



Carbon Dioxide Capture and Storage. Transboundary Issues

Tim Dixon

IEA Greenhouse Gas R&D Programme

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IEA Greenhouse Gas R&D Programme



- A collaborative international research programme founded in 1991
- Aim: To provide information on the role that technology can play in reducing greenhouse gas emissions from use of fossil fuels.
- IEA Implementing Agreement funded by members: 23 countries and 25 organisations
- Producing information that is:
 - Objective, trustworthy, independent
 - Policy relevant but NOT policy prescriptive
 - Reviewed by external Expert Reviewers
- Focus is on carbon dioxide capture and storage
- Activities: **Studies and reports** (>120); **International Research Networks** (Wells, Risk, Monitoring, Modelling, Oxy, Capture, Social Research, Solid Looping); **Communications** (GHGT conferences, IJGGC, etc); **facilitating and focussing R&D and demonstration activities** eg Weyburn; **peer reviews** of projects and programmes; **Summer Schools**

Decision 7 / CMP.6



- (h) The appropriateness of the development of transboundary CCS projects and their implications shall be addressed

Points raised in Submissions to UNFCCC



- Many refer to IPCC GHG Guidelines, using the scenarios
- Potential negative consequences: potential violation of international law; cross-border disputes; long-term liability allocation; GHG reporting
- Potential approaches:
 - majority do not have objections, some prefer priority to national projects;
 - use of IPCC GHG Guidelines for accounting;
 - **involvement and approval of both DNAs;**
 - joint approval of boundary;
 - legal and regulatory regimes in both Parties;
 - clearly defined and agreed liability between Parties

IPCC Guidelines for GHG Inventories



- Apr 2006
- Vol 2 Energy, Chp 5 - CO2 Transport, Injection and Geological Storage
- Each site will have different characteristics
- Methodology

Site characterisation – inc leakage pathways



Assessment of risk of leakage – simulation / modelling



Monitoring – monitoring plan



Reporting – inc CO2 inj and emissions from storage site

- For appropriately selected and managed sites, supports zero leakage assumption unless monitoring indicates otherwise

IPCC Guidelines for GHG Inventories



Reporting of cross-border CCS operations - 4 scenarios:

- **Scenario 1.** CO₂ may be captured in one country, Country A, and exported for storage in a different country, Country B.
- Country A should report the amount of CO₂ captured, any emissions from transport and/or temporary storage that takes place in Country A, and the amount of CO₂ exported to Country B.
- Country B should report the amount of CO₂ imported, any emissions from transport and/or temporary storage (that takes place in Country B), and any emissions from injection and geological storage sites.

IPCC Guidelines for GHG Inventories



Reporting of cross-border CCS operations

- **Scenario 2.** CO₂ is injected in one country, Country A, and migrates from the storage site and leaks in a different country, Country B.
- Country A is responsible for reporting the emissions from the geological storage site. If such leakage is anticipated based on site characterization and modelling, Country A should make an arrangement with Country B to ensure that appropriate standards for long-term storage and monitoring and/or estimation of emissions are applied.

IPCC Guidelines for GHG Inventories



Reporting of cross-border CCS operations

- **Scenario 3.** More than one country utilizes a common storage site.
- The country where the geological storage takes place is responsible for reporting emissions from that site. If the emissions occur outside of that country, they are still responsible for reporting those emissions.

IPCC Guidelines for GHG Inventories



Reporting of cross-border CCS operations

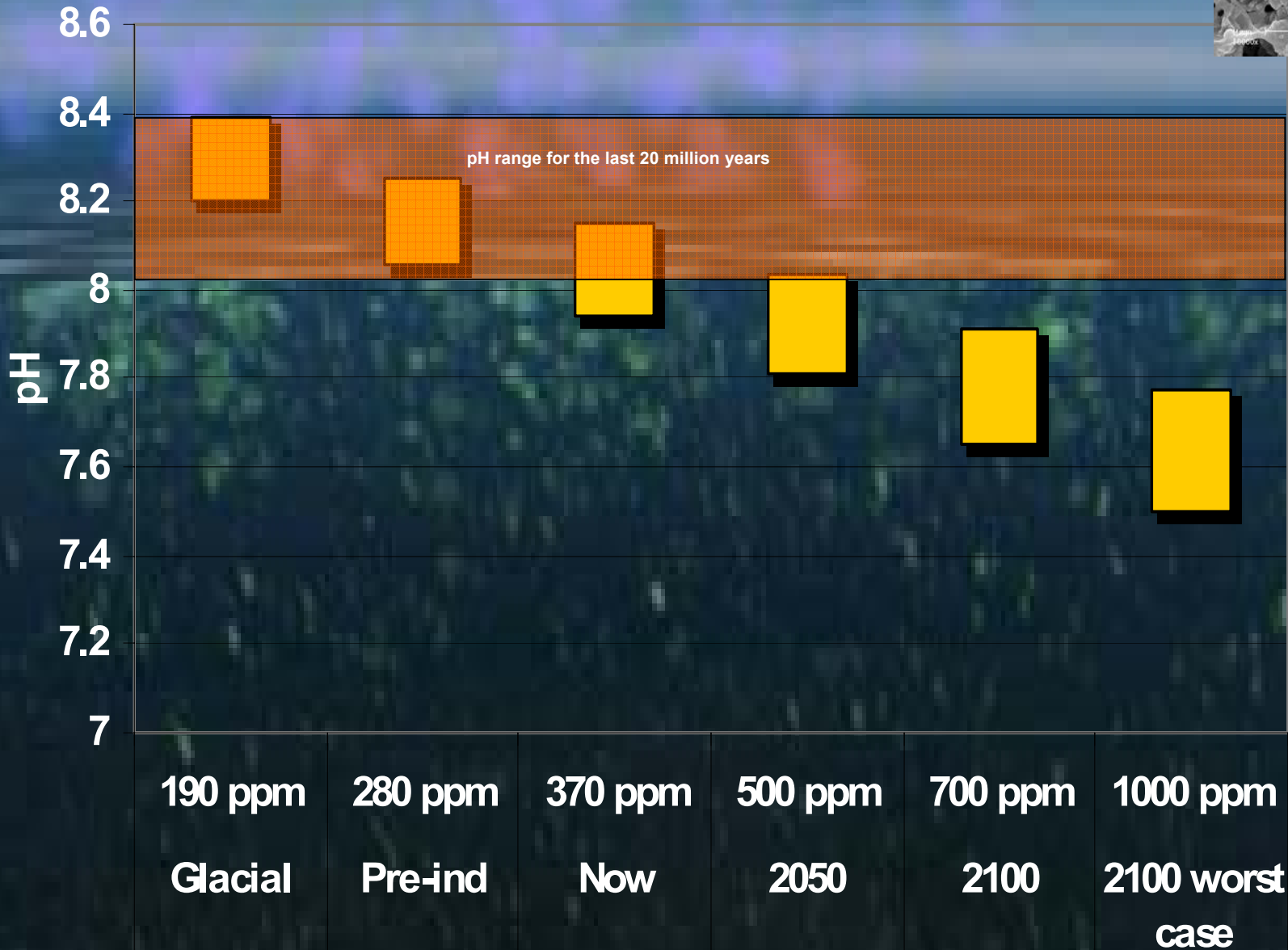
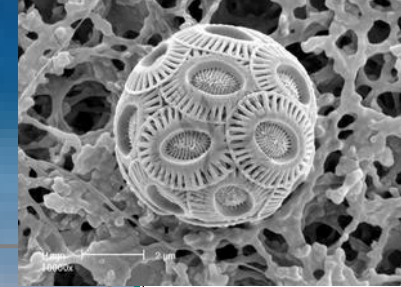
- **Scenario 4.** Storage site occurs in more than one country.
- Countries concerned should make an arrangement whereby each reports an agreed fraction of the total emissions.

London Convention and Protocol



- Marine Treaty - Global agreement regulating disposal of wastes and other matter at sea
- Convention 1972 (87 countries)
- Protocol 1996 – ratified March 2006 (40 countries as of Mar 2011)
- Prohibited some CCS project configurations
- CO₂ Geological Storage Assessed by LC Scientific Group 2005/6
- 2006 - Risk Assessment Framework for CO₂
- **To allow prohibited CCS configurations – Protocol amendment adopted at 28th Consultative Meeting (LP1), 2 Nov 2006 - came into force 10 Feb 2007 to allow disposal in geological formations**
- CO₂ Specific Guidelines – to guide regulators in permitting, based on EIA

Simulated and observed marine pH ranges till 2100



PML
2005



London Protocol Amendment



Allowed to dispose of “ *CO2 streams from CO2 capture processes for sequestration*”

“*Carbon dioxide streams may only be considered for dumping, if:*

- 1 disposal is into a sub-seabed geological formation; and*
- 2 they consist overwhelmingly of carbon dioxide. They may contain incidental associated substances derived from the source material and the capture and sequestration processes used; and*
- 3 no wastes or other matter are added for the purpose of disposing of those wastes or other matter.”*

LC 28/15 (6 Dec 2006) Annex6

London Protocol: Transboundary treatment



London Protocol Article 6

“EXPORT OF WASTES OR OTHER MATTER

Contracting Parties shall not allow the export of wastes or other matter to other countries for dumping or incineration at sea.”

- Prohibits transboundary transport of CO₂ for geological storage
- Working Groups 2008 and 2009. Considered range of scenarios
 - Working Groups agreed transboundary migration in geological formation is not export
- Annual meeting Oct 2008 - Agreed plenary statement to give a political message that “***LP should not create barrier to transboundary transport of CO₂ for CCS***”.
- Amendment proposed by Norway Apr 09 for consideration at annual Consultative meeting in Oct 09

CO₂ Transboundary Amendment to LP



- LP4 30 Oct 2009 - Amendment was adopted.
- Article 6 , new para 2. ***‘Export of CO₂ for disposal in accordance with Annex 1 may occur, provided an agreement or arrangement has been entered into by countries concerned’***
- Agreement shall include : permitting responsibilities; for export to non-LP Parties provisions equivalent to LP’s for issuing permits.
- Request to Scientific Group to re-examine CO₂ Specific Guidelines wrt to transboundary issues
- To come into force needs ratification by two thirds all Parties (27)

CO₂ Transboundary Amendment to LP



Context:- 2009 Amendment preamble includes:

- Reiterating the serious concern regarding the implications for the marine environment of climate change and ocean acidification
- CCS not a substitute for other measures, but one of portfolio of options
- Reiterating that LP should not constitute a barrier.....[to transboundary CCS]
- For export to non-Parties, accountability for compliance rests with CP

London Convention CO2 Specific Guidelines (2007)



- Scope – scenarios, boundaries
- Site selection and characterisation – physical, geological, chemical, biological
- Exposure assessment – characterisation CO2 stream, leakage pathways
- Effects assessment – sensitivity of species, communities, habitats, other users
- Risk characterisation – integrates exposure and effects - environmental impact, likelihood
- Risk management – incl. monitoring, mitigation

- CO2 stream purity: *“Acceptable concentrations of incidental associated substances should be related to their potential impacts on the integrity of the storage sites and relevant transport infrastructure and the risk they may pose to human health and the marine environment”*.

LC/SG 30/14 (Jul 2007) Annex 3.

Work ongoing on revisions for transboundary considerations

Ongoing LC work on revisions for transboundary considerations



LC/SG34 (2011)

- Revised Guidelines should cover both the scenario of export of CO₂ (by ship or pipeline) for sequestration purposes, and the scenario of transboundary movement of CO₂ after injection in sub-seabed geological formations;
- Transboundary movement should be addressed in the Guidelines as soon as possible, irrespective of whether the Article 6 amendment entered into force as it was recognized that this aspect is currently excluded.

Ongoing LC work on revisions for transboundary considerations



Proposed changes:

- Sharing of information (much, all specified)
- CP to CP – meet requirements and apply Guidelines jointly
- Transboundary movement to non-Parties on condition that meet the Protocol standards (on protection of marine environment) also procedures under the CO2 Specific Guidelines. Responsibility is CP's. Failure = transboundary movement not permissible
- Transboundary movement – CPs to meet Guideline requirements jointly
- Two or more permitting authorities for one geological formation, then States to reach agreement
- Export – originating State to characterise the CO2 stream
- Export – storage State to characterise the storage site, and effects
- Export – storage State to verify the monitoring and risk management arrangements

EU CCS Directive



Directive 2009/31/EC, 23 April 2009

- *Article 24*
- **Transboundary cooperation**
- *In cases of transboundary transport of CO₂, transboundary storage sites or transboundary storage complexes, the competent authorities of the Member States concerned shall jointly meet the requirements of this Directive and of other relevant Community legislation.*

Other international conventions



- *Basel Convention on Control of Transboundary Movements of Hazardous Wastes (1989)* – CO₂ not listed as a regulated substance
- *Bamako Convention on Ban on Import to Africa and Control of Transboundary Movement within Africa of Hazardous Wastes (1991)* – CO₂ not listed as a regulated substance
- Some CCS legislation has exempted CCS CO₂ from waste legislation (eg EU)
- *UN ECE – Espoo (1991)* – transboundary EIAs for industrial activities – CCS not listed, but similar activities are listed
- *Aarhus Convention (1998)* – public participation and access to environmental information for transboundary EIAs – would include CCS

Recommendations from others



‘Experts Report’ “Implications of the inclusion....CCS in CDM”. UNFCCC EB50, Annex 1

- Recommended for KP first and a second commitment period to restrict to within national boundaries with no risk of migration - to avoid problems such as if second country does not have a DNA or relevant permitting authority

IEA Model Legal Framework (2010)

- Harmonisation of regulatory approaches – permitting requirements, market issues, etc
- *“Either select a competent authority for one jurisdiction to oversee the project or, more likely, to implement joint regulatory responsibility for operations”*

Conclusions on Transboundary issues



- Transboundary GHG accounting and reporting covered by IPCC GHG Guidelines (2006)
- Offshore environmental protection and control of export and transboundary storage - covered by London Convention
- Onshore – environmental impacts of transboundary CCS potentially covered for some Parties by international conventions

UNFCCC CDM options for transboundary CCS include:

- to allow projects with a transboundary component, and require joint governance and collaboration between DNAs
- to only allow projects without a transboundary component

Useful information sources



- London Convention <http://www.imo.org>
- UCL Carbon Capture Legal Programme <http://www.ucl.ac.uk/cclp/>
- IEA Regulatory Network <http://www.iea.org/ccs/legal/index.asp>
- (Model Regulatory Framework, Legal Review, Webinars)
- <http://unfccc.int/resource/docs/2011/sbsta/eng/inf07.pdf>
- http://unfccc.int/documentation/submissions_from_parties_in_2011/items/5901.php
- http://unfccc.int/parties_observers/ngo/submissions/items/3689.php