


What Makes a Good Regulation of CCS?

Asia CCUS Network (CAN) Knowledge Sharing Conference, 14.11.2024

Ingvild Ombudstvedt, IOM Law

IOM Law at a glance

- Founded January 2017
- Specialized in CO_2 capture, transport, use and storage, including negative emissions, with extensive experience from oil and gas, international law and climate change policy
- Six team members, based in Son (Norway), Tasmania (Australia) and Copenhagen (Denmark)
- Formal education from Norway, England, France, Denmark, Belgium, Hong Kong, Egypt, Japan, Australia and the United States





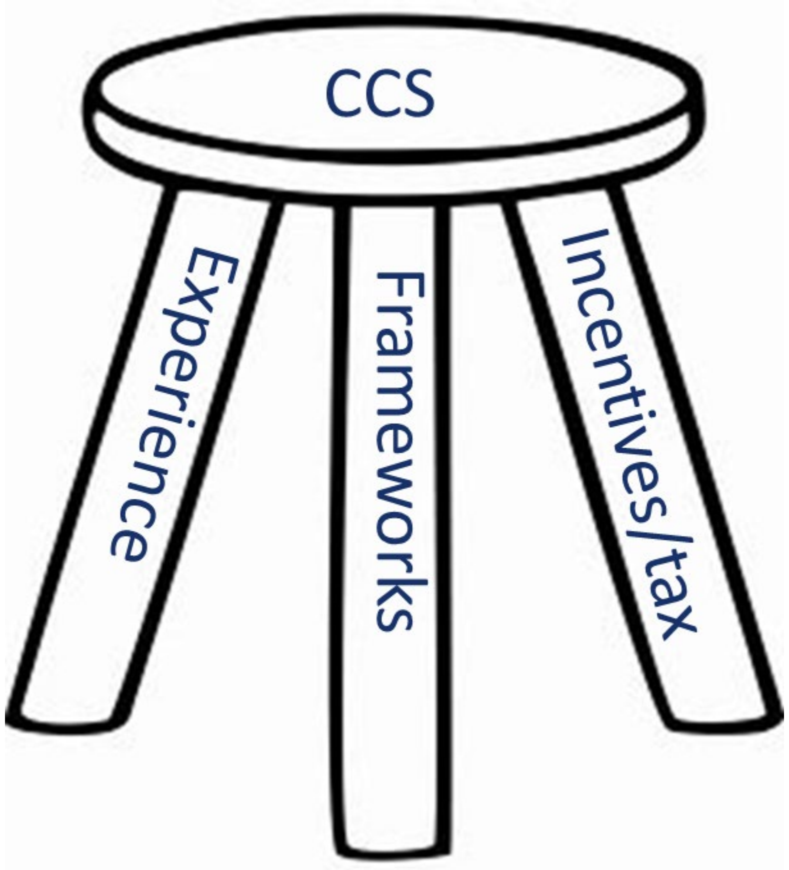

A roadmap to CCS frameworks

A three-legged stool

- A three-legged stool's legs form a triangle, giving it stability.

- The three legs are:
  1. Knowledge/experience
  2. Regulatory frameworks/standards
  3. Incentives/carbon tax

- Without any one of the three legs, CCS will fail.



A roadmap to developing a framework

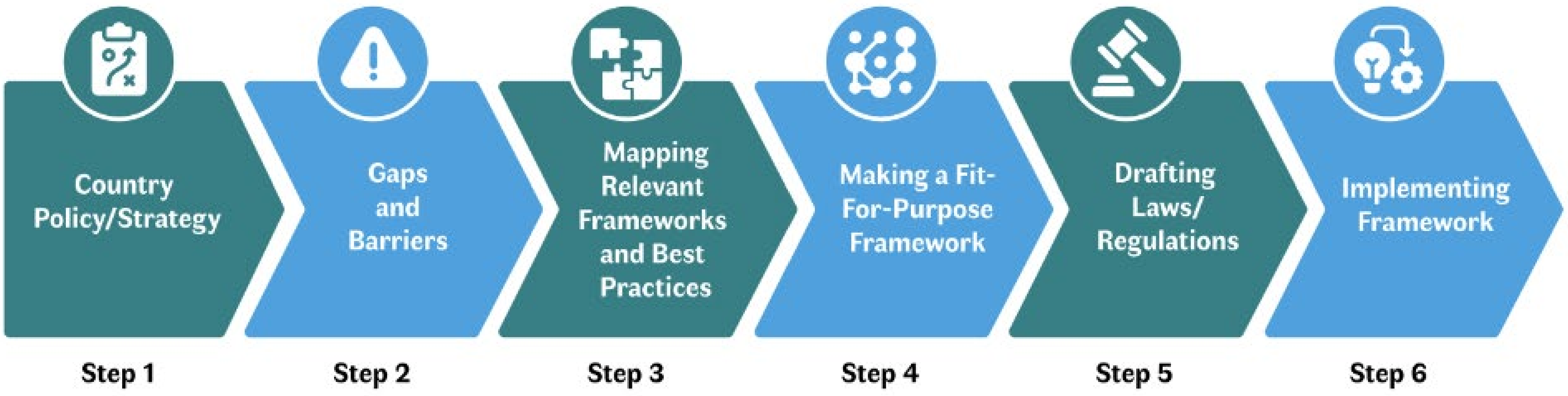


Illustration from the CLDP CCUS Handbook for Policymakers:
https://cldp.doc.gov/carbon-capture-utilization-and-storage-ccus-resources

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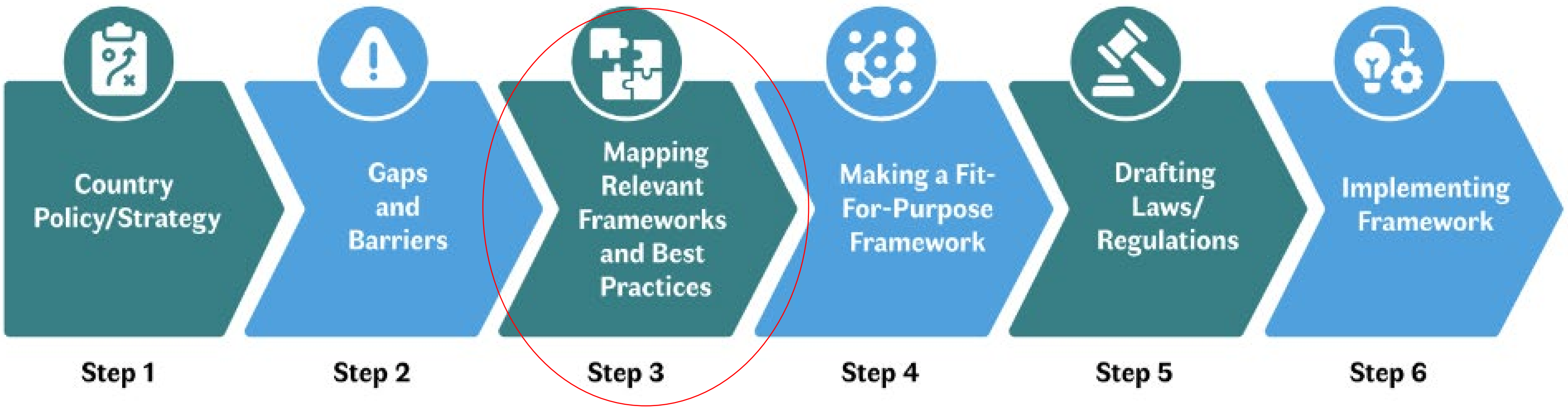

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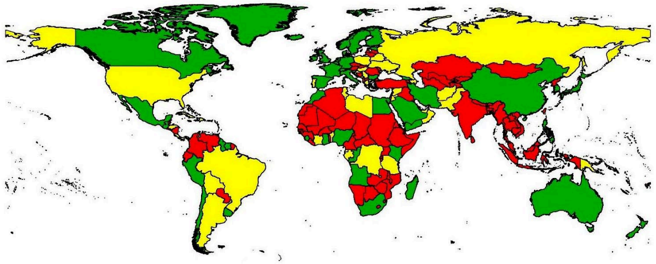
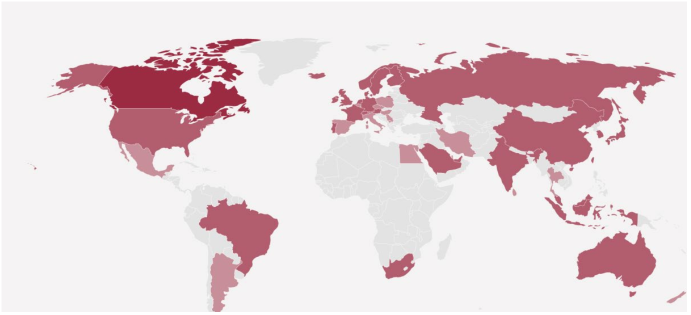
A number of instruments and tools to develop frameworks

- The London Protocol, including
  - its guidelines;
  - Resolutions; and
  - Contracting Parties
- Early-mover frameworks
- IEA CCUS Model Framework
- Technical standards, including standards developed under ISO TC 265
- Domestic legal and permitting frameworks for extractive industries
- Technical, commercial and regulatory findings from early-mover projects around the world



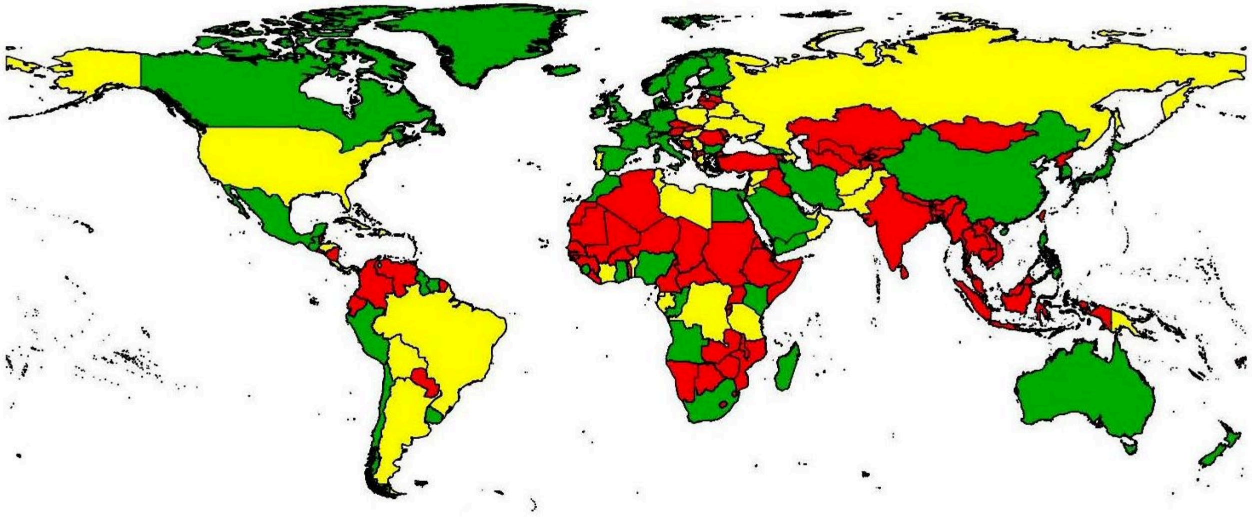
Source: International Maritime Organization



Source: International Organization for Standardization

The London Protocol

- Stand-alone agreement that supersedes the London Convention
- Implements a general ban on the dumping of waste and other matter at sea, with the exception of the waste and other matter listed in Annex 1 (reverse list)
- CO_2 was added to Annex 1 in 2006
- Export prohibition (art. 6)
  - 2009 Amendment
- 2009 Amendment is not yet in force
  - 2019 Resolution
- If envisioning an offshore CO_2 storage hub, <u>the London Protocol is key</u>



Map showing Contracting Parties to the London Convention (yellow), London Protocol (green) and non-Contracting Parties (red). Source: International Maritime Organization

Approaches to legal and policy issues around the world

Examples of approaches to issues: Level of regulation

- **Federal vs. State**
  - Australia: Commonwealth laws offshore; state laws <=3 nautical miles. Some state-specific CCS legislation
  - EU: CCS Directive. The Member States have national-level CCS regulation based on the Directive
  - Canada: federal and provincial
  - US: Split in Federal and State, with Primacy
- **Project-specific regulation**
  - Australia: W. Australia Gorgon Project regulated by Barrow Island Act
  - Malaysia: Kasawari offshore and Lang Lebah offshore → environmental, petroleum, safety/health acts all relevant (similar concept in Guyana)
- **Role of state-owned energy company**
  - Indonesia: govt permits companies to conduct CCS projects w/Pertamina
  - Malaysia: role of Petronas/PTTEP operating CCS projects under existing offshore O&G regulations
  - Denmark: Nordsøfonden is partnering in all Danish CCS projects
  - The Netherlands: EBN is partnering in all Dutch CCS projects

Examples of approaches to key issues: Incentives

- **Different approaches around the world; carrot or stick?**
  - EU: Emissions Trading Scheme (EU ETS), Carbon Removal Certification Framework (CRCF) and Carbon Border Adjustment Mechanism (CBAM)
  - Norway: ETS for about 40% of industrial emissions, stacking CO_2 tax + ETS for the petroleum sector, and introducing a CO_2 tax for non-ETS sectors
  - Australia: Australian Carbon Credit Units + $25 per ton "voluntary incentive"
  - Malaysia: tax incentive introduced 2023
  - US: 45Q tax credit, some places stacked with other incentives

Examples of approaches to key issues: liability

- Transfers to State after certain conditions met
  - Australia: for offshore projects, after min 15 years provided stable facility, Cth indemnifies operator
  - Japan: transfers
  - EU: CCS Directive requires min 20 years, unless evidence of permanent containment
  - France and Germany: 30 years (stricter than CCS Directive); civil liability not transferred
  - UK, Netherlands and Norway: 20 years (as per CCS Directive)
  - US: Indiana, Louisiana, North Dakota: permit transfer of liability upon evidence of suitable integrity and compliance
  - US: Louisiana and North Dakota: 10 years subject to proof of integrity
  - Canada: no specified min time (but best practice is 10 years)

- No transfers, but likely
  - Indonesia: facility secured, plan for future leak prevention, verified by independent third party
- No transfers
  - US: Texas

Examples of approaches to key issues: CO_2 Stream

- Most frameworks are performance-based, requiring the CO_2 stream to *«consist overwhelmingly of carbon dioxide»,* c.f. the London Protocol Annex 1

- The CO_2 stream composition will be dependent on several aspects, such as:
  - CO_2 source
  - Available technology
  - The characteristics of the storage site/storage complex
  - The infrastructure
  - Comingled streams

- Often, the infrastructure operators may have stricter requirements than the regulators

Examples of approaches to key issues: geophysical requirements

- Many commonalities
- The purpose of the geophysical requirements is to:
  - confirm geological formations are suitable for retention of CO_2,
  - identify risks,
  - to ensure integrity of the formation during and after operation, and
  - ensure permanency

- Geophysical requirements are
  - often performance-based
  - often partly described in laws and regulations, and partly from the operator’s proposed plans
  - often summarized in the permit and updated as needed
  - site specific
  - found in all the phases of the project

Examples of approaches to key issues: Building public trust

- Community engagement often criteria for environmental impact assessments

- Public trust and acceptance are risk factors to deploy large-scale industrial projects

- Several projects have been cancelled entirely or partly due to public opposition, e.g,;
  - The German RWE Hürth project: 2,6 Mt/yr annually (2008)
  - The Dutch Barendrecht project: 10 Mt over 25 years (2010)
  - The Polish Bełchatów project 280 MW. 0.1 to 1.8 Mt/yr CO_2 (2013)

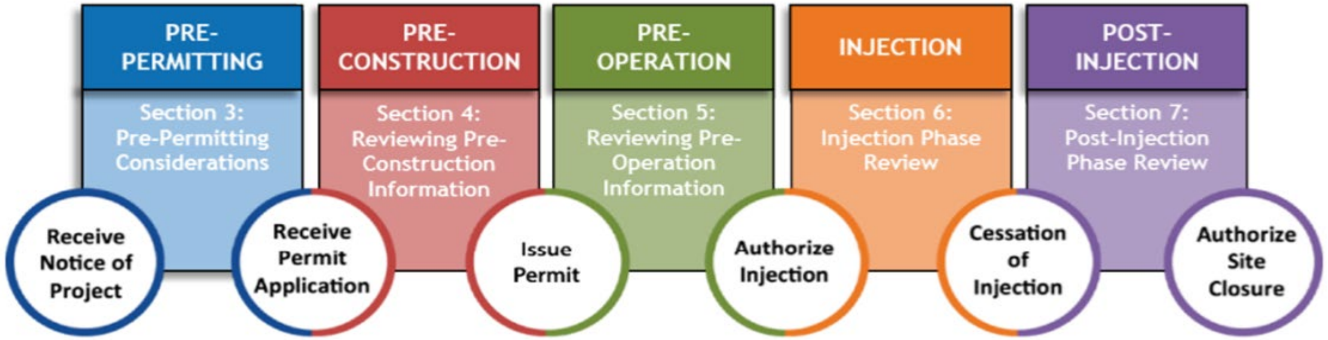
“The most important lesson learned from the Barendrecht project is that it is important to create mutual trust between stakeholders and commitment to each other and to the project. This can be done by including all stakeholders in the project process at an early stage and communicating about the project and its process to the community.”

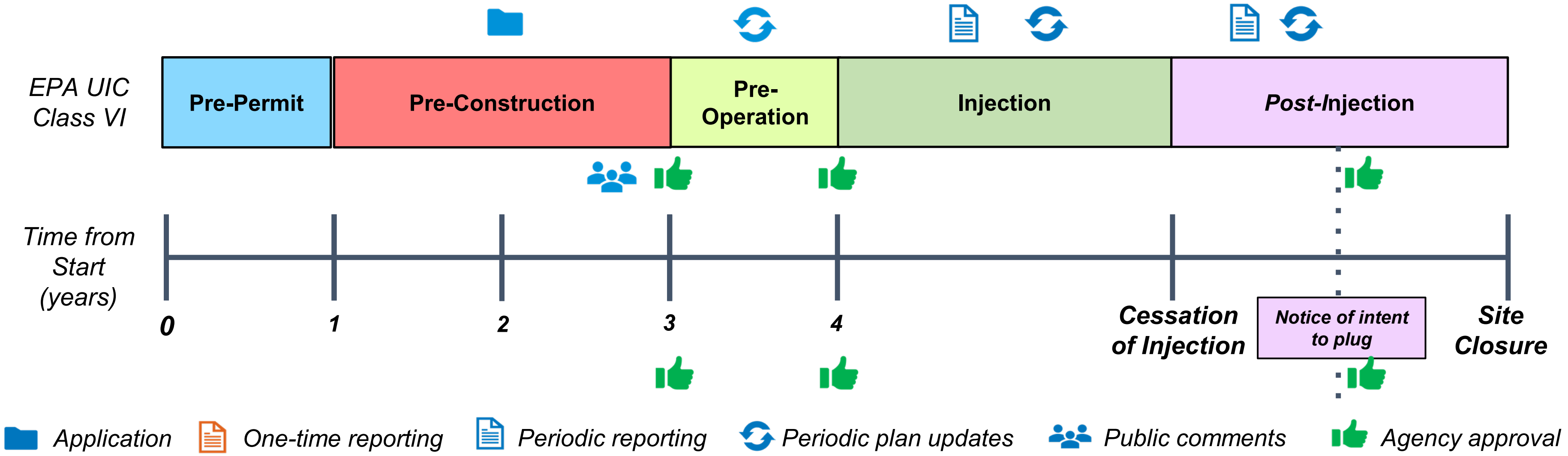
Examples of approaches to key issues: Building public trust

- An EIA was not required for Norcem's CO_2 capture project (**Norway**), but Norcem wished to be transparent about its project with the authorities and their local community.
- For Longship (**Norway**, transport/storage), a letter was sent to affected parties and announcements were printed in local newspapers to provide notification regarding start-up of the planning work and public consultation concerning the planning program, and public meetings were held in various locations.
- Illinois Basin - Decatur Project (**US**.) incorporated well and water table testing into their measurement and monitoring regimes to provide comfort and security to local landowners and inhabitants as required by regulation.
- Quest (**Canada**) engaged a local NGO to provide independent technical knowledge and information
- The Tomakomai CCS Demonstration Project (**Japan**) produced a range of manga-like cartoon books to explain CCS and its role in climate mitigation.
- The Peterhead project (**UK**) engaged with stakeholders:
  - formally as required by local planning regulations;
  - through events for supply chain, and with local communities in community centers and schools in towns and villages in the area around the project; and
  - organized a one-day event with a 2.5 km walk around the site to engage with the local community

Examples of approaches to key issues: Permitting

Permitting in the United States under the UIC Class VI framework





Lessons learned – Case study: Norway

Norwegian CCS development in a nutshell

- **Sleipner (1996) and Snøhvit (2008) – industrial projects**
  - A result of offshore carbon tax, ETS allowances, technical specification on sale of natural gas and permitting requirements
  - Commenced pursuant to the regulatory framework for petroleum activities

- Previous attempts of full-scale demo projects cancelled
  - Kårstø: 2005-2010
  - Mongstad: 2009-2013

- New CCS strategy in 2014-2015

- **Dedicated regulatory framework for CCS since 2014 (EU CCS Directive)**

- Ongoing full-scale industrial demonstration project (Longship) commenced in 2015

- Final investment decision for "Longship" made in December 2020, with planned start of injection Q3 2024

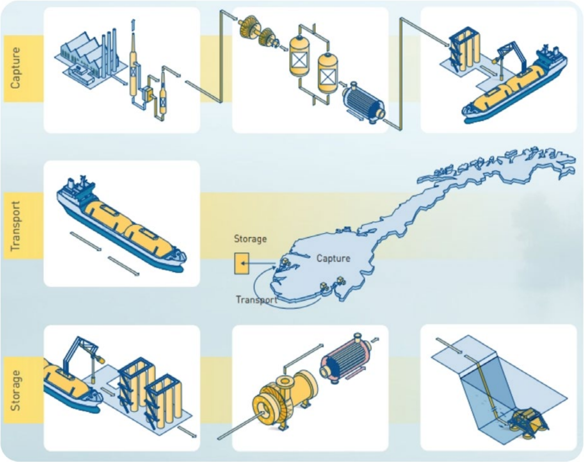


Illustration from Gassnova, Developing Longship – Key lessons learned, https://ccsnorway.com/publication/developing-longship-key-lessons-learned/

Some lessons learned from Norwegian CCS development

- Commencing a CCS project offshore Norway was possible without having a CCS framework
- Composing a well-functioning comprehensive framework for CCS is helped by having a pilot
- The experiences in the offshore petroleum industry was useful, and regulatory and permitting process and terms were re-used for CCS
- Performance-based requirements provide technical flexibility while ensuring environmental protection
- Filling gaps may be done using technical international standards and industry best practices
- Financial incentives key to have industry champion a pilot project
- Having the Norwegian authorities heavily involved has been beneficial
- Multiple regulators and agencies may need to collaborate to make it happen

Norwegian Ministry of Foreign Affairs

Norwegian Ministry of Energy

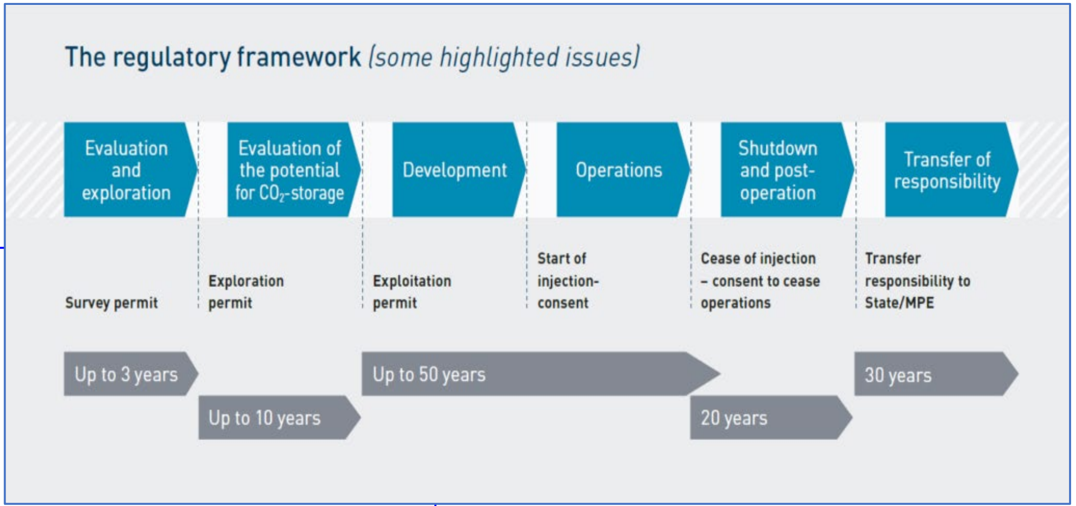
Norwegian Ministry of Climate and Environment

GASSNOVA

NORWEGIAN OFFSHORE DIRECTORATE

Havtil Norwegian Ocean Industry Authority

Current Norwegian regulatory approach to CCS



- Petroleum Act (1996)
  - Petroleum Regulations (1997)

Relevant for CO_2 storage related to petroleum activities

- Continental Shelf Act (1969)
  - Storage Regulations (2014)
  - CO_2 Safety Regulations (2020)

Relevant for CO_2 storage related to industrial activities (not related to petroleum)

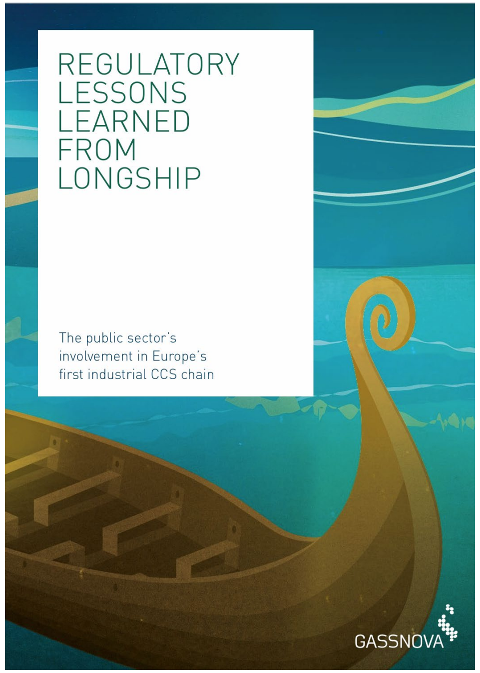
- Pollution Control Act (1981)
  - Pollution Control Regulations (2004)
    - Guidelines for financial security (2016)
- Greenhouse Gas Emission Trading Act (2004)
  - Greenhouse Gas Emissions Trading Regulations (2004)
- CO_2 Materials and Documentation Regulations (2017)

Relevant to CO_2 storage related to both petroleum and other industrial activities

The business case of CCS in Norway is based on national CO_2 taxes and CO_2 allowances under the European ETS market

Some observed challenges in the CCS Regulatory framework

- Industry, technology development and value chains move faster than the policy and legal frameworks
- Existing framework needs to be tested on commercial projects to refine e.g.:
  - Business models
  - Third-party access
  - Financial security
  - Liability
  - Transfer of responsibility
  - Interface between agencies
  - Cross-border collaboration
- Ship transportation not included in the CCS Directive and ETS Directive (recognised in the ETS Directive from 2024)
- Carbon removals not included in legal frameworks (recognized in the Carbon Removal Certification Framework from 2024)



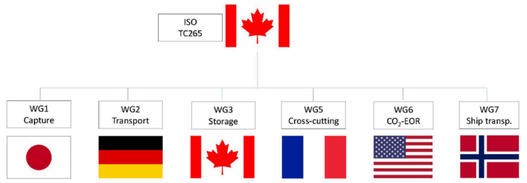
Technical standards

Privately developed standards under the ISO TC265

- Intent: *"prepare International Standards for the design, construction, operation, environmental planning and management, risk management, quantification, monitoring and verification, and related activities in the field of CCS"*

- A wide range of stakeholders and countries involved
  - 6 working groups
  - 28 countries participating
  - 17 observing countries
  - 10 liaisons (+ liaison ISO committees)

- 13 publications and counting
- 8 ongoing projects



ISO TC265 Carbon Dioxide Capture, Transportation and Geological Storage

TC265 standards support commercialization and R&D

- Technology neutrality
  - No patented rights
  - No explicit descriptions of technology or product
  - Fits both onshore and offshore
- Regulatory neutrality
  - Performance-based rather than descriptive
  - No time periods specified
  - No criteria for reporting
  - No criteria for decommissioning
  - No explicit references to e.g. transfer of liability
- Complements other standards
  - TC265 standards
  - Other ISO standards
  - Specific technical standards from other standardization bodies

Well-suited for e.g.:

- Contractual frameworks for hubs and clusters, and cross-border collaboration
- Cost reductions
- Filling gaps in frameworks and addressing technical requirements
- Permitting
- Accessing incentives
- Securing funding
- Public acceptance

TC265 standards in frameworks, processes and projects

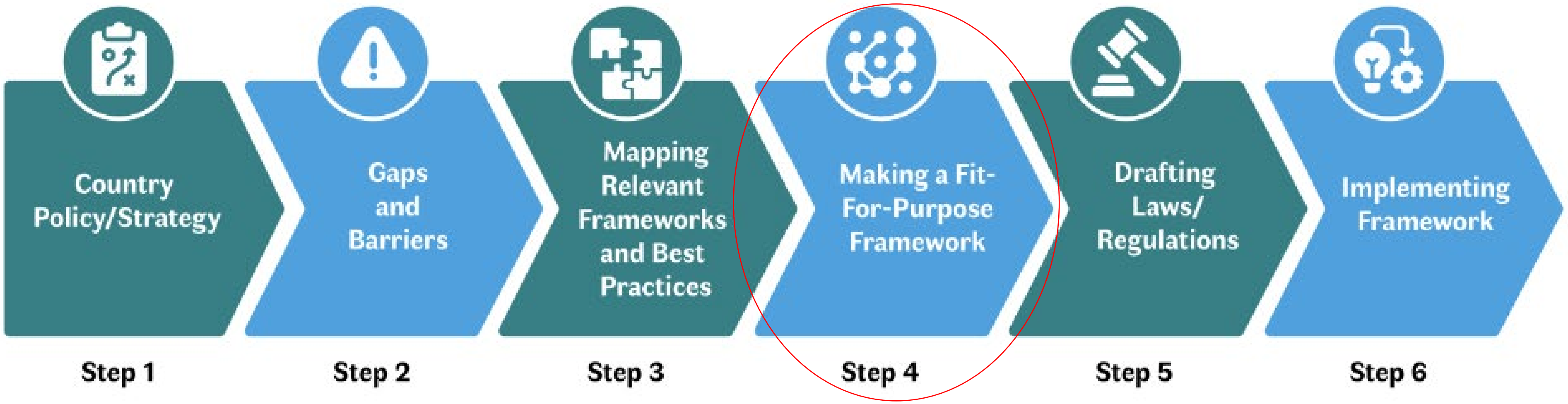
- Referred to in legal frameworks and regulatory processes, such as:
  - **Norwegian** CO_2 safety regulation guidelines refer to both ISO:27913 and ISO:27914
  - **United States'** IRS refers to ISO:27916 in 45Q tax credits for CO_2-EOR
  - The **European Union** taxonomy
  - MRV Plans in **Alberta, Canada**
  - Recommended guidelines for planning and evaluating CO_2 storage resources in **Japan**
  - Increased interest in using the standards in emerging frameworks in e.g., **developing countries**

- Used in known demonstration projects, such as:
  - The risk management approach in the **Norwegian** Longship project
  - Well design, inspection and testing, as well as CO_2 delivery specifications in the **Dutch** Porthos project
  - **Danish** permitting and tender processes for CO_2 storage in the Greensand project
  - Site feasibility of the Obskiy (Yamal) and Tadebyayakhinskiy (Gydan) licenses in **Russia**
  - The **Canadian** Aquistore project to assess e.g., injectivity, containment and capacity

- Used in other schemes and initiatives, such as:
  - Eligibility criteria for CO_2 stored from steel processes, in **Climate Bonds Initiative**
  - Monitoring requirements in the methodology for biomass fermentation with CO_2 storage, **Gold Standard**

What Makes a Good Regulation of CCS?

A roadmap to developing a framework



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Developing a fit for purpose framework takes time and efforts

Case study: the European Union

- ETS Directive (2003)
  - Monitoring and reporting regulations and guidance, including.:
    - ➢ Monitoring and Reporting Regulation (2018)
    - ➢ Accreditation and Verification Regulation (2018)
    - ➢ Regulation on GHGs chemically bound in products (2024)

- «Constantly» updated.
- Ship transportation added to the ETS regime recently.
- Amendments to accommodate for CCU are underway

- Environmental Liability Directive (2004)

- CCS Directive (2009)
  - Guidance Document 1: CO_2 (Storage Life Cycle Risk Management Framework)
  - Guidance Document 2 (Characterization of the Storage Complex, CO_2 Stream Composition, Monitoring and Corrective Measures)
  - Guidance Document 3 (Criteria for Transfer of Responsibility to the Competent Authority)
  - Guidance Document 4 (Financial Security and Financial Contribution)

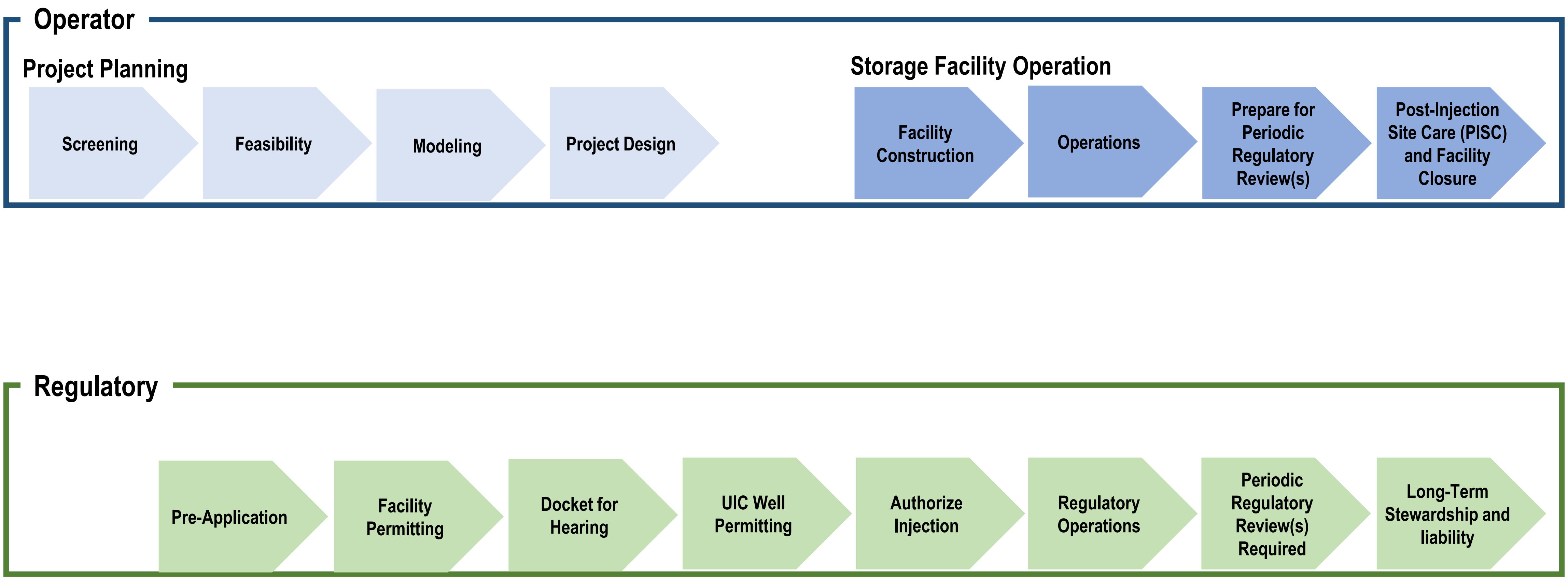
Updated in 2024

- Carbon Removal Certification Framework (2023)

- Carbon Border Adjustment Mechanism (2023)

- Net-Zero Industry Act (2024)

Building blocks in a framework inspired by the US model



Acknowledgements

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Thank you!

Back-up slides

Incentives in the United States – 45Q

45Q (US Federal)[1, 2]

- Credit goes to the **owner of the capture equipment, but** allows **transfer** of qualified credits.
- Available for **12 years** from date carbon capture equipment is placed in service.

Attribute	2018 BBA Value	2022 IRA Value
Credit for Dedicated Storage	$50US/MT	$85US/MT
Credit for Associated Storage	$35US/MT	$60US/MT
Credit for Dedicated Storage with DAC	$50US/MT	$180US/MT
Credit for Associated Storage with DAC	$35US/MT	$130US/MT
Qualifying threshold for power generation industrial facilities (MT)	500,000	18,750
Qualifying threshold for non-power generation industrial facilities (MT)	100,000	12,500
Qualifying threshold for DAC facilities (MT)	100,000	1,000
Deadline for starting construction	1/1/2026	1/1/2033

[1]U.S. Bipartisan Budget Act (BBA), 2018 [2]U.S. Inflation Reduction Act (IRA), 2022

Incentives in the United States – 45Q

California Low Carbon Fuel Standard

- Enables CCS projects that reduce emissions associated with the production of transport fuels sold in California, and projects that directly capture CO_2 from the air, to generate LCFS credits (**trading between $120-$200/tCO_2**).
- To receive certification, operators are required to meet **several minimum site selection criteria and plans** (e.g., well construction, monitoring, PISC period)
- The number of credits a project can claim is specified in the accounting requirements of the CCS Protocol. **CCS projects must contribute between 8% and 16.4% of the credits they generate** to a Buffer Account which provides a reserve that can be drawn on to maintain the environmental integrity of the LCFS in the event of CO_2 leakage.
- CLCFS can be stacked with the 45Q credit.

Incentives in the European Union: ETS cap and trade

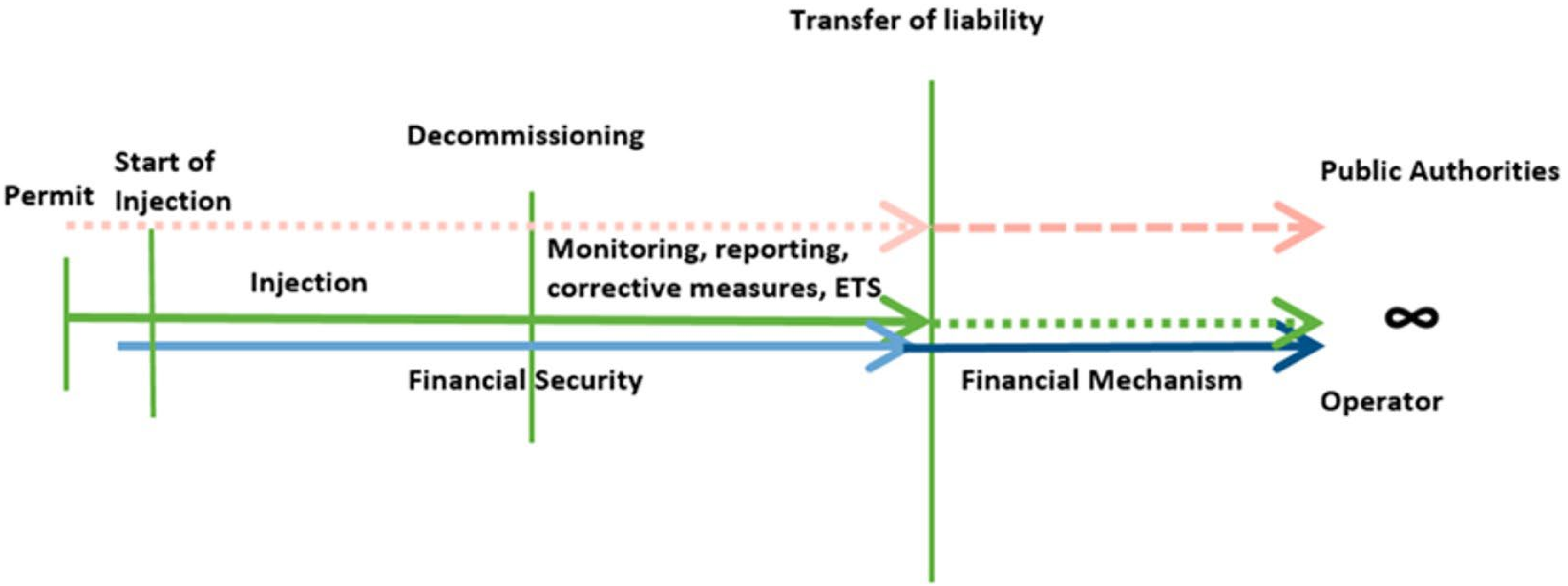
- Emitters must surrender and pay for allowances
- The operator shall subtract from the emissions of the installation any amount of CO_2 originating from fossil carbon [...] that is not emitted from the installation, but:
    - (a) **transferred out of the installation to** any of the following:

      (i) a **capture installation** for the purpose of transport and long-term geological storage in a storage site;

      (ii) a **transport network** with the purpose of long-term geological storage;

      (iii) a **storage site** [...] for the purpose of long-term geological storage;
- Member States shall ensure that allowances can be transferred within the Union*
- The CO_2 price is market driven; often fluctuating between 60-100 EUR/ton
- CBAM introduced to protect EU emitters from EU import of emissions intensive producs from jurisidictions with no or low price on carbon

Liability


Transfer of liability
Decommissioning
Start of
Injection
Permit
Public Authorities
Monitoring, reporting,
corrective measures, ETS
Injection
∞
Financial Security
Financial Mechanism
Operator

Case study: U.S. regulatory approach to CCS

The US Environmental Protection Agency regulates CO_2 storage onshore and in state waters pursuant to the Safe Drinking Water Act (SDWA) and the Underground Injection Control (UIC) Program;

- CO_2 storage associate with CO_2 -EOR; regulated under UIC Class II
- CO_2 geological storage; regulated under UIC Class VI

The UIC Class VI program provides minimum and often performance-based criteria

- In addition to the Class VI rule itself, the US EPA has developed:
  - ➢ guidance documents, a permit outline, checklists and computational tools, inventory of already permitted Class VI wells.

How to access, use, or lease property is regulated by State law and private contracts

- Stratigraphic test wells and monitoring wells are permitted under State frameworks

A Federal framework to store CO_2 offshore is pending and a draft is expected by the end of 2024