



How to Meet International Regulations Covering Offshore CCS

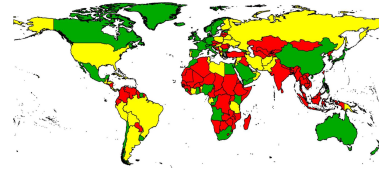
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IEA Greenhouse Gas R&D Programme

International Workshop on Offshore Geological CO₂ Storage

BEG, Austin, 19-20 April 2016

London Convention and Protocol



- Marine Treaty - Global agreement regulating disposal of wastes and other matter at sea. London Convention 1972 (87 countries). **London Protocol 1996** – ratified March 2006 (47 countries as of April 2016)
- Annual Meeting of the Contracted Parties. Annual meeting of Scientific Group.
- How it works:
- Prohibition on dumping of all wastes, except for those listed in Annex 1, which need to be permitted meeting certain requirements described in Annex 2.
- Annex 1: dredged material; sewage sludge; fish waste; vessels and platforms; inert, inorganic geological material; organic material of natural origin; bulky items primarily comprising unharmed materials, from small islands with no access to waste disposal options, and **Carbon dioxide streams from carbon dioxide capture processes for sequestration (must consist overwhelmingly of CO₂)**



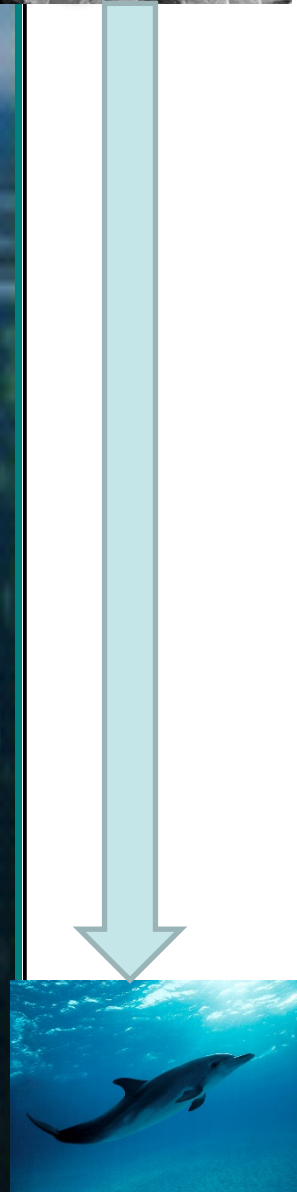
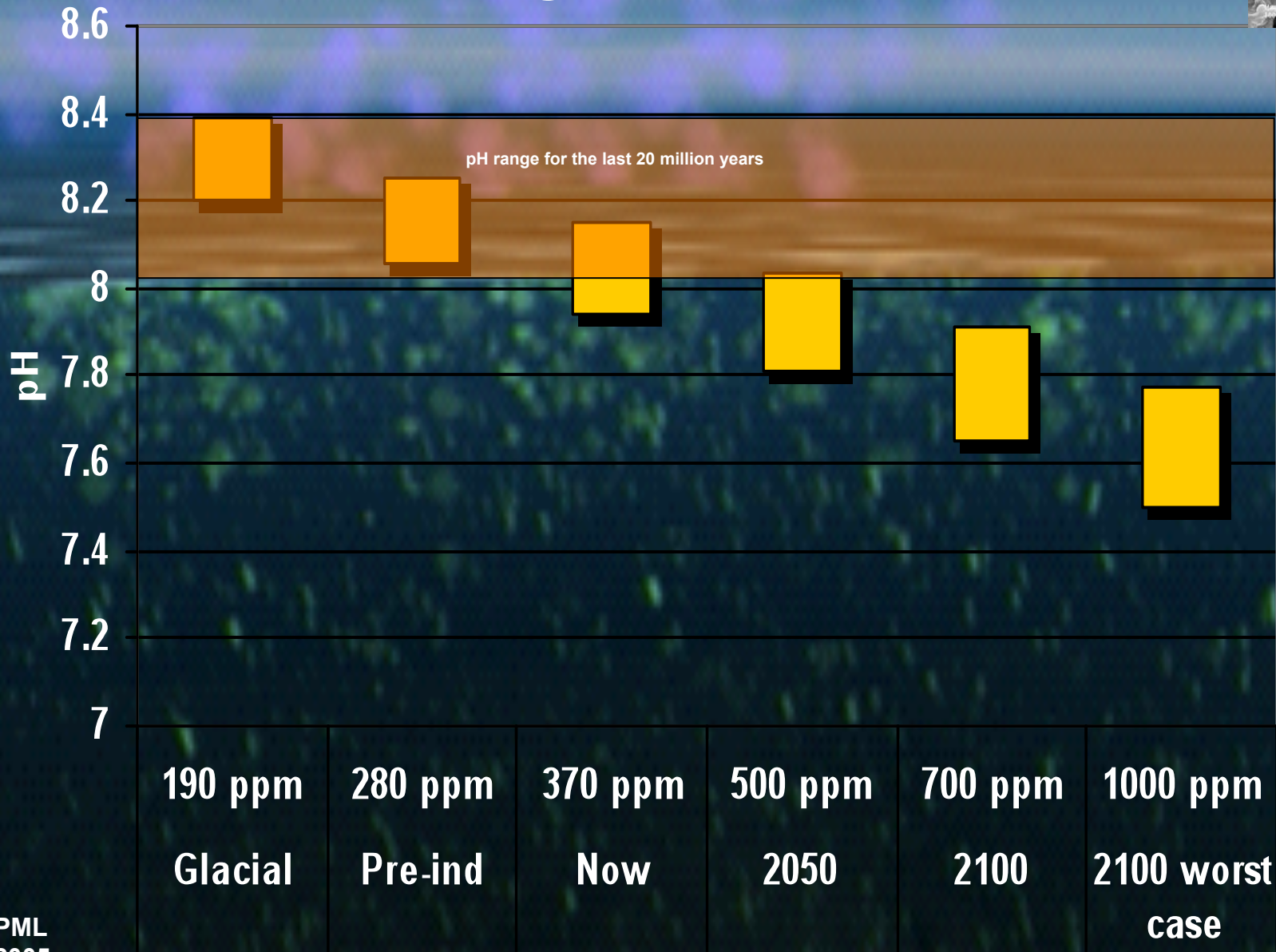
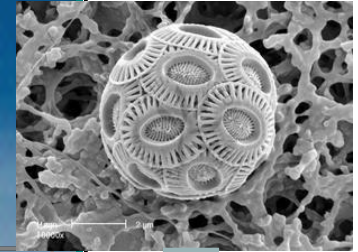
London Convention and Protocol and CCS



- Originally 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 – an amendment to allow disposal in geological formations was proposed and adopted at 28th LC Meeting (LP1), 2 Nov 2006 - came into force 10 Feb 2007
- CO₂ Specific Guidelines (2007/2012) developed to provide Annex 2 requirements



Simulated and observed marine pH ranges till 2100



CO₂ Specific Guidelines



- Around 56 requirements - generally qualitative rather than quantitative in nature:
 - Waste prevention audit / Waste management options
 - Chemical and physical properties (of CO₂ stream)
 - Action list (substances not allowed in CO₂ stream)
 - Site selection and characterisation
 - Characterization of the sub-seabed geological formation
 - Characterization of the marine area
 - Evaluation of potential exposure
 - Assessment of potential effects
 - Evaluation of potential effects
 - Risk assessment
 - **Impact hypothesis**
 - Monitoring and risk management
 - Monitoring and risk management
 - Mitigation or remediation plan
 - Permit and permit conditions

CO₂ Specific Guidelines



- "the CO₂ stream, consisting of:
 1. CO₂;
 2. *incidental associated substances derived from the source material and the capture and sequestration processes used:*
 - .1 *source- and process-derived substances; and*
 - .2 *added substances (i.e. substances added to the CO₂ stream to enable or improve the capture and sequestration processes);*
- 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.



London Protocol Transboundary



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
- 2009 LP4 (30 Oct) - Amendment to allow CO₂ for storage was adopted by vote.
- 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.
- **To come into force needs ratification by two thirds all Parties**
- Transboundary movement of CO₂ streams after injection is not export in the sense of article 6, of the London Protocol.

London Protocol Transboundary



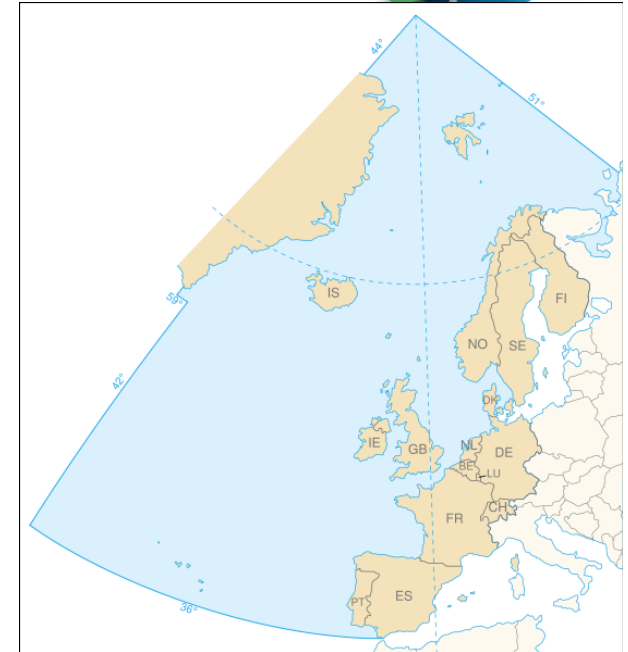
2015 Update

- 2012 - Revised CO₂ Specific Guidelines approved and adopted at LC-34, Oct 29, London. Covering subsurface transboundary migration.
Transboundary storage offshore now possible
- 2013 - New 'Guidance on Export of CO₂ Streams for Disposal' approved to cover responsibilities for 'arrangements or agreements' for export
- **All safeguards are now in place for transboundary CCS activity in the marine environment, including export.**
- **But – 2009 Transboundary amendment for CO₂ export needs 31 countries to ratify in order to come into force. Only 3 so far (Norway, UK, NL), 4 more on way**
- **So export of CO₂ still not permitted for offshore storage – unless for utilisation eg EOR.**

OSPAR



- Marine Convention for NE Atlantic, 1992
- 15 nations and EC
- Prohibited some CCS configurations
- Considered CCS and CO2 impacts
- To allow prohibited CCS configurations:
- Amendments (to Annexes II and III) for CO2 storage adopted June 2007
- Needed ratification by 7 Parties (8 ratified as of Oct 2011)
- Amendments came into force July 2011



- OSPAR Decision – requirement to use Guidelines when permitting, including risk assessment and management process
- OSPAR Guidelines for Risk Assessment and Management of Storage of CO2 in Geological Formations – includes the Framework for Risk Assessment and Management (FRAM)
- OSPAR Decision to prohibit ocean storage



OSPAR Guidelines for Risk Assessment and Management



In order to receive a permit must demonstrate:

- 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





Thank You

Any questions?

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