Recent developments in public attitudes and acceptance of CCS: An overview of research activities and results in recent years

Peta Ashworth, Sarah Wade, David Reiner, Dancker Daamen, Kenshi Itaoka
Copenhagen Climate Conference – Session 17
Overview

• Acknowledge Carbon Dioxide Capture and Storage Social Research Network (C2S2RN)
• Covers a snapshot of the research
• Research directed at range of stakeholders:
  • Influential stakeholders – energy researchers, policy makers, NGO’s, media
  • General public
  • Project specific areas

• Considerations
  • Belief in carbon mitigation
  • Role of information provision
  • Social risk to technology acceptance
  • Once formed opinions can be hard to change
  • Social characterisation of project sites
  • Awareness does not mean acceptance
Timeline of Communication Research Activities
2002 - 2007
171 scientists and engineering students working in CCS

What is your personal opinion of CCS? What do you think general public’s opinion is?

Shows substantial variations between different nations.

Personal opinion most positive in UK, NO and US.

Perceived public opinion most positive in FR, NO and UK
Informed Opinions on barriers for CCS implementation

What are the most relevant barriers to the implementation of CCS-technology in the future?

- Economic feasibility
- Public acceptance
- Legal issues
- Policy aspects
- Risk aspects
- Technology
- Management

Percentage of respondents
Public Awareness: 
Heard or read of the following in the past year?

- Carbon sequestration
- Carbon capture and storage
- Bioenergy/biomass
- Hydrogen cars
- Bioenergy/biomass
- Carbon capture and storage
- Hydrogen cars
- Bioenergy/biomass
- More efficient appliances
- Wind energy
- More efficient appliances
- Wind energy
- Nuclear energy
- More efficient appliances
- Wind energy

D. Reiner et al., (2007) *An international comparison of public attitudes towards carbon capture and storage technologies. GHGT-8*
Public Awareness:
Heard or read of the following in the past year?

Spain

UK

Sweden

Japan

* know to some extent
Preferred energy technology to address global warming

D. Reiner et al., (2007) *An international comparison of public attitudes towards carbon capture and storage technologies. GHGT-8*
Pseudo Opinions
(de Best-Waldhober et al. 2009)

Have you heard of large, modern coal fired power plants where CO$_2$ is captured and stored underground?
- no (not heard of) 68%
- a little 28%
- yes 4%

Can you give this technology a grade?
“No opinion” 27%
gives a grade 73%

40 to 56% combines “no (awareness)” regarding CCS technology with a grade (=pseudo-opinion).

- highly unstable (changes in 12 minutes)
- worthless for predicting future public support of CCS
Information Choice Questionnaire

Aim

• To provide respondents with the necessary information to reach an informed opinion,
• To help them make use of this information to form opinions about different policy options.
• By guiding respondents’ information processing.

Differences

• Instead of asking respondents to evaluate several options, respondents are asked to solve a policy problem by choosing an option.
• Respondents are informed about the policy problem and the aspects and consequences of the choice options.
• Respondents are helped to process and remember the information, and are helped to make a decision.

M.de Best-Waldhober et al. (2009) How the Dutch evaluate CCS options in comparison with other CO2 mitigation options. GHGT9
## CCS in relation to other options

- **Overall Informed Evaluation Options**

<table>
<thead>
<tr>
<th>OPTIONS:</th>
<th>Grade (1-10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>7.33</td>
</tr>
<tr>
<td>Efficiency + &lt;use</td>
<td>5.84</td>
</tr>
<tr>
<td>Wind at sea</td>
<td>7.15</td>
</tr>
<tr>
<td>Biomass to fuel</td>
<td>7.41</td>
</tr>
<tr>
<td>Coal/ gas to electricity + CCS</td>
<td>5.34</td>
</tr>
<tr>
<td>Gas to hydrogen + CCS</td>
<td>5.92</td>
</tr>
<tr>
<td>Nuclear plants</td>
<td>5.29</td>
</tr>
</tbody>
</table>

M.de Best-Waldhober et al. (2009) How the Dutch evaluate CCS options in comparison with other CO2 mitigation options. GHGT9
Acceptable but less popular

- Pick 3 out of 7 of options
- Reject – if option is totally unacceptable

<table>
<thead>
<tr>
<th>Choice</th>
<th>Choice</th>
<th>Rejection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>90.2%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Efficiency + &lt;use</td>
<td>24.0%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Wind at sea</td>
<td>75.4%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Biomass to fuel</td>
<td>70.0%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Coal/ gas to electricity + CCS</td>
<td>6.9%</td>
<td>11.0%</td>
</tr>
<tr>
<td>Gas to hydrogen + CCS</td>
<td>10.6%</td>
<td>6.8%</td>
</tr>
<tr>
<td>Nuclear plants</td>
<td>22.9%</td>
<td>20.0%</td>
</tr>
</tbody>
</table>

M.de Best-Waldhober et al. (2009) How the Dutch evaluate CCS options in comparison with other CO2 mitigation options. GHGT9
Most of the Japanese public is still unaware of CCS but number of people with some knowledge is increasing.

Japanese public are rather positive toward promoting CCS in general as a part of climate portfolio but rather negative toward real implementation.

In terms of knowledgeable people on CCS, they support CCS more than unknowledgeable people. They even support implementation of geologic storage.

“Concern about risks and leakage” and “Understanding of effectiveness” would influence public acceptance.

Itaoka et al. (2008) Influential information and factors for social acceptance of CCS: The 2nd round survey of public opinion in Japan.GHGT-9
<table>
<thead>
<tr>
<th>Time</th>
<th>Saturday</th>
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</thead>
<tbody>
<tr>
<td>8:45 - 9:00</td>
<td>Workshop registration.</td>
</tr>
<tr>
<td>9:00 - 9:30</td>
<td>Welcome and introductions.</td>
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<tr>
<td></td>
<td>Individual Survey</td>
</tr>
<tr>
<td></td>
<td>Current knowledge</td>
</tr>
<tr>
<td>9:30 - 10:30</td>
<td>Climate Change &amp; Energy</td>
</tr>
<tr>
<td>10:30 - 10:45</td>
<td>MORNING TEA</td>
</tr>
<tr>
<td>10:45 - 12:30</td>
<td>Energy Technologies</td>
</tr>
<tr>
<td>12:30 - 1:15</td>
<td>LUNCH</td>
</tr>
<tr>
<td>1:15 - 3:00</td>
<td>Deliberation</td>
</tr>
<tr>
<td>3:00 - 3:15</td>
<td>AFTERNOON TEA - Facilitators meet</td>
</tr>
<tr>
<td>3:15 - 4:30</td>
<td>Key messages - clarification</td>
</tr>
<tr>
<td></td>
<td>Individual Survey</td>
</tr>
<tr>
<td>4:30</td>
<td>FINISH</td>
</tr>
</tbody>
</table>
## Qualitative - Large group process

<table>
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<tr>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Strongly disagree</strong></td>
<td>Before % 6.9</td>
<td>After % 3.6</td>
<td>Before % 8.6</td>
<td>After % 10.2</td>
<td>Before % 2.1</td>
</tr>
<tr>
<td><strong>Moderately disagree</strong></td>
<td>13.8</td>
<td>10.7</td>
<td>5.2</td>
<td>1.7</td>
<td>2.1</td>
</tr>
<tr>
<td><strong>Disagree</strong></td>
<td>0</td>
<td>14.3</td>
<td>6.9</td>
<td>5.1</td>
<td>14.9</td>
</tr>
<tr>
<td><strong>Unsure</strong></td>
<td>48.3</td>
<td>25</td>
<td>48.3</td>
<td>32.2</td>
<td>59.6</td>
</tr>
<tr>
<td><strong>Agree</strong></td>
<td>13.8</td>
<td>35.7</td>
<td>8.6</td>
<td>27.1</td>
<td>6.4</td>
</tr>
<tr>
<td><strong>Moderately agree</strong></td>
<td>13.8</td>
<td>7.1</td>
<td>17.2</td>
<td>13.6</td>
<td>8.5</td>
</tr>
<tr>
<td><strong>Strongly agree</strong></td>
<td>3.4</td>
<td>3.6</td>
<td>5.2</td>
<td>10.2</td>
<td>6.4</td>
</tr>
<tr>
<td><strong>Missing responses</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100.1</td>
<td>100</td>
</tr>
</tbody>
</table>

Ashworth et al. (2008) Engaging the public on Carbon Dioxide Capture and Storage: Does a large group process work? GHGT9
Questions about CCS

• “Have any studies been done on ways to use CO2 emissions for practical uses thereby creating a recycling effect rather than just bury it?”

• We need to know more about it before widespread application - Is it safe? What are the long-term effects? Is it a cover-up operation – will it give companies that invest in this technology the appearance of looking green without actually doing anything?

• CCS is not an answer but can be a bridge for other technologies. I thought it was bad but now I have changed my opinion.

• What is payback period for building CO2 sequestration, brings jobs and progress but how many emissions?

• CCS is a pipedream; there is not concrete evidence of it working

• How far down the track is carbon sequestration? How soon can we implement? How long can we use the special sequestration spots?
Project specific

• US Department of Energy’s (DOE) Regional Carbon Sequestration Partnership Program provided opportunity for comparison of public perceptions among three different geographic and cultural regions:
  • West (California Central Valley) - Potential and actively considered host site community
  • Southwest - Near communities affected by hosting test sites (New Mexico and Arizona)
  • Midwest - In non-host community (Ohio)
• Focus groups
  • general societal concerns
  • familiarity with & attitudes about climate change
  • familiarity with carbon sequestration
  • reactions to sequestration policy frameworks
  • perceived advantages/disadvantages of sequestration
  • attitudes toward potential safeguards to mitigate risks

Bradbury, J., et al. *The Role of Social Factors in Shaping Public Perceptions of CCS: Results of Multi-State Focus Group Interviews in the U.S*
Predominance of Social Concerns

• Among all groups, most strongly expressed concerns were:
  • trust in authority
  • concern about the fairness of CCS implementation procedures
• Domination of technological risk issues in CCS discussion may be misplaced. Rather, social processes are key.
• Public perceptions of the risk of technology do not occur in a vacuum. People bring to their evaluation of a particular technology their cultural frame of reference: differing values, experiences, way of interpreting and responding.
• Technology and decisions about risk (level and acceptability) are essentially social in origin and effect.
• Resolution of safety issues related to leakage, seismicity and containment are essential to successful deployment of CCS.
• But, management of these risks is the critical factor for public acceptance
  • How can we have a say in what happens?
  • Will the process be fair and will anyone listen to us?
  • Can we trust the project developers and government to take care of problems
  • What have our previous relationships with these entities shown us?
  • What is the benefit to the community
  • How does the project fit or improve our way of life?
What have we learnt

- CCS is less positively evaluated when compared with other mitigation options
- The evaluation of capture and storage could be influenced by the technology it is associated with
- Influenced by individual’s strength of existing opinions – does the new information create dissonance
- Quality and objectiveness of information
- Trusted and knowledgeable expert
- Greater emphasis needed on procedural and management concerns
- Associated need for upfront social analysis and planning
- One-way outreach after site selection is not the same as prior consultation, two-way exchange of communication between developers and potentially affected community
Conclusions

- Varying levels of knowledge about climate change and its causes – need this to accept CCS
- Still limited knowledge about CCS
  - Knowledge greater among more educated participants
  - Very little knowledge of the potential scale required
- Any communication needs to be in context of climate change mitigation – suite of options
- CCS is a bridging technology to a more sustainable future
- CCS investment not at expense of renewables
- Need to provide scientific based information, includes benefits and risks
  - information on natural/industrial analogues will assist risk perception
- Communication about how other people or organisations view CCS will influence acceptance.
Peta Ashworth
Senior Social Scientist

Phone: +61 7 3327 4145
Email: peta.ashworth@csiro.au
Web: www.csiro.au

Thank you
CCS Risky Business or Not?

• Stakeholder positions about new ideas and technologies are arrived at through a series of decisions that are made when assessing the risks and benefits of a technology, as well as its moral acceptability.

• Perceptions of risks are heightened when the risk is
  • unknown,
  • catastrophic,
  • felt immediately,
  • uncontrollable, and
  • can harm other people (Slovic, 2000)

• Essential elements of any worthwhile risk communication strategy for new perceived high risk technologies (Cormick 2004):
  • mechanisms for building trust
  • understanding stakeholder perceptions
  • moral acceptability to society
  • ensuring benefits outweigh risks.