

**ccsp**

Carbon Capture and Storage Program

# Social acceptability of CCS technology in Finland

## Reflections from stakeholder interviews

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BASREC, Conference on Carbon Transportation and Storage

Warsaw, Poland, 6–7 March 2012

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Carbon Capture and Storage Program

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OF TAMPERE**

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## Objective of the presentation

- The objective:

to contribute to the discussion on the role of CCS in a context of low expectations.

- The main question:

What are stakeholders' concerns regarding CCS technology in the context of climate and energy policy in Finland?

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## GHG emissions in Finland

- Finnish greenhouse gas emissions 70 Mt CO<sub>2</sub>eq in 2008
  - Of these, CO<sub>2</sub> emissions accounted for 58 Mt
  - Majority from power and heat production
  - Annual variations wide
- Mapping of the largest (>0.1 Mt/a) emission sources performed
  - 60 largest facilities account for 50-60 % of Finnish CO<sub>2</sub> emissions

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## Some CCS activities in Finland

R&D:

1999–2002 ClimTech Program

- CO<sub>2</sub> capture, storage and utilisation in Finland

2004–2009 ClimBus Program

- CCS Finland (2008–2011)

2008–2010 Meri-Pori CCS demonstration project

- by power companies Fortum and TVO

2011– Carbon Capture Storage Program

Policy:

- The long-term energy and climate strategy of 2008
- Implementation of the CCS directive in Finnish legislation

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## Carbon Capture and Storage Programme – CCSP

Consortium members

- 16 Industrial partners
- 9 Research partners

Program volume:

- 3 M€/a 2011–2015

Consortium managed by CLEEN,

the strategic research centre for the Energy and  
Environment Cluster

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# Carbon Capture and Storage Programme

The key technology areas:

- CCS in CHP systems
- CCS technology related to multi-fuel and bio-CCS
- CCS solutions for the oil and gas and for the iron and steel industry
- Acceptability of CCS

Long term breakthroughs

- CLC (Chemical Looping Combustion)
- Mineral carbonation

The overall objective:

- to develop CCS related technologies and concepts leading to essential pilots and demonstrations starting by ca. 2014-2015 targeting these to commercial concepts available from ca. 2020 onwards

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# Carbon Capture and Storage Programme

## Work Package 1: CCS related regulation, legislation and EHSS questions

Updating and forecasting of the legislative framework of CCS, determining CO<sub>2</sub> emissions in connection to CCS and monitoring, Acceptability, Environment Health Safety & Sustainability questions, International networking

## Work Package 2: CCS concept studies

Power Plants, CHP, oil refining, steel industry, other industrial solutions

## Work package 3: Capture of CO<sub>2</sub> including advanced technologies

Oxyfuel solutions, post combustion capture, biomass related solutions, advanced solutions, CLC

## Work Package 4: Processing and logistics of captured CO<sub>2</sub>

Processing, logistics

## Work Package 5: Storage of CO<sub>2</sub>

Geological storage, CO<sub>2</sub> fixation by mineral matter

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## Review of the key terms: acceptance and acceptability

### public acceptability

refers to people's willingness to consider technology seriously

### public acceptance

formal decision to implement the proposal

Wolfe et al. (2002)

A Framework for Analyzing Dialogues over the Acceptability of Controversial Technologies.  
*Science, Technology & Human Values*. 27(1), 134–159.

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## Acceptability – meeting the social values and norms

- For Wolfe et al. **acceptability addresses the extent which the technology conforms with social values and norms “sufficiently well to be placed on the table as a viable alternative to other technologies”**.
- A technology may be technically feasible but not pass the test of social acceptability; **acceptability is a continuum** not a dichotomy; **acceptability may change over time**, positively and negatively.

Flynn (2007, 17)

Risk and the public acceptance of new technologies.  
In Flynn and Bellaby (Eds.) *Risk and the public acceptance of new technologies*.  
Palgrave MacMillan, Basingstoke, 1–23.

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## Conceptualizing social acceptance – three dimensions

### Socio-political acceptance,

- the broadest, most general level

### Community acceptance

- refers to specific acceptance of siting decisions and renewable energy projects by local stakeholders, particularly residents and local authorities

### Market acceptance

- in a wider understanding of market acceptance, the focus is not only on consumers, but also on investors
- probably the most under-researched angle of this field

Wüstenhagen, et al. (2007)

Social acceptance of renewable energy innovation: An introduction to the concept  
Energy Policy, 35(5), 2684–6

## Conceptualizing social acceptance – three dimensions

Socio-political acceptance	Community acceptance	Market acceptance
<ul style="list-style-type: none"> <li>• Of technologies and policies</li> <li>• By the public</li> <li>• By key stakeholders</li> <li>• By policy makers</li> </ul>	<ul style="list-style-type: none"> <li>• Procedural justice</li> <li>• Distributional justice</li> <li>• Trust</li> </ul>	<ul style="list-style-type: none"> <li>• Consumers</li> <li>• Investors</li> <li>• Intra-firm</li> </ul>

# Public acceptance of CCS in Finland – Survey results

## SPECIAL EUROBAROMETER 364

### Public Awareness and Acceptance of CO<sub>2</sub> capture and storage

#### REPORT

Fieldwork: February – March 2011

Publication: May 2011

[http://ec.europa.eu/public\\_opinion/archives/ebs/ebs\\_364\\_en.pdf](http://ec.europa.eu/public_opinion/archives/ebs/ebs_364_en.pdf)

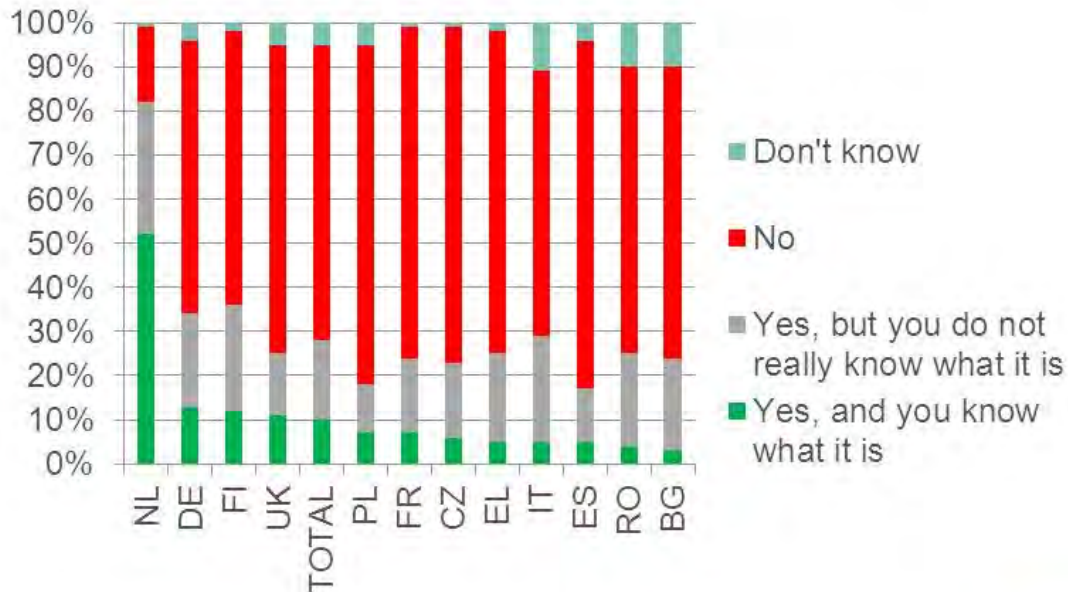
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### QE5. Which of the following statements do you think apply to carbon dioxide (CO<sub>2</sub>)? (Special Eurobarometer 364, p.47)

	unhealthy	water pollutant	flammable	safe to breath	exposive	harmless	other (spontaneous)	none (spontaneous)	don't know	only pos. statements	only neg. statements
DE	74%	16%	8%	11%	9%	6%	2%	3%	8%	9%	74%
NL	69%	20%	5%	17%	5%	8%	5%	7%	3%	15%	66%
PL	75%	14%	8%	5%	11%	7%	1%	2%	8%	6%	78%
FI	52%	26%	2%	10%	2%	18%	2%	5%	11%	19%	58%

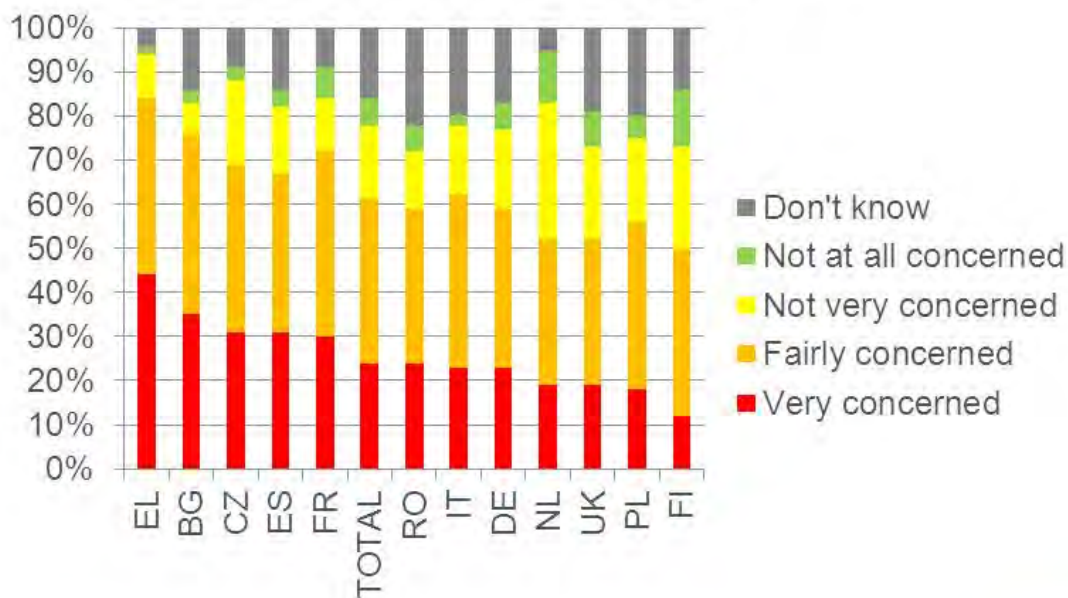
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**QE9. Have you ever heard of CO<sub>2</sub> capture and storage, also known as carbon capture and storage or carbon capture and sequestration (CCS)? (Special Eurobarometer 364, p.74)**



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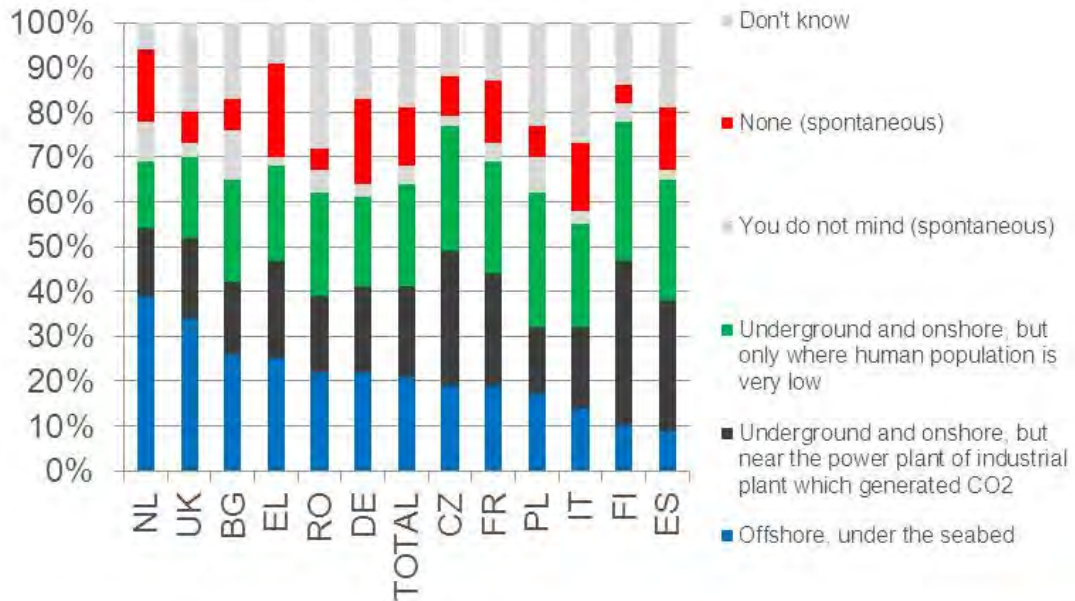
**QE16. If a deep underground storage site for CO<sub>2</sub> were to be located within 5 km of your home, do you think that you would be...? (Special Eurobarometer 364, p. 91)**



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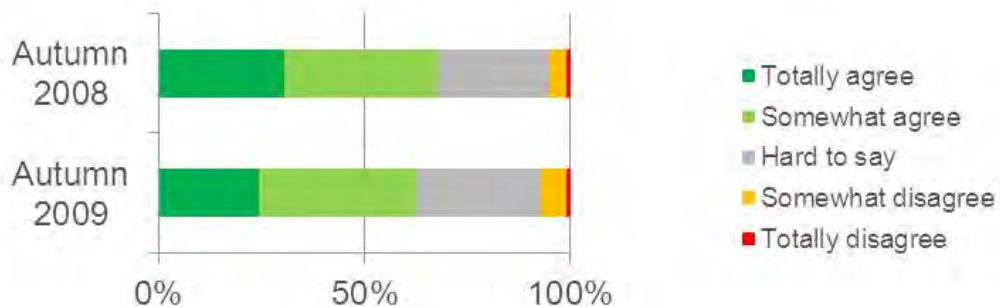


**QE18. For future use of CCS in the EU, which of the following options concerning the storage of CO<sub>2</sub> would you prefer? (Special Eurobarometer 364, p. 104)**



**“Because most of the world’s energy will be produced using fossil fuels for decades, the most urgent task is to develop systems for capture and storage CO<sub>2</sub>.”**

Source: *Finnish Energy Attitudes 2009, Figure 24*  
[http://www.sci.fi/~yhdys/eas\\_09/english/en\\_kuvio\\_24.htm](http://www.sci.fi/~yhdys/eas_09/english/en_kuvio_24.htm)





## Definition of a stakeholder

*"... agents with a professional interest in CCS. Hence, stakeholders can include industry, non-governmental organizations (NGOs), governments and research institutions.*

*The issues concerning CCS are quite different for the lay public compared to the stakeholders.*

*One of the reasons for this is that the latter nearly always have a defined agenda or set of preferred policy objectives in mind when evaluating CCS, whereas the lay public does not have an a priori viewpoint."*

van Alphen, et al. (2007)  
Societal acceptance of carbon capture and storage technologies.  
*Energy Policy*. 35(8), 4369.



## Stakeholder interviews in Finland (1)

- Twelve stakeholders interviewed
- Selection of interviewees based on
  - Statements on the implementation of the directive on geological storage of CO<sub>2</sub>
  - Own consideration
  - Interview feedback
- No refusals

## Stakeholder interviews in Finland (2)

- Conducted November 2011 – January 2012
- Duration of one interview:  
from ~45 minutes up to ~1h 40 minutes
- Extent of a transcribed interview:  
from 9 pages (~22000 characters with spaces)  
up to 19 pages (~68000 characters with spaces)

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## Stakeholders interviewed

Representatives of

- Authorities
  - National
  - Local
- Energy industry
  - Companies
  - Interest groups
- Environmental NGOs
- Research organisation

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## Who should be interviewed? Most frequently recommended by the interviewees (**interviewed**)

### Industry

- Rautaruukki
- Fortum
- The Confederation of Finnish Industries EK
- The Finnish Energy Industries
- Finnish Forest Industries

### Authorities

- Ministry of Employment and the Economy
- Ministry of the Environment

### NGOs

- Greenpeace
- Friends of the Earth
- World Wide Fund for Nature
- The Finnish Association for Nature Conservation

### Research

- Technical Research Centre of Finland

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## Method of interview

- Theme introduced briefly beforehand, but not questions
- Short presentation of CCS Program
- Main questions same for all interviewees
- Additional questions and amplification depending on responses (semi-structured interview)
  - I Background / warm-up
  - II Main questions
  - III Specific themes
  - IV Recommendations for additional interviewees

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## Definition of a concern in the study

- Expression of criticality, uncertainty, risk, threat, concern, challenge, problem or fear by a stakeholder due the main questions in interview
- Expression of concern used as a unit of analysis in the study
- Main categorization based on tripartite dimensions :
  - socio-political,
  - market,
  - community
- Sub categorization based on interview data

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## Typology of stakeholders' concerns

### SOCIO-POLITICAL DIMENSION

- Policy and regulation issues
- Technology and technological development
- Storage of CO<sub>2</sub>
- Environmental and health issues
- Moral issues

### MARKET DIMENSION

- Costs, cost efficiency, profitability
- Investment, investment risk, public subsidies

### COMMUNITY DIMENSION

- Local impacts and acceptance
- Local awareness and acceptance

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## Remarks on socio-political dimension (1)

- Predictability and continuity of policy requested
  - at both international and national level
- Need for international agreements e.g.
  - to safeguard storage capacity
  - to clarify responsibilities
  - to create confidence
- Climate and energy policy
  - CCS seen as
    - hopelessly slow technology, other measures preferred
    - technology with great potential
  - Support for coal industry?
  - Impaired energy efficiency
  - Uncertainty of CCS technology
  - Combination of peat and CCS rejected by NGOs

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## Remarks on socio-political dimension (2)

- Incomplete regulation of CCS export
  - Supervision of ship transportations?
- Implications of absence of CO<sub>2</sub> storage capacity in Finland
  - Prevents full-scale deployment in Finland
  - To proceed Finnish players must join international storage projects
  - Delays development and deployment of CCS technology in Finland
- Environmental concerns
  - Leaks
  - Effects on climate change
  - Transportations (more traffic, shipping accidents)
- Moral issues
  - Is it morally right to export CO<sub>2</sub> captured in Finland elsewhere?

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## Remarks on market dimension

- Costs, cost-efficiency, profitability
  - Transportation costs
  - Impaired energy efficiency
  - Concern on over-confidence on declining costs of CCS
- Investments and investment risks
  - Negative and critical attitudes to CCS; displaces more efficient measures
  - Investment in CCS on market terms and private funding only
  - Lack of national means to arrange and share the investment risk
    - No state owned energy company as a risk bearer

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## Remarks on community dimension

- Local impacts
  - Pipelines (in relation to land use)
  - Increased transportation
  - CO<sub>2</sub> leakages with severe health impacts
  - Milieu
- Local awareness
  - Local awareness of general principles and equity issues
  - Local residents in Finland interested in rights of people living near the storage site
  - Ironized "as long as the loader and the crane are not hanging over my backyard, people will feel pretty safe"

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**Thank you for your attention!**