Impact assessment for enabling legal framework for Carbon capture & Storage

CO2Net East Kick-off Meeting

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Rationale for enabling CCS

- **Energy demand and supply projections for EU show significant fossil fuel use until 2050, unless nuclear is expanded significantly.**
- **Internationally, China, India, Brazil, South Africa and Mexico will lead a major global energy demand increase, probably met in large part from fossil fuels.**
- **Without making this use climate-compatible, we can never meet our climate objectives, regardless of our action in Europe.**
- **All technologies must be harnessed to meet the 2° objective at reasonable cost. Renewables and energy efficiency alone are not enough.**
- **By 2050, more than 90% of all coal-fired electricity generation would be from plants equipped with CCS.**

Outline of work

Basic objectives:

- **Confirm potential for CCS in Europe**
- **Ensure that it can be used safely.**
- **Provide legal and policy framework to promote rapid deployment of the technology.**

Main problems to be addressed:

- **Lack of information on potential for CCS in Europe**
- **Risks, and lack of a framework to manage them**
- **How to ensure commercialisation of the technology**

Timing

- **Assessment completed end July 2007, proposal end 2007**

Clarity on potential for CCS in Europe

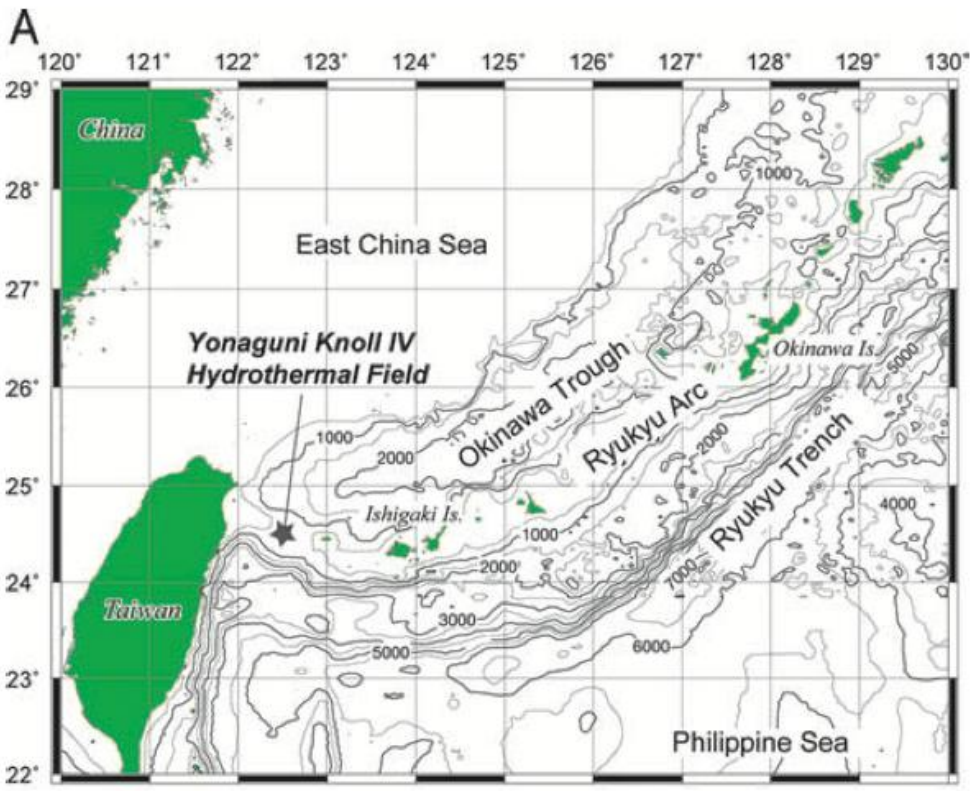
- Projections for future capture, transport and storage network, giving assessments of
  - Domestic storage capacity, for Europe and for MSs
  - Proportion of storage land-based, sea-based
  - Which kinds of storage site used
  - What sort of transport network is needed
- Use experience from RTD projects (CASTOR, Geocapacity)

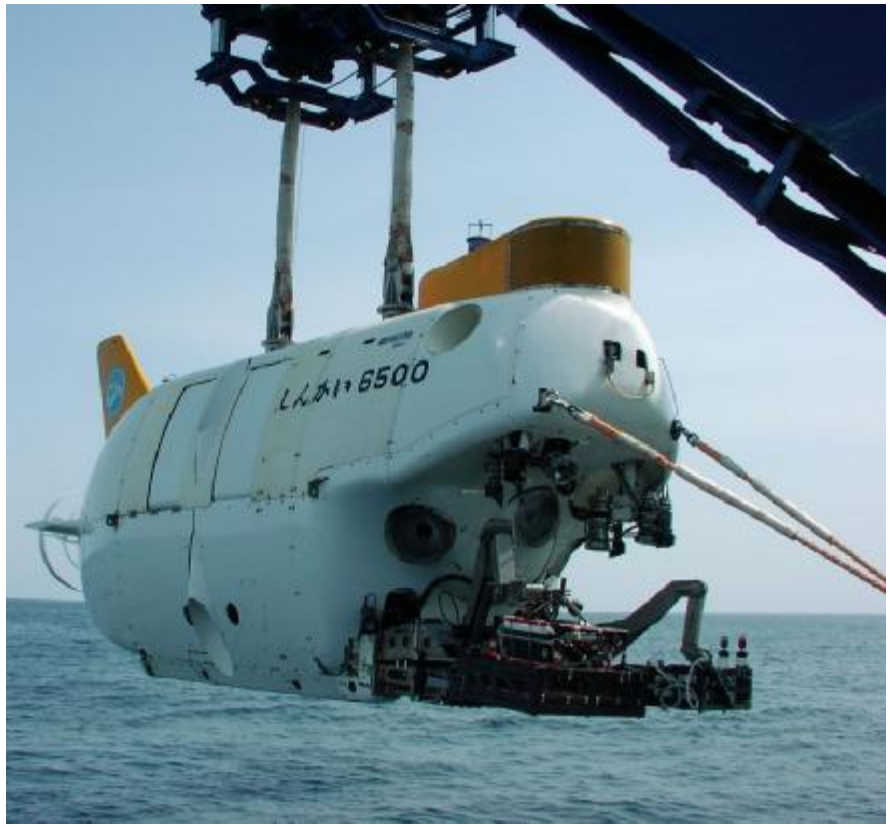
Risks

- **Risks from adverse events (principally leakage from transport network or storage site)**
  - **Kinds of event (e.g. point/diffuse leakage)**
  - **Likely frequency**
    - Historical leakage rates from transport/storage of natural gas, adjusted for difference in characteristics?
  - **Implications for human health and the environment?**
    - Monitoring/modelling of impacts?

- **Risks from construction and normal operation**
  - **Landscape, waste, impacts on air, water, soil, biodiversity and human health impacts**
    - Examine whether risks dealt with sufficiently by existing instruments (EIA, IPPC)
    - Assess extra impacts (e.g. from increased mining, transporting of coal)

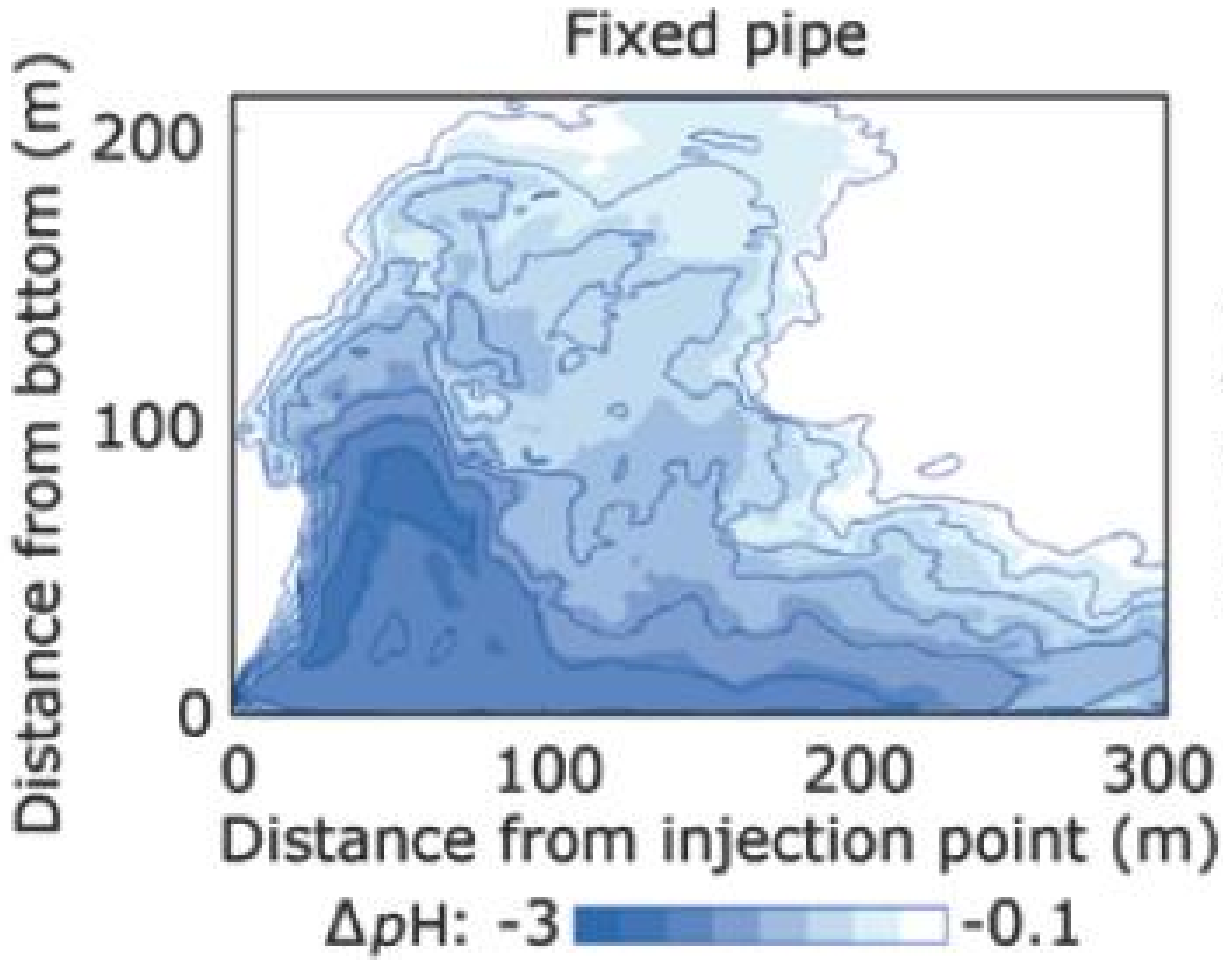
Observations of a naturally occurring CO_2 "lake"





Slide courtesy Ken Caldeira; data Inagaki et al. (2006)

Example: Leakage at a rate of 3,200,000 tons CO_2 per year



Slide courtesy Ken Caldeira, Data Chen et al., 2005

Atmospheric CO_2 stabilization above pre-industrial concentrations implies massive placement of CO_2 in the ocean

Stabilizing atmospheric CO_2 at 450 ppm will result in 4,500,000,000,000 tons of CO_2 (= 4500 $GtCO_2$) added to the ocean in equilibrium

Atmospheric CO_2 stabilization concentration (ppmv)	Total cumulative ocean + atmosphere CO_2 release ($GtCO_2$)	Amount of anthropogenic CO_2 stored in the ocean in equilibrium ($GtCO_2$)
350	2880 ± 260	2290 ± 260
450	5890 ± 480	4530 ± 480
550	8350 ± 640	6210 ± 640
650	10,460 ± 750	7540 ± 750
750	12,330 ± 840	8630 ± 840
1000	16,380 ± 1000	10,730 ± 1000

Slide courtesy Ken Caldeira; data IPCC SRCCS, 2005

Impact assessment of management options

- What kind of monitoring, modelling, risk management procedures have worked in the storage projects developed until now?
- Feasibility of various options for constraining site selection (geological requirements, leakage rates, requirement to demonstrate that no leakage occurs)
- Cost benefit work on risk management options: detail on monitoring, reporting and other risk management costs.
- Consistency with international regulatory obligations and third-country approaches (competiveness impacts)

Legal options for management framework

- If IPPC, can be inserted into revision timed for end 2007
- For SEA, EIA, no revision scheduled. Options:
  - Modify SEA, EIA to include CCS: requires opening text
  - Simply apply the relevant provisions using another legal text: 'The requirements of Articles x, y.. of Dir … on … shall apply to carbon capture and storage projects/plans…'
- Free-standing framework – develop provisions from scratch

Removing unwarranted barriers

Issues

- Water Framework Directive, Landfill Directive prohibit some kinds of geological storage
- Waste Shipment Regulation prohibits transboundary movement
- Waste Framework Regulation requires certain provisions in permit
- Other?

Options

- For waste directives, on basis of ECJ jurisprudence seems not possible to classify CO2 for storage as a by-product – any material in fact discarded counts as a waste.
- Landfill/Waste Shipment will need attention. Waste Framework permitting requirements can be covered by e.g. IPPC permit.
- WFD will need attention
- None of these up for modification. Can open text, wait for a suitable revision, or disapply provisions using another legal text.

Impact assessment

- With risk management framework in place, achievement of objectives of these directives will not be endangered. (Evidence that risks to aquatic and terrestrial ecosystems, drinking water supplies, human health are properly covered.)

Liability

- Long lifetime of storage sites: who is liable for any adverse effects?
- Three types of liability issue:
  - Liability for local damage to health and property
  - Liability for local damage to environment (ELD)
  - Liability for leakage of emissions credited under ETS
- Possible options:
  - Do nothing (over and above risk management measures)
  - Legal framework (including provisions governing transfer to state)
    - **Feasibility/desirability of financing mechanisms (insurance/funds)**

Incentive framework for CCS

- ETS is first line of incentivisation
- Further incentive framework?
  - Projections for 2015: €40-60/tonne avoided; carbon futures under second phase c €15-18
  - Will action happen to bring costs down without further EU intervention?
- If not, what further action is needed?
  - Treatment under state aid rules
    - **Possibility to treat notifications directly under the Treaty, based on state aids allowed for projects of comparable environmental performance (CHP, renewables)**
    - **Revision of Environmental Guidelines? (proposal early 2007, adoption end 2007)**
- Impacts on other forms of energy production

Making CCS mandatory?

- **Target in Communication on Sustainable Power Generation from fossil fuels communication**
  - **All new post-2020 must use CCS**
  - **All new prior to 2020 must be capture-ready and retrofit rapidly after 2020**

- Impact asssessment
  - What would we regulate: coal, gas, all fossil fuels, only large installations?
  - Cost of regulating?
  - Optimal retrofitting schedule for capture-ready plant
  - Effect on structure of energy market

Legal options for regulation

- IPPC, LCP, new legal framework

Information and consultation

Member States and stakeholders

- Work with contact groups of key MSs
- Consultation on gap analysis and options (week of April 16)
- Consultation on assessment/possible proposals (July)

Public

- Internet consultation (ends 16 April)
- Possible inclusion in Green Week
- Conference on science of CCS?

Summary

- Identifying potential in Europe
- Assessing likelihood and impact of risks
- Assessing management options
- Removing barriers
- Need for measures to support demonstration?
- Regulation of CCS?
- Public consultation