support cannot in itself get CCS projects off the ground in developing countries.

Furthermore, CCS opportunities could be boosted by mobilizing finance which may partly happen through the financial mechanisms under the Agreement⁵⁴. The prospects of CCS projects being considered by the climate funds will increase if more countries feature CCS in their NDCs⁵⁵. Finally, both developed and developing countries could conduct research and development to enhance the next generation of CCS. Establishing a club of interested countries under the

Agreement would offer opportunities for developed countries that have a successful track record in using CCS to share their knowledge with developing countries interested in hosting this technology⁵⁶. Carbon trading and carbon taxation are two policy options for the promotion of CCS⁵⁷.

As mentioned in passing above, not all actions necessary to expedite CCS can be expected to take place through the UN climate regime and particularly the Agreement. But some of the mechanisms and bodies of the UN climate regime could accelerate certain steps required in respect of CCS implementation in developing countries. To what extent developing countries as contributors to the global response to climate change and as recipients of support could use these opportunities partly hinges on the interpretation and implementation of the principle of differentiation adopted.

2. Differentiation under the UN climate regime

2.1 Differentiation under the UNFCCC

The UNFCCC, as the founding treaty of the climate change regime, establishes an 'ultimate objective', both for itself and 'any related legal instruments,

⁵² 'Strategic Analysis of the Global Status of Carbon Capture and Storage. Report 1: Status of Carbon Capture and Storage Projects Globally' (Global CCS Institute 2009) 79–80 <<https://www.globalccsinstitute.com/archive/hub/publications/5751/report-5-synthesis-report.pdf>>.

⁵³ Sara Budinis and others, 'An Assessment of CCS Costs, Barriers and Potential' (2018) 22 *Energy Strategy Reviews* 61, 64; Dennis YC Leung, Giorgio Caramanna and Mercedes Maroto-Valer, 'An Overview of Current Status of Carbon Dioxide Capture and Storage Technologies' (2014) 39 *Renewable and Sustainable Energy Reviews* 426, 439; Milan Elkerbout and Julie Bryhn, 'An Enabling Framework for Carbon Capture and Storage (CCS) in Europe': (CEPS 23 September 2019) No 2019/03 5 <https://www.ceps.eu/wp-content/uploads/2019/09/RB2019_03_An-enabling-framework-for-carbon-capture-and-storage-in-Europe.pdf> last accessed 3 October 2021.

⁵⁴ Maddahi (n 16).

⁵⁵ Mark Bonner, 'The Opportunities to Promote Carbon Capture and Storage (CCS) in the United Nations Framework Convention on Climate Change (UNFCCC)' (Global CCS Institute 2017) <<https://www.globalccsinstitute.com/archive/hub/publications/201643/1706-ccs-opportunities-unfccc-comms-fd.1-fina.pdf>>.

⁵⁶ Paul Zakkour and Wolfgang Heidug, 'A Mechanism for CCS in the Post-Paris Era' (King Abdullah Petroleum Studies and Research Center 2019) <<https://www.kapsarc.org/research/publications/a-mechanism-for-ccs-in-the-post-paris-era/>> accessed 29 November 2019.

⁵⁷ Budinis and others (n 47) 67; Heleen Groenenberg and Heleen de Coninck, 'Effective EU and Member State Policies for Stimulating CCS' (2008) 2 *International Journal of Greenhouse Gas Control* 653.

namely the prevention of ‘dangerous anthropogenic human-induced interference with the climate system’⁵⁸. It goes on to specify that ‘in their actions to achieve the objective of the Convention ... Parties shall be guided’, among other things, by CBDRRC⁵⁹. Building on CBDRRC, the UNFCCC requires developed countries to take ‘the lead in modifying longer-term trends in anthropogenic emissions’⁶⁰. To this end, Annex I of the UNFCCC contains a list of 43 developed countries of which leadership is required (eight of these countries were added to the original list by amendments to the Annex). The requirement of leadership by developed countries is also reflected in a commitment to provide financial resources⁶¹ and ‘to promote, facilitate and finance’ the transfer of technology, to developing countries⁶². Unsurprisingly, the extent of the financial resources to be provided to developing countries, and how they should be disbursed, has been the subject of ongoing debate throughout the history of the climate regime. Countries not listed in Annex I are understood to be developing countries. This dual structure, colloquially known as the ‘firewall’, has structured the commitments of parties throughout the history of the climate regime⁶³.

2.2 Differentiation under the Paris Agreement

The Agreement represents the latest stage in the international community’s efforts to address climate change⁶⁴. It builds on a complex body of institutions, rules, and procedures that have evolved over the years. The content of the Agreement is rigorously structured in order to achieve its purpose as defined in Article 2⁶⁵. This includes holding temperature increase to ‘well below’ 2°C above pre-industrial levels, while also pursuing efforts to stay below 1.5°C, increasing the ability to adapt, and ensuring finance flows towards low GHG emissions and climate-resilient development⁶⁶.

Ambition under the Agreement is balanced with a nuanced approach to differentiation⁶⁷. The Agreement developed a new approach to addressing developed/developing countries by establishing core obligations for all parties, modernizing the principle of common but differentiated responsibilities by adding ‘in the light of different national circumstances’ and addressing differentiation in a variety of ways⁶⁸. The Agreement tailors the principle of differentiation by reference to the issue addressed, which may be mitigation, transparency, capacity building, finance or adaptation⁶⁹.

⁵⁸ UNFCCC art 2.

⁵⁹ *ibid* art 3.

⁶⁰ *ibid* art 4.2(a).

⁶¹ *ibid* art 4.3 and 4.4.

⁶² *ibid* art 4.5.

⁶³ Joanna Depledge and Andrew Higham, ‘Foundations for the Paris Agreement’ in Daniel Klein and others (eds), *The Paris Agreement on Climate Change: Analysis and Commentary* (OUP 2017) 30.

⁶⁴ Sobhan Tayebi and Zeinab Mazinanian, ‘Environmental Impact of Climate Change on National Security’ (2020) 1 CIFILE Journal of International Law 16 <<https://doi.org/10.30489/cifj.2020.207971.1009>> accessed 7 October 2021.

⁶⁵ Paris Agreement art 2.

⁶⁶ *ibid* art 2.

⁶⁷ Lavanya Rajamani and Emmanuel Guerin (n 13) 81.

⁶⁸ Bodle and Oberthür (n 12) 97.

⁶⁹ Lavanya Rajamani, ‘Ambition and Differentiation in the 2015 Paris Agreement: Interpretative Possibilities and Underlying Politics’ (2016) 65 *International and Comparative Law Quarterly* 493, 509.

This modernized approach has altered the rights and duties of developing countries as contributors to the global response to climate change and as recipients of supports (in the forms of finance, technology development and transfer and capacity-building)⁷⁰.

2.2.1 Differentiation in respect of mitigation and CCS

Differentiation remains crucial to the way in which mitigation efforts are implemented, as reflected in State NDCs⁷¹. Article 4.1 of the Agreement recognizes that emissions peaking will take longer for developing countries. It also refers to equity, sustainable development and poverty eradication. Developing countries that have fossil-fuel-based economies may view CCS as likely to increase the cost of producing energy and other industrial products and thus object to it on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty unless developed countries provide adequate technical and financial support.

Countries' mitigation plans are mainly introduced in their NDCs. Article 4.2 requires each party to 'prepare, communicate and maintain successive NDCs that it intends to achieve' and to undertake domestic measures to implement their NDCs.⁷² Article 4.3 adds that NDCs need to be progressive,

i.e. each new one must be more ambitious than its predecessors, in accordance with CDRRC-NC.⁷³ Article 4 also requires the submission of NDCs every five years⁷⁴ with the 'information necessary for clarity, transparency and understanding'.⁷⁵ The use of the phrase 'each party' in the Agreement makes it clear that the requirement to prepare and communicate NDCs and to take a progressive approach applies equally to developed and developing Parties. In this sense, each Party chooses what to include in its NDC without specific requirements for any categories of Parties.

While the Agreement imposes mitigation obligations on both developed and developing Parties, it nonetheless contains some differentiated obligations. For example, reflecting the language used in the UNFCCC, developed countries are responsible for leading mitigation efforts by undertaking 'economy-wide absolute emission reduction targets' (EAERTs). For their part, developing states are urged to 'move over time towards economy-wide emission reduction or limitation targets (EERLTs) in the light of different national circumstances'⁷⁶. The term 'absolute reductions' refers to lower annual emissions by reference to a historical base year and contain an element of stringency that 'limitations' does not. Developing states are also given leeway as

⁷⁰ Decision 1/CP.17, Establishment of an Ad Hoc Working Group on the Durban Platform for Enhanced Action, FCCC/CP/2011/9/Add.1 (15 March 2012) para 5

⁷¹ Neil Craik and William CG Burns, 'Climate Engineering Under the Paris Agreement' (2019) 49 *The Environmental Law Reporter* 17, 11121.

⁷² Paris Agreement art 4.2.

⁷³ *ibid* art 4.3.

⁷⁴ *ibid* art 4(9).

⁷⁵ *ibid* art 4(8).

⁷⁶ *ibid* art 4.4.

to when the EERLTs should be applied through the phrases ‘move over time’ and ‘in the light of different national circumstances’⁷⁷.

While the Agreement represents a marked shift away from the traditional differentiation system, developed countries still bear the main burden of mitigation. Therefore, it should fall to developed countries to bear the main responsibility for the deployment of CCS as a mitigation tool.

2.2.2 Differentiation in respect of finance and CCS

With regard to finance, who pays how much, to whom and for what is the key issue. As is the case under the UNFCCC, the Agreement recognizes the importance of finance in climate change mitigation. Indeed, one of its objectives is listed as ‘making finance flows consistent with a pathway towards low GHGs and climate-resilient development’⁷⁸. To this end, it largely maintains the differentiation between parties that is characteristic of the UNFCCC and the Kyoto Protocol by placing the burden of providing finance on developed states⁷⁹.

Article 9.1 uses the mandatory term ‘shall’ in relation to developed states’ duty to assist developing states⁸⁰. Developed states also bear the primary responsibility for mobilizing climate finance, as

reflected in Article 9.3, which provides that they should continue to take the lead⁸¹. The decision that accompanied the Agreement stated that the goal of US\$100 billion per year agreed in Cancun is to be reassessed before 2025⁸².

Developed states also have a duty to provide quantitative and qualitative information, on a biennial basis, on finances provided and mobilized for assistance to developing states⁸³. Similarly, Article 9.7 requires developed states to provide biennial information on support provided and mobilized through public interventions⁸⁴. At COP-24, the Parties agreed that the information under this article should include aspects such as the amount of funds provided per year, the type of intervention made, the targeted sector and the amount used to mobilize support.

For CCS to be deployed, a huge amount of finance needs to be provided by developed countries and by wealthy developing states. The Agreement features explicit recognition that enhanced financial support for developing countries will lead to higher ambition in terms of actions⁸⁵ and effective implementation of the agreement,⁸⁶ and implicit recognition of the need to expand the donor pool⁸⁷. Wealthy developing

⁷⁷ Harald Winkler, ‘Mitigation (Article 4)’ in Daniel Klein and others (eds), *The Paris Agreement on Climate Change: Analysis and Commentary* (1st edn, OUP 2017) 151.

⁷⁸ Paris Agreement art 2(1)(c).

⁷⁹ Rajamani (n 70) 512.

⁸⁰ Paris Agreement art 9.1.

⁸¹ *ibid* art 9.3.

⁸² ‘Adoption of the Paris Agreement, UNFCCC Dec. 1/CP.21 para 54.

⁸³ Paris Agreement art 9.5.

⁸⁴ *ibid* art 9.7.

⁸⁵ *ibid* art 4.5.

⁸⁶ *ibid* art 3.

⁸⁷ *ibid* art 9.2.

states may provide assistance to other developing states, which permits ‘other Parties’ to provide finance voluntarily. Unlike developed states, developing country donors are not required but merely encouraged to communicate information on their provision of finances⁸⁸.

2.2.3 Differentiation in respect of technology development and transfer and CCS

Within the UN climate regime, countries have confirmed the importance of technology development and transfer (TD&T) as a key pillar of the international response to climate change and the realization of NDCs⁸⁹. A key point regarding climate technology is that there is no consensus on how to support TD&T.

The main technology-related efforts are currently organized under the technology mechanism, which is an umbrella mechanism established in 2010 at COP16⁹⁰. It comprises the Technology Executive Committee (TEC) and the Climate Technology Centre and Network (CTCN). The CTCN handles requests from developing countries received via their National Designated Entities (NDEs), on receipt of which it ‘mobilizes its global Network of climate

technology experts to design and deliver a customized solution tailored to local needs⁹¹.

Whether NDCs are successfully implemented will depend on the existence of sufficient funding and supports for institutions such as CTCN that focus on supporting technology deployment⁹². Currently, given the high costs of full implementation of CCS, the CTCN and TEC are unable to fund CCS projects. Instead, they look to other financial mechanisms such as the green climate fund (GCF) to finance projects on the ground, including CCS demonstration projects⁹³. At this stage, it seems feasible that countries may send requests to CTCN to receive supports for bilateral research and development activities and to raise awareness and build capacity regarding CCS.

The provisions on TD&T are to be found in Article 10, whose wording is prescriptive in nature, albeit that the commitment laid down concerns conduct not result. Its first paragraph utilizes non-legally binding and flexible language. The second paragraph utilizes ‘shall’ to highlight the importance of TD&T and appears to impose an obligation of collective nature while failing to spell out how the parties should meet

⁸⁸ *ibid* arts 9.5 and 9.7.

⁸⁹ Heleen de Coninck and Ambuj Sagar, ‘Making Sense of Policy for Climate Technology Development and Transfer’ (2015) 15 *Climate Policy* 1, 1.

⁹⁰ Heleen de Coninck and Ambuj Sagar, ‘Technology in the 2015 Paris Climate Agreement and Beyond’ (International Centre for Trade and Sustainable Development 2015) 42 1
<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=11&ved=2ahUKEwiWvuvoipXmAhUQuIsKHSfEDd4QFjAKegQIAxAC&url=https%3A%2F%2Fwww.ru.nl%2Fpublish%2Fpages%2F749373%2F2015_-_technology_in_the_2015_paris_climate_agreement_and_beyond_-_ictsd_issue_paper_no_42.pdf&usg=AOvVaw2awI9wp-GYQ8jccRtspkR>.

⁹¹ ‘Technical Assistance’ (Climate Technology Centre & Network, 18 November 2014) <<https://www.ctc-n.org/technical-assistance>> accessed 1 December 2019.

⁹² Heleen de Coninck and Ambuj Sagar, ‘Technology Development and Transfer (Article 10)’ in Daniel Klein and others (eds), *The Paris Agreement on Climate Change: Analysis and Commentary* (OUP 2017) 264.

⁹³ Paul Zakkour, John Scowcroft and Wolfgang Heidug, ‘The Role of UNFCCC Mechanisms in Demonstration and Deployment of CCS Technologies’ (2014) 63 *Energy Procedia* 6945, 6954.

this obligation. As a consequence, it seems more to reflect a qualitative idea than a concrete objective imposed on the parties⁹⁴.

Paragraph 5 establishes an institutional commitment to the provision of support and financial means for research and development, and to the facilitation of access to climate technology for developing country parties. Finally, paragraph 6 specifies the manner in which financial support is to be provided to developing country Parties for the general implementation of TD&T in the context of the Agreement⁹⁵.

The language of Article 10 is strong but does not mention any country or indicators. It seems that the commitments expressed under this article are more institutional in nature than directed either collectively or individually to the parties⁹⁶. The vagueness of the wording of the article would appear to allow countries to limit the scope or intensity of their actions⁹⁷.

2.2.4 Differentiation in respect of capacity building and CCS

In the context of CCS, efforts to create the information, tools, skills, expertise and institutions required to implement CCS demonstrations and move them rapidly into commercial operation are

collectively known as capacity building⁹⁸. During the negotiations regarding the text of the Agreement, developing countries were looking forward to including a section on support for capacity building to assist them with implementing their commitments under the Paris climate regime⁹⁹.

Article 11.1 of the Agreement characterizes capacity building as enhancing developing countries' capacity to take effective climate change action and facilitating the development and deployment of technology, as well as improving access to climate finance and training, while also involving the raising of public awareness and the communication of transparent, timely, and accurate information¹⁰⁰.

Article 11.1 notes that developing country parties receive capacity-building support and highlights the least developed countries and those particularly vulnerable to climate change (e.g. small island developing States) as being those with the least capacity.

Article 11.3 imposes a legal expectation (using 'should') on the parties that they will cooperate to enhance capacity in developing countries to implement the Agreement, thus marking another

⁹⁴ Igor Andre Castilho Salgues, 'Commitments and Legal Obligations in the Paris Agreement: Compliance and Adjudication - The Supplementary Role of the ICJ and ITLOS in Tackling Climate Change' (OSLO 2018).

⁹⁵ *ibid* Daniel Klein and others (eds), *The Paris Agreement on Climate Change: Analysis and Commentary* (OUP 2017).

⁹⁶ Castilho Salgues (n 95).

⁹⁷ R Keohane and M Oppenheimer, 'Paris: Beyond the Climate Dead End through Pledge and Review?' (2016) 4(3) *Politics and Governance* 142.

⁹⁸ 'CCS Capacity Building and Public Awareness in Guangdong Province, China' (Global CCS Institute 2013) 3 <<https://www.globalccsinstitute.com/archive/hub/publications/115593/ccs-capacity-building-and-public-awareness-in-guangdong-province-china.pdf>> last accessed 3 October 2021.

⁹⁹ Paris Agreement art 11.

¹⁰⁰ *ibid* Art. 11.1.

departure from the traditional bifurcated approach to differentiation under the UNFCCC¹⁰¹. While recognizing that developed country parties have historically taken the lead in providing capacity-building to developing countries, it provides that the former should enhance support for capacity-building actions in the latter. Article 11.4 requires parties providing capacity-building to report regularly on their efforts in this regard.

The Paris Decision establishes the Paris Committee on Capacity Building, whose purpose is to address ‘gaps and needs’ concerning implementation of capacity-building in developing countries¹⁰². Based on the changing landscape regarding the provision of capacity-building support, recipient developing countries should probably take a more strategic, programmatic, and long-term approach to capacity-building and increasingly mainstream this into national climate change planning.¹⁰³

Conclusion

Countries’ contribution to GHG emissions, development needs, and vulnerability to climate change – and accordingly their levels of responsibility for climate change and capacity to cope with it – vary greatly. The Agreement has addressed these differences through the principle of

CBDRRC-NC and has moved away from differentiation along Annex-based developed/developing country lines towards self-differentiation.¹⁰⁴ This article examines how the Agreement’s modernized concept of differentiation penetrates into developing countries’ rights and obligations regarding the deployment of CCS. While the Agreement represents a significant shift away from the traditional differentiation approach, developed countries still bear the burden of the main issue areas such as mitigation and finance and technology supports. Developing states are under general obligations to mitigate, but there are no binding requirements on how to go about this.

The article finds that the Agreement introduces several innovative provisions that may increase the prospects of CCS being utilized. Encouraging ‘other Parties’ to provide finance voluntarily increases the chance of funding climate technologies such as CCS. The goal of US\$100 billion per year agreed in Cancun is another similar endeavour. Whether these normative statements will help CCS in practice will hinge on the serious political will of countries to make efforts to tackle climate change through the large-scale implementation of CCS.

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¹⁰² ‘“Adoption of the Paris Agreement”, UNFCCC Dec. 1/CP.21’ (n 83) para 72.

¹⁰³ d’Auvergne and Nummelin (n 103) 291.

¹⁰⁴ Daniel Bodansky, Jutta Brunnée and Lavanya Rajamani, *International Climate Change Law* (1st edn, OUP 2017) 29.

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