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Oceanic Carbon Storage & Abatement: An International Law Perspective

TEM – CENRIT Evening Seminar
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Structure

- I. Background
- II. International Legal Regime
- III. EU Legal Framework
- IV. Situation in Germany

Climate Change 2022

Mitigation of Climate Change

Summary for Policymakers

I. Background

- **2015 Paris Agreement on Climate Change:** Keep global mean temperature to “well below 2°C” and “pursue efforts” to cap warming at 1.5°C!
- Primary effort must focus on reducing CO₂ emissions, but ...
- ... latest IPCC Report (2022, p. 28) states that Carbon Capture and Storage (CCS) and CO₂ removal technologies are needed to limit the average global temperature rise to 1.5 - 2.0°C:

C.3

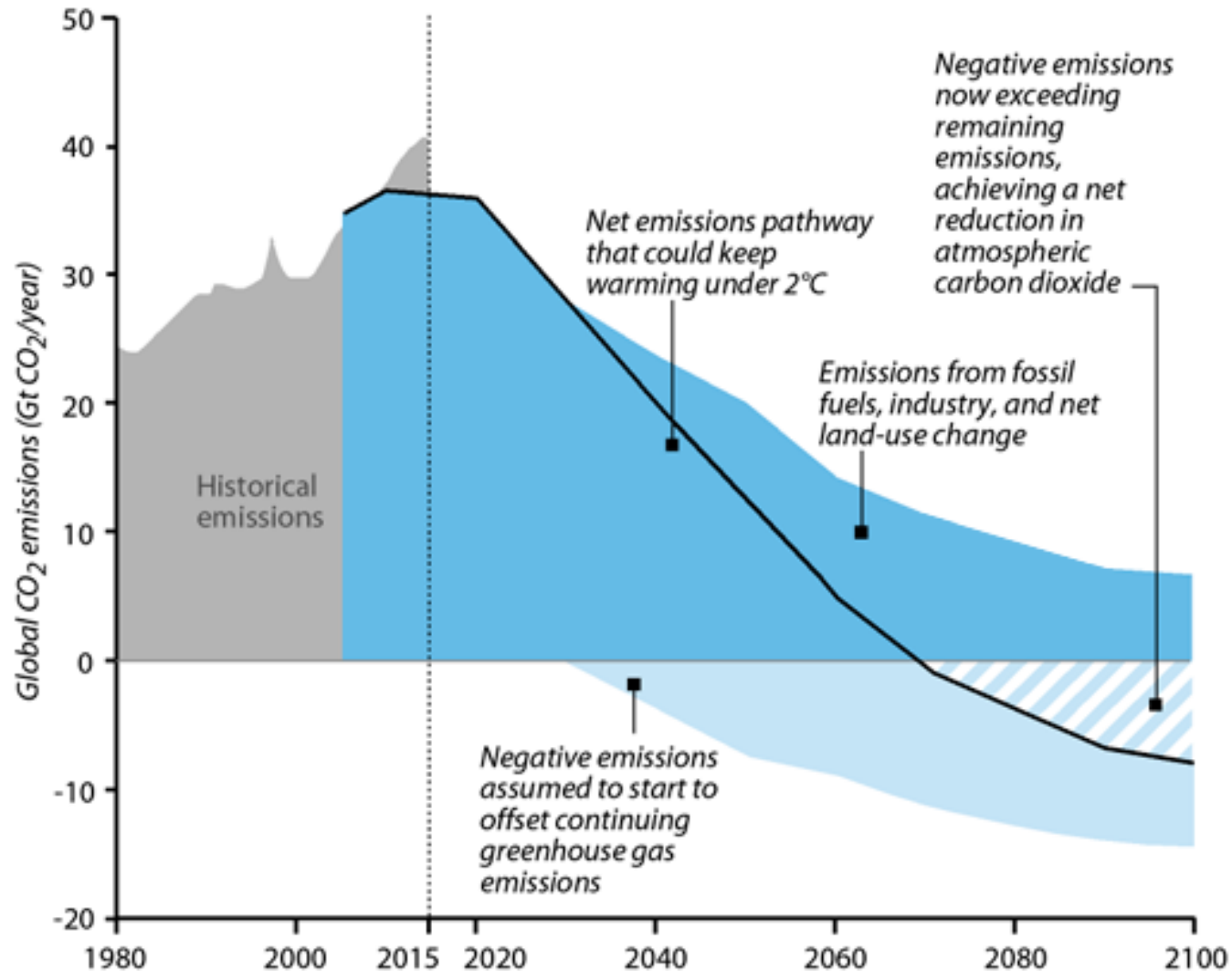
All global modelled pathways that limit warming to 1.5°C (>50%) with no or limited overshoot, and those that limit warming to 2°C (>67%), involve rapid and deep and in most cases immediate GHG emission reductions in all sectors. Modelled mitigation strategies to achieve these reductions include transitioning from fossil fuels without CCS to very low- or zero-carbon energy sources, such as renewables or fossil fuels with CCS, demand side measures and improving efficiency, reducing non-CO₂ emissions, and deploying carbon dioxide removal (CDR) methods to counterbalance residual GHG emissions. Illustrative Mitigation Pathways (IMPs) show different combinations of sectoral mitigation strategies consistent with a given warming level. (*high confidence*) (Figure SPM.5) {3.2, 3.3, 3.4, 6.4, 6.6}

I. Background

- On **Carbon Dioxide Removal (CDR)**, see also:
 - **IPCC 2018** (Special Report on Global Warming of 1.5°C, Summary for Policymakers, p. 19):
 - “All pathways that limit global warming to 1.5°C with limited or no overshoot project the use of carbon dioxide removal (CDR) on the order of 100–1000 Gt CO₂ over the 21st century. [...] (high confidence).”
 - **UNEP 2017** (UNEP Emissions Gap Report, p. 65):
 - “In order to achieve the goals of the Paris Agreement, to keep the global mean temperature increase well below 2°C (or even below 1.5°C), carbon dioxide removal is likely a necessary step.”

How Negative Emissions Could Buy Time

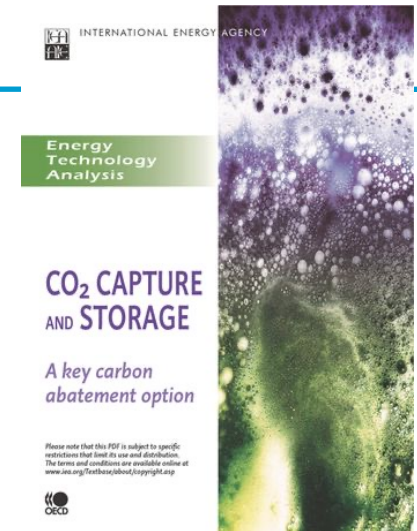
If a large amount of carbon dioxide could be pulled from the atmosphere, the decline in fossil fuel emissions necessary to keep warming under 2°C would not be as sharp.



SOURCE: European Academies' Science Advisory Council, adapted from Anderson and Peters (2016)

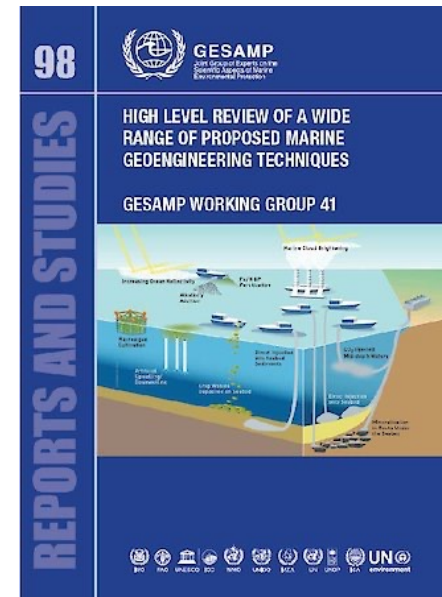
I. Background

- What is the difference between CCS and CDR?
 - CCS: Sequestration of CO₂ **directly at source** (thus no CO₂ emissions into the atmosphere) and subsequent storage in onshore and/or offshore storage facilities
 - IAEA 2008: CCS as “key carbon **abatement** option”
 - CDR: Capture of CO₂ that has **already been emitted** into the atmosphere and subsequent storage

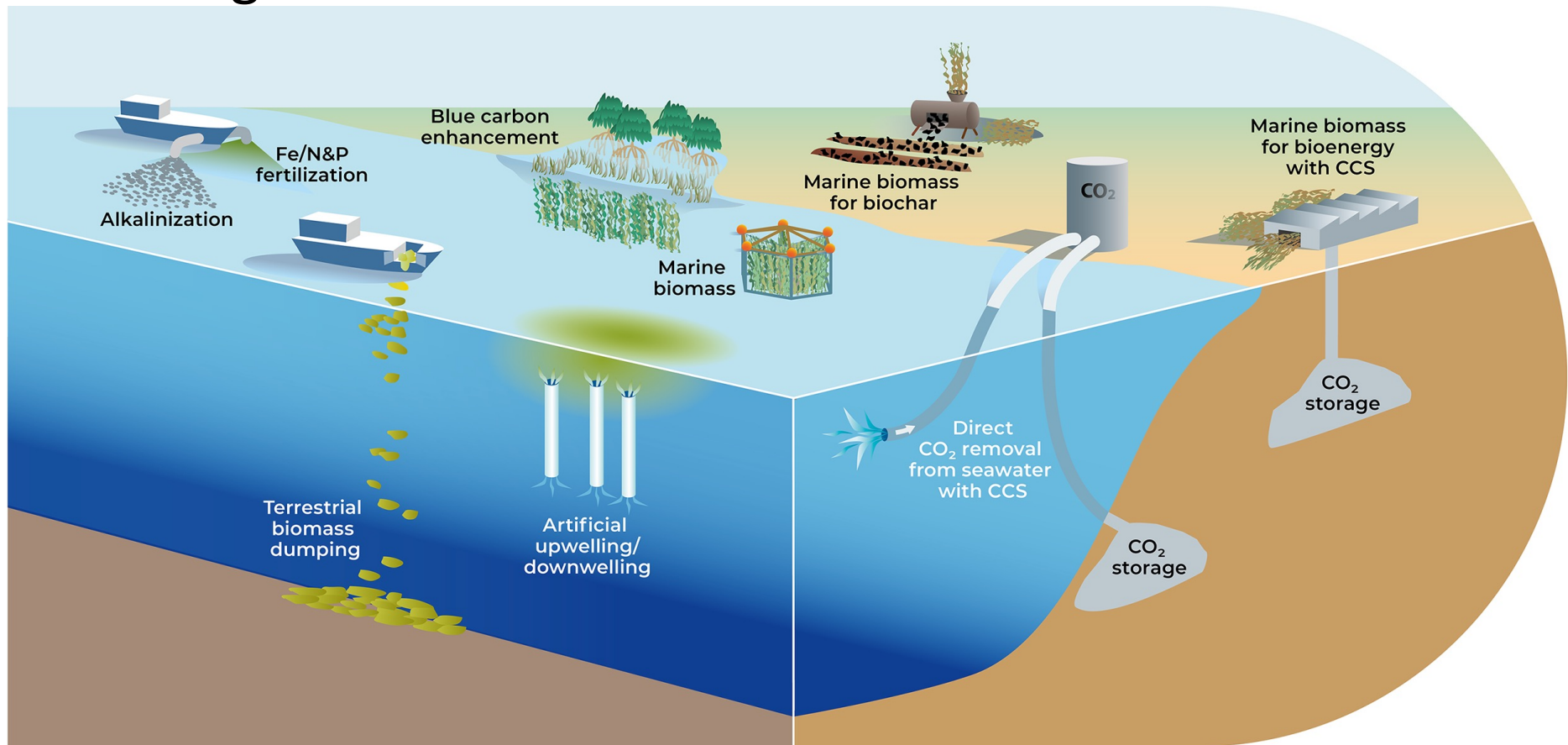


I. Background

- Wide array of marine carbon dioxide removal (mCDR) approaches presently under investigation (see next slide)
 - Note existing **terminological confusion**: mCDR, marine geoengineering, ocean interventions for climate change mitigation, ocean-based negative emissions technologies etc.
 - In March 2021, the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) Working Group 41 suggested the term **“ocean interventions for climate change mitigation”** to replace “marine geoengineering”



I. Background



I. Background

- **Overlaps and potential** (see IPCC 2022, p. 32):

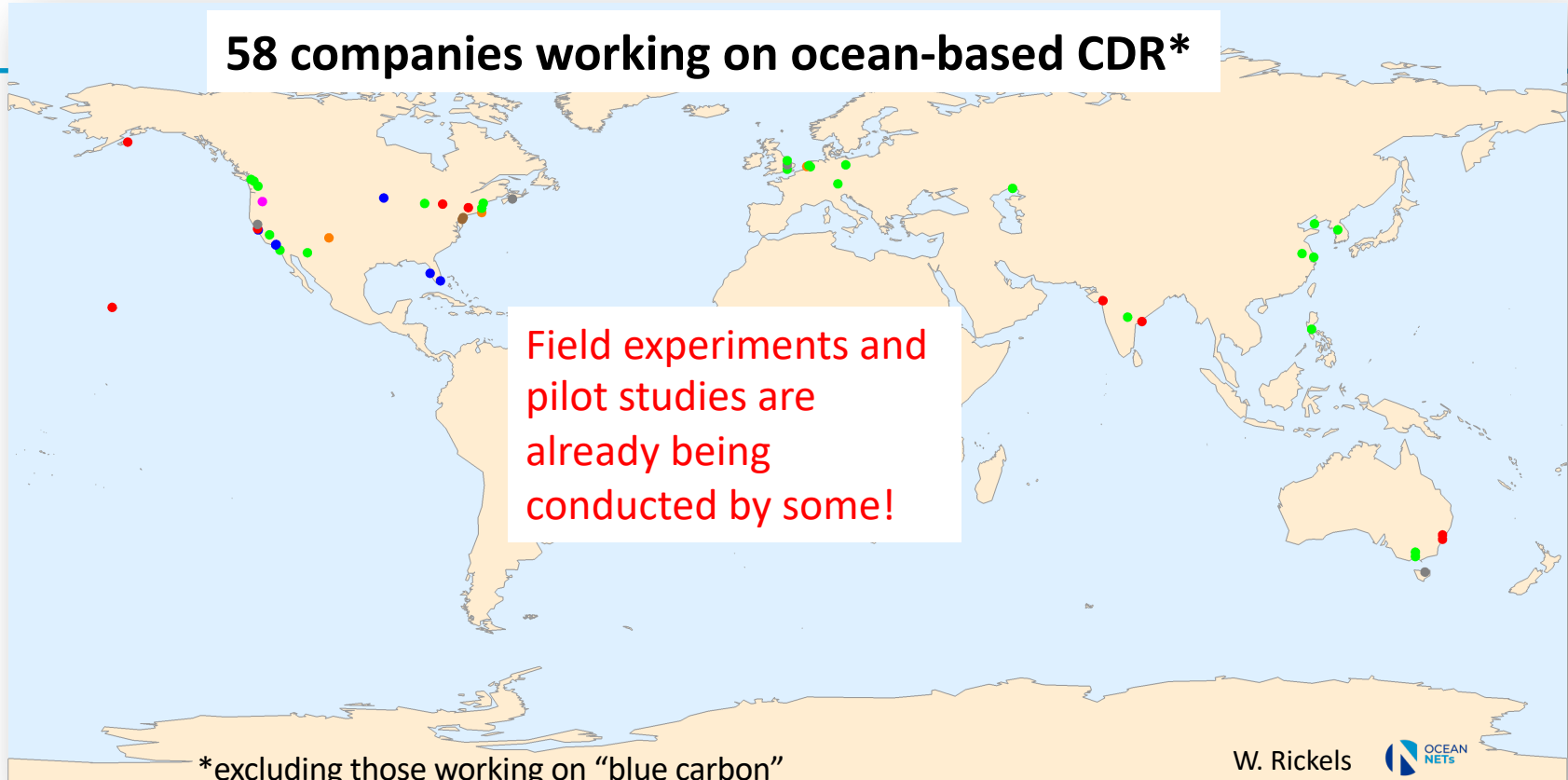
C.4.6 CCS is an option to reduce emissions from large-scale fossil-based energy and industry sources, provided geological storage is available. When CO₂ is captured directly from the atmosphere (DACCS), or from biomass (BECCS), CCS provides the storage component of these CDR methods. CO₂ capture and subsurface injection is a mature technology for gas processing and enhanced oil recovery. In contrast to the oil and gas sector, CCS is less mature in the power sector, as well as in cement and chemicals production, where it is a critical mitigation option. The technical geological CO₂ storage capacity is estimated to be on the order of 1000 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. Implementation of CCS currently faces technological, economic, institutional, ecological-environmental and socio-cultural barriers. Currently, estimates of CCS deployment are far below those in modelled pathways limiting global warming to 1.5°C or 2°C. Enabling

I. Background

- In 2009, it was expected that 100 storage projects would be set up worldwide by 2020
- With the exception of Norway, where CO₂ captured during natural gas extraction has been stored in the Norwegian continental shelf since 1996, CCS has **not yet been implemented on a large scale** in Europe
- However, this situation is **likely to change** in the near future
 - Ever increasing pressure to act against global warming
 - Several projects being planned to store CO₂ from industrial sources in disused oil and gas fields or in sandstone formations
 - Opposition to CCS and CRD has declined (even in Germany!)

→ DecarbLaw is a highly topical project!

58 companies working on ocean-based CDR*



Field experiments and pilot studies are already being conducted by some!

*excluding those working on “blue carbon”

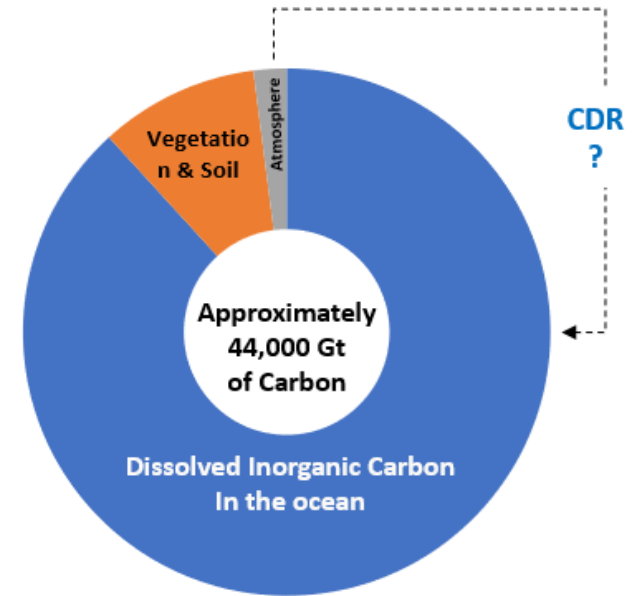
W. Rickels



- Artificial Upwelling
- Ocean Fertilization
- Electrochemical Weathering
- Alkalinity Enhancement
- Marine Biomass Farming
- Marine Biomass Sinking
- Coral Reef Restoration

I. Background

- Why **marine** CCS and CDR then?
 - Conflicting land uses
 - Ocean covers most of the Earth's surface
→ generally less competition for space when compared to land
 - Ocean holds most of the carbon in the active carbon cycle
→ Massive carbon storage capacity in an area where most anthropogenic carbon will ultimately end up
 - For Europe, scientific studies attribute the majority of storage capacity to offshore areas



I. Background

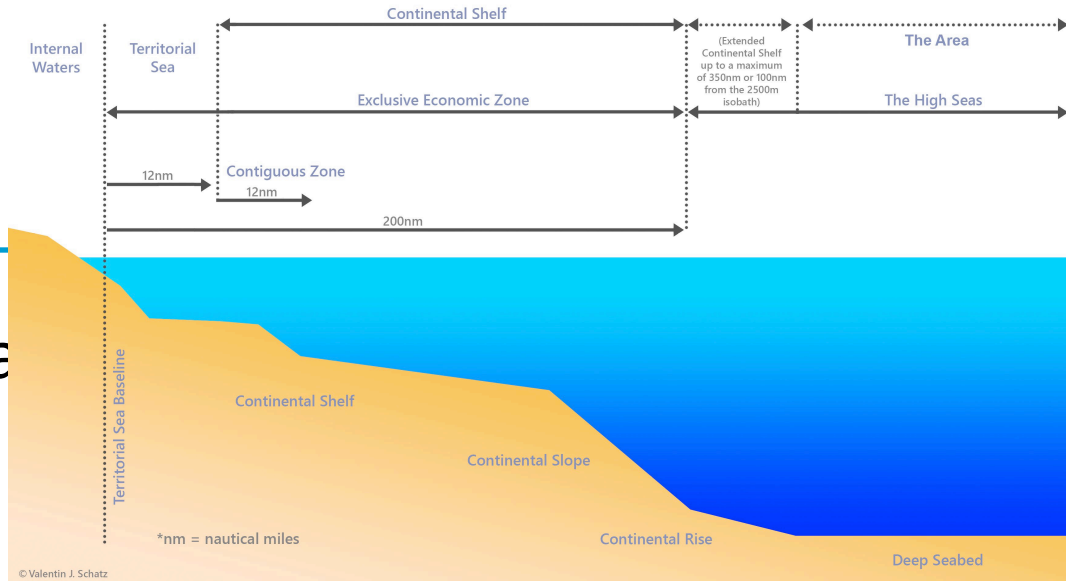
- Storage capacity of formations in offshore areas under German sovereignty/jurisdiction in the North and Baltic Seas is roughly estimated at 3.8 to 23.9 Gt of CO₂
- For comparison, around 0.18 Gt of CO₂ were emitted by industrial processes in Germany in 2021
- What is the industry's interest?
 - Potential inclusion of CCS and (m)CDR into carbon credit markets
 - But considerable challenges concerning provision of sufficient incentives, monitoring, crediting as well as technical challenges

II. International Legal Framework

- Challenge:
 - All mCDR activities characterized by varying degrees of scientific uncertainty concerning their **feasibility** as well as their **potential negative impacts** on the environment
 - → high and continuing relevance of (marine) scientific research (far less so in relation to CCS, however)
- Starting points:
 - Relevance of **international law** due to the potential transboundary effects of virtually all relevant activities
 - Zonal approach of the international law of the sea

II. International Legal Framework

- Only one international legal regime available that has been amended to specifically address CCS and mCDR:
 - **1996 London Protocol** to the 1972 London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (LC/LP)
- Other potentially relevant multilateral agreements include:
 - 1992 UNFCCC and Paris Agreement
 - 1992 Convention on Biological Diversity (CBD)
 - 1982 United Nations Convention on the Law of the Sea (UNCLOS)
 - Regional agreements (e.g. OSPAR, HELCOM etc.)



II. International Legal Fra

■ Zonal approach:

- **Internal waters and territorial sea** are subject to the sovereignty of the coastal State
 - Coastal State is thus entitled to approve and regulate carbon storage projects without further ado
 - Certain limitations arise from the right of other States of innocent passage in the territorial sea

II. International Legal Framework

- **Continental shelf:**
 - Coastal State has sovereign rights over the continental shelf “rights for the purpose of exploring it and exploiting its natural resources” (Article 77 (1) of UNCLOS)
 - No mention of carbon storage, but ...
 - ... an interpretation of relevant UNCLOS provisions suggests that any activity associated with interventions in the continental shelf is covered by the sovereign rights of the coastal State, also taking into account
 - According to Article 81 of UNCLOS, the coastal State has the exclusive right to authorize and regulate drilling on the continental shelf “for all purposes”

II. International Legal Framework

- Article 85 of UNCLOS: rights concerning tunneling
- Factual similarities between carbon storage and exploitation of natural resources
- **Offshore CCS:**
 - Sub-seabed storage of CO₂ must be compatible with State obligations concerning protection of the marine environment
 - Relevance of **LC/LP**
 - Which States are bound to the London Protocol?
 - Its 53 contracting parties (incl. Australia, Germany) AND ...

II. International Legal Framework

- ... arguably **also all (other) contracting parties to UNCLOS** (altogether 168 States and the EU)!
- Why this?
 - Article 210 (6) of UNCLOS (addressing pollution by dumping) contains a ‘renvoi’ to “global rules and standards”
 - “Global rules and standards” is generally understood as a reference to the London Convention and the London Protocol, which are specifically applicable to pollution by dumping
 - → UNCLOS is further developed by LC/LP

II. International Legal Framework

- Is sub-seabed storage of CO₂ “dumping”?
 - According to Article 1.4.1.1 LP as well as Article 1 (5)(a) of UNCLOS, “dumping” is
 - “any deliberate disposal at sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea”
 - Article 1.7 LP clarifies that the term “marine waters” used throughout the Protocol **also includes the seabed and subsoil** (with the exception of deposits under the seabed that are only accessible from land)
 - → Injection of CO₂ into seabed structures is clearly dumping

II. International Legal Framework

- Dumping is generally **prohibited** by the LP, unless it is expressly allowed by way of inclusion of the relevant substances in annex 1
- In 2006, section 1.8 (“Carbon dioxide streams from carbon dioxide capture processes for sequestration”) was added to Annex 1 LP (“2006 amendment”)
- → Subject to the granting of a licence by the competent authority under domestic law (see Article 4.1.2 LP), CO₂ **can now be permissibly stored in the seabed**
 - Note that storage in **water column** remains prohibited!
- Duty to observe requirements on **composition of CO₂ stream, risk management** and **monitoring** included in section 4 of Annex 1 LP, in the new Annex 2, and in several relevant decisions and resolutions of the contracting parties

II. International Legal Framework

- Export of CO₂ for storage purposes:
 - Article 6 LP establishes a **prohibition** of authorising the export of waste and other substances to other states for dumping or incineration at sea
 - In 2009, Article 6 LP was **amended** by a new para. 2 specifically **enabling transboundary export** of CO₂ for the purpose of storage (“2009 amendment”)
 - Amendment not yet in force!

II. International Legal Framework

- In 2019, contracting parties to the LP agreed by way of consensus decision to create the possibility of **provisionally applying** amended Article 6 LP (see Article 25 (1) (b) VCLT)
- Two conditions:
 - Only between States that have made a corresponding **declaration** in accordance with Resolution LP.5(14)
 - Conclusion of an **agreement or arrangement** between the exporting and the importing State

II. International Legal Framework

■ mCDR:

- Article 1.4.2.2 LP (as well as Article 1 (5)(b)(ii) of UNCLOS) contains an exception clause, under which
 - “‘Dumping’ does not include: [...] (ii) placement of matter for a purpose other than the mere disposal thereof, provided that such placement is not contrary to the aims of this Convention.”
- Thus, decisive question is **whether mCDR is contrary to the aims of the Convention**
- This issue has been addressed by the parties to the LC/LP since October 2008

II. International Legal Framework

- Resolution LC-LP.1 on the Regulation of Ocean Fertilization:
 - “AGREE that, given the present state of knowledge, ocean fertilization activities other than legitimate scientific research should not be allowed. To this end, such other activities should be considered as contrary to the aims of the Convention and Protocol and not currently qualify for any exemption from the definition of dumping [...]” (para. 8)
 - “AGREE that scientific research proposals should be assessed on a case-by-case basis using an assessment framework to be developed by the Scientific Groups under the London Convention and Protocol”

II. International Legal Framework

- Adoption of (non-binding) Assessment Framework for Scientific Research Involving Ocean Fertilization by way of Resolution LC-LP.2 (2010)
 - Tool to provide for **responsible (“legitimate”) scientific research**
- → Differentiation between legitimate and non-legitimate scientific research decides upon whether or not activity constitutes unlawful dumping
- Important development: 2013 Amendment to the London Protocol
 - 2013 amendment to the London Protocol proposed by Australia, Nigeria and the Republic of Korea

II. International Legal Framework

- Proposal was adopted by consensus in October 2013 but will only enter into force following ratification of 2/3 of the (53) parties to the London Protocol
- At present only **six ratifications** (Estonia, Finland, Germany, Netherlands, Norway, United Kingdom)
- Applicability depends on whether Contracting Parties have decided to include the activity concerned in new Annex 4 to the London Protocol
 - So far only ocean iron fertilization

II. International Legal Framework

- In 2022, the Correspondence Group on Marine Geoengineering re-established by the Scientific Groups of the LC/LP agreed on **four other techniques** to be considered for listing in new annex 4 to the Protocol:
 - Enhancing ocean alkalinity
 - Macroalgae cultivation and other biomass for sequestration including artificial upwelling
 - Marine cloud brightening
 - Microbubbles/reflective particles/material
- Consented by the COP/MOP of the LC/LP in a 2022 Statement on Marine Geoengineering, but not yet included in annex 4

II. International Legal Framework

- Art. *6bis* LP generally prohibits the placement of matter for marine geoengineering activities NOT listed in Annex 4
- The equally new Annex 5 transforms the Assessment Framework (concerning ocean iron fertilization) into a (potentially) legally binding text
- Reflects a comparatively strict implementation of the precautionary approach by foreseeing at several stages of the assessment that a permission should not be granted if no sufficient evidence is provided that the activity concerned is not likely to produce adverse effects to the marine environment

II. International Legal Framework

- Recent developments:
 - Establishment of **Legal Intersessional Correspondence Group on Marine Geoengineering (LIGC)** in 2023
 - Production of a document outlining preliminary considerations concerning the provisional application of the 2013 amendments
 - Document notes that the provisional application of the amendments would appear in line with international law
 - Is 2013 amendment going to follow the model of the 2009 amendment concerning sub-seabed storage of CO₂???

III. EU Legal Framework

- Directive 2009/31/EC of the European Parliament and of the Council on the Geological Storage of Carbon Dioxide (**“CCS Directive”**)
 - Provides a binding legal framework for the EU Member States for environmentally sound geological storage of CO₂
 - Must be implemented by the Member States in their domestic legal systems
 - Also applies in the EEZ and on the continental shelf
 - But: Authorizes Member States **not** to allow storage on parts or all of their territories
 - According to EU COM, CCS Directive embodies the agreement between the EU Member States required for transboundary export of CO₂

III. EU Legal Framework

- EU ETS
 - While the EU pursues the aim to safeguard that the emission cap in the European Emission Trading System (EU ETS) becomes net negative before 2050, no mechanism allows for the inclusion of **CO₂ removal credits** issued in exchange for certified atmospheric CO₂ removal, in the EU ETS to date
 - Concerning the impact of CCS, market participants are merely not obliged to surrender allowances for emissions which have been captured and transferred to an authorised installation for permanent storage
- Net Zero Industry Act (2023 Proposal of the EU COM)
 - Inter alia, aims at facilitating and enabling CCS projects, including by enhancing the availability of CO₂ storage sites

IV. Situation in Germany

- Existing domestic legislation essentially **aimed at preventing CCS and mCDR**:
 - **2012 Carbon Dioxide Storage Act**
 - Serves to implement the EU CCS Directive
 - Covers EEZ and continental shelf
 - But: Establishes numerous obstacles for carbon storage (e.g. deadline for applications for the authorization of storage facilities with a capacity of no more than 1.3 mio t of CO₂ expired on 31 December 2016)
 - **1998 High Seas Dumping Act**
 - Amended in 2018 by Act on the restriction (!) of marine geoengineering
 - Tightens regulations of the London Protocol

IV. Situation in Germany

- Since 2022, there are increasing signs that Federal Government and Parliament is intending to change its **regulatory approach**
- February 26th, 2024: Announcement of key elements of “**Carbon Management Strategy**”
 - Storage:
 - Germany will allow exploration of offshore storage sites in its Exclusive Economic Zone (EEZ) or the continental shelf; if suitable, safe and in line with ecological criteria, CCS shall be developed for industrial utilization
 - Injection of carbon dioxide in marine protected areas excluded
 - No onshore carbon storage, but Federal States can request opt-in possibility to be put in law

IV. Situation in Germany

- Export:
 - Planned ratification of 2009 amendment to the London Protocol
 - Declaration on provisional application of Article 6 LP in order to enable export of CO₂
 - Construction of privately-owned pipeline network, abolish hurdles for new projects
- mCDR:
 - Potential amendment of High Seas Dumping Act (but still uncertain)