1ST SOCIAL RESEARCH NETWORK MEETING

Report: 2010/ 09

June 2010

INTERNATIONAL ENERGY AGENCY

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DISCLAIMER AND ACKNOWLEDGEMENTS

IEAGHG supports and operates a number of international research networks. This report presents the results of a workshop held by one of these international research networks. The report was prepared by IEAGHG as a record of the events of that workshop.

The 1st international research network on Social Research was organised by IEAGHG in co-operation with CIRED. The organisers acknowledge the financial support provided by Global CCS Institute and by the Chaire d'Enseignement et de Recherche sur le Captage, le Transport et le Stockage du CO_2 for this meeting and the hospitality provided by the hosts at CIRED, Campus du Jardin, Nogent-sur-Marne, Paris, France.

A steering committee has been formed to guide the direction of this network. The steering committee members for this network are:

Peta Ashworth, CSIRO (Chair)
Tim Dixon, IEA GHG (Co-Chair)
Jason Anderson, WWF
Dancker Daamen, Leiden University
Marjolein de Best-Waldhober, ECN
Sallie Greenberg, University of Illinois
Minh Ha Duong, CIRED (Host)
Kenshi Itaoka, Mizuho Information and Research Institute
David Reiner, University of Cambridge
Sarah Wade, AJW

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Summary Report of

Social Research Network

Meeting

2 – 3 November 2009

CIRED, Campus du Jardin Tropical, 45 bis avenue de la belle Gabrielle, Nogent-sur-Marne, France

Organised by IEA GHG

Hosted by CIRED

With the sponsorship of:

Cired, Global CCS Institute, Chaire d'Enseignement et le Recherche sur le Captage, le Transport et le Stockage du

Contents

Appendix 1: Agenda
Appendix 2: Attendees

Welcome and Introduction

The meeting was opened by Minh Ha Duong of CIRED, who welcomed the participants to the Campus du Jardin Tropical and thanked the sponsors of the meeting, CIRED, who were hosting the meeting, the Chaire d'Enseignement et de Recherche sur le Captage, le Transport et le Stockage du and the Global CCS Institute.

This was followed by an introduction from Tim Dixon of the IEA GHG, who reiterated Minh's thanks to the sponsors and hosts, and welcomed all to the IEA GHG Social Research Network meeting. He gave a short description of the IEA GHG Programme and explained how the IEA GHG Research Networks work; each of them focused on a particular area of research with the aim to bring together experts and share knowledge and experience in the area.

Peta Ashworth of CSIRO also welcomed the participants and gave a brief history of the Social Research Network, which started as the Carbon Capture and Storage Social Research Network (C2S2RN) in 2006.

After this introduction the group participated in several panel and interactive discussions. When presentations are indicated below, the slides are available online in the members' area of the website at:

://www.ieaghg.org/index.php?/2009112027/social-research-network.

Session 1: Setting Objectives and Scope of the Research Network
Chair: Peta Ashworth, CSIRO

As this was the first IEA GHG Social Research Network meeting, group discussions took place to identify the overarching aims and objectives of the network. After much discussion and reiteration it was agreed that the overarching aim should be:

To foster the conduct and dissemination of social science research related to CCS in order to improve understanding of public concerns as well as improve the understanding of the processes required for deploying projects

In more detail the objectives agreed by the network included to:

Ensure high quality social science research

- Elevate the reputation and acceptance of social science research to help people understand the value of it.
- Ensure consistency of our research.
- Identify and fill the gaps in the work that is being done.
- Develop a greater understanding of the value of social processes.
- Engage alternative theoretical approaches and raise awareness of alternatives

Promote a learning environment

- Learn from one another
- Provide peer review and feedback on individual research projects
- Exchange ideas
- Minimize overlap - especially among planned research projects

Building capacity within the social research network

- Promote student and researcher exchanges

Translate the information gleaned from studies into tools or applied lessons

- Apply insights to actual CCS projects
- Interact with technical experts
- Address technical communication challenges
- Communicate results to policy makers
- Facilitate collaboration between social science researchers and technical experts
- Ensure that the application of social science findings is grounded in theory

Create a database of social science research – a clearing house of tools

- Build objective and accessible information

Other Considerations

Participants also discussed that the SRN should consider ways to include new researchers into the network as well as integrating the research of the network into other areas of energy and environmental risk policy. At the same time it was recognized that the SRN was likely to evolve over time as it became more established. Potential phases that were discussed included:

- Phase I - Focusing within the social science community to build consistent language, approaches and overall quality of research
- Phase II – More externally focused on other researchers and disciplines as well as targeting users of the information.

A desire was also expressed to ensure that the SRN mission remained inclusive, that is it is not so pro CCS that certain groups are excluded, e.g. NGO's. However concern was expressed that the network needs to be mindful of its role within the CCS world and that its role should be considered more as knowledge brokers and not advocates - the difference between the research network and industry.

Session 2: Current Research in Social Science
Chair: David Reiner, University of Cambridge

This session featured three presentations describing some current social science research projects focused on CCS.

2.1. Australian Energymark Programme. Peta Ashworth, CSIRO

Peta Ashworth, supported by Anne-Maree Dowd gave a review of CSIRO's Energymark Programme in Australia, which takes on a bottom-up approach towards communicating with the public about tackling climate change. Small groups of people led by a voluntary group convenor discuss various topics relating to climate change, energy technologies and behaviour. The concept builds on the idea of bonds within a social network. The approach may serve as a model for engaging larger groups of stakeholders at a lower cost.

Clarifying Questions and Comments

Q: It was mentioned that on average, emissions reduction per household by 27% was achieved by changing people's attitudes and behaviours, how was this followed up?

A: This was followed up after 12 months and we are planning to re-survey 6 months after that. There are different methods of carbon footprint analysis and we take an average of these. People reduce their consumption of energy often by switching to solar power as this is relatively easy in Australia.

Q: You do pre-, interim and post surveys. When are they carried out?

A: There are 8 sessions in total, for which the groups will set the agenda, depending on their various commitments. The first survey is taken at the start, the interim after session 4 and the post-survey after session 8.

2.2. A Review of Public Understanding and Public Engagement Studies for the IEA Roadmap. Simon Shackley, Edinburgh University

Simon Shackley, supported by Ben Evar, gave a presentation showing how traditional project planning and decision making processes, while elegant, are not necessarily effective. The presentation offered the term 'clumsy' to describe an approach to planning and decision making that may be effective in the case of CCS. Such an approach would take a more organic or dynamic approach to planning. Three modes were described. Mode 1 (universal knowledge) and 2 (context specific) scientific approaches do not take into account social and political issues, seeing them more as an obstacle. Where as a mode 3, hybrid imagination approach, integrates social issues, which makes it more robust, but complex and possibly messy.

Clarifying Questions and Comments

Q: What is 'clumsiness'? It is coming to a solution between competing interests, not necessarily from a position of trade-offs.

A: It's an early concept with no clear answer. You have to think not just in terms of CCS, but what the local community is concerned with, such as local transport.

A comment was made that ‘clumsy’ if necessarily a good word choice as it suggests ‘inept’.

2.3. The General Publics (Mis)beliefs about CCS and Related Issues. Vivianne Visschers, ETH Zurich

Vivianne Visschers presented results from a mail survey carried out in Switzerland to ascertain public perception and common beliefs regarding CCS. The survey showed that while 36% of the people said they had heard about CCS, there were many misconceptions about it. The conclusions at the end of the study were that laypeople have intuitive beliefs about and CCS and that only clear and simple ‘misbeliefs’ can be solved with extensive information.

Clarifying Questions and Comments

Q: There may be problems with this methodology as some of the questions are factually wrong on purpose and not phrased in a neutral way, which could affect the opinion given.

A: Only a selection of the questions was shown in the presentation and the complete list is more balanced.

Comment: There is a risk that self-assessed knowledge may be wrong.

Q: The first conclusion states that many people have an intuitive belief. But since people don’t like to say that they don’t know, many people produce beliefs when asked.

A: People were not pushed into an answer, it was open-ended.

2.4 DISCUSSION ON SESSION 2

The discussion started with a comment on the Energymark project. It was pointed out that Energymark uses an implicit model of communication, involving communication outside of the group. It was suggested that this doesn’t always work well as there are different sources of knowledge. Examples of early technologies shown inaccurately in the media, affects people’s opinions.

In response, it was said that Energymark is one idea of reaching people, but only one way. It involves a level of sophisticated discussion, which gets the knowledge out in a controlled process.

Discussion covered the complexities and effects of the use of social networking sites such as Facebook, Twitter and blogs in regards to discussing CCS, and that these may or may not have correct information or be credible. They can be quick to respond to developments and news. If incorrect information is used without a rebuttal this gives credence to the information. This was contrasted with official sites such of government sites, which have accountability and have processes to ensure only correct information is used but then cannot respond as quickly.

It was mentioned that within the Energymark program one of the students has launched an online version of the ICQ, but face-to-face talking has proven better in instigating behavioural changes. It is good to have information online, but as to whether it will change behaviour is yet to be seen. People like the social aspect of the discussions.

The discussion concluded by raising concerns about constraints on openness and academic freedom, these constraints driven by the need for institutional and government approval and industry sensitivity on 'live' projects. Also the time burden of engagement for researchers and tensions with other pressures, such as the desire not to be seen as advocates. The discussion also noted concerns over quality of information sources available to the public, eg peer-reviewed articles versus immediacy of internet information. Different agendas are inevitable so there is a need to make agendas more explicit and clearly state starting assumptions and goals of individual research projects.

Session 3: Measuring Public Awareness on CCS
Chair Kenshi Itaoka, Mizuho Information and Research Institute

This session featured three presentations exploring three methods for measuring public attitudes.

3.1. Quantitative Measurement: Public Survey. David Reiner, University of Edinburgh

David Reiner gave a presentation showing people's knowledge on CCS as recovered from surveys carried out in various countries. The main problem encountered while carrying out studies is the lack of a consistent time series, without which it is almost impossible to gauge changes in public opinion.

Clarifying Questions and Comments

Q: Is there a consensus on what and how to measure?

A: It's up to individual groups how to do it. There were 6 consistent surveys put into the field. The same surveys should start in the same countries and it would be good if the survey could take in different countries.

Q: How do you get the quality to be accurate? How do you know the quality of the results?

A: The criticisms are if we are asking the right questions or getting pseudo opinions instead. Some critical questions were defined, but at this stage we cannot focus exclusively on CCS, as people would be suspicious of surveys with too many questions on CCS. Due of the lack of knowledge, the results are not very illuminating.

Comment: In the Energymark survey, a baseline is taken, and then the same questions were consistently asked. This way it is possible to detect changes in opinion. There are also external events that might change the answers. The process affects the answers.

3.2. Focus Groups and GIS in Outreach: The experience of the Plains Reduction Partnership. Sarah Wade (in place of Dan Daly), AJW Group

Sarah Wade gave a presentation showing the results of using Geographic Information System (GIS) to track outreach efforts, and using focus groups as both a communications and research tool regarding the Plains Reduction (PCOR) Partnership. Several outreach materials were used to try to communicate with the public, including factsheets, presentations, video clips and a website. School district enrolment and public TV station broadcasts can be mapped using GIS. Results of surveys and focus groups can then be used to correlate the impact of the outreach material in public opinion.

3.3. Comparison of CCS Communication Methods. Diana Schuman, Forschungszentrum Juelich, EF-STE

Diana Schumann presented findings from a study which compared the effectiveness of Focus Group Discussions (FGD) and Information-Choice Questionnaires (ICQ). The FGD and ICQ groups consisted of 10 people of identical composition in all countries involved in the project (three groups). They were given identical information regarding two types of CCS technology, coal-fired power plants and coal gasification. The results show that the opinions of the ICQ groups may be more stable, though generalised conclusions cannot be drawn due to the small sample size. Further cross-national comparison studies are needed.

Clarifying Questions and Comments

Q: How is stability measured?

A: The first survey was taken at the start of the questionnaire and the second at the end. The stability is measured by the change.

Comment: You could expect opinions on new technologies to be less stable

A: The statistics show stability.

Q: Why do ICQ groups pick technology 2 over technology 1 by so much?

A: It seems like the ICQ participants understood better. The FGD groups seemed to understand less and the measured opinions were less stable. There was an expert and a moderator in the FGD groups, suggesting that participants may not be able to develop a full understanding of a new technology in one session of an FGD.

Q: Is it possible that being in a focus group interfered with information processing as people could be influenced by others?

A: This has not been completely evaluated yet. Out of the 3 focus groups, one had a positive outcome and 2 had a negative outcome. Re-evaluating and looking over the results is required.

Q: What was the length of time between reading the information and asking questions?

A: A short length. The FGD had presentation of 15 minutes with the expert, then 2 hours discussion, followed by the questionnaire. The ICQ groups had a short explanation followed by the questionnaire.

3.4 DISCUSSION ON SESSION 3

Much interesting side information was found in the focus groups, which was not expected. The EF-STE groups found that they got what they were expecting, but that the opinion within the group changed many times, depending on who said what. In the UK focus groups, there were lots of unexpected topics coming up, including terrorism and re-using . It was agreed that it may only be through focus groups that you get unexpected information and that such unstructured discussion could be helpful.

Cross-overs with using focus groups with stakeholders as well as the public were mentioned. Though, it was said that there may not be much difference between stakeholder importance, as it is necessary to understand the full array of stakeholders, some of which may not even have been considered, such as water officials, public health workers and indigenous peoples. It is important to look at the overall landscape to see who it is relevant to talk to.

The discussion concluded by highlighting the overall lack of awareness of CCS, along with common misconceptions. Public surveys for national populations are still useful to provide implication for policymaking, especially for setting baselines of public opinion and periodical assessment of public attitude toward greenhouse gas mitigation technologies, although it is costly to do well. Focus groups and interviews for the local public provide insights of local perspectives on the issues, as well working as a part of an outreach program. It was also noted in the debate of focus group vs informed questionnaires (ICQ), that group discussion in focus groups might interfere with each participant to form a clear opinion on the projects or help them understand the projects from different views. Meanwhile ICQs may help participants keep thinking over the issues for a long time and reach relatively stable opinion.

Session 4: Strength of Opinion – How these move or not – Impacts of Contextual Factors
Chair: Dancker Daamen, Leiden University, and Minh Ha Duong, CIRED

This session included tree presentations describing research into the stability of measured opinion concerns and attitudes towards CCS.

4.1. When and Why are Pseudo Opinions on CCS Unstable? Dancker Daamen, Leiden University

Dancker Daamen presented the results of experiments to develop a better understanding of factors that affect the stability of measured opinions. The principle finding is that the fact of measuring opinion may lead stakeholders to offer pseudo-opinions. In this study, 68% of respondents indicated that they had no knowledge of CCS. However in follow-up 73% of these respondents were willing to offer a grade for CCS, while only 27% of those indicating they had no knowledge of CCS responded with "no opinion". These opinions are thought to be innately unstable and are termed ‘pseudo-opinions’.

Variables in the experiments included the interval between giving the opinions (between 8 and 12 minutes), the filler task set between the 2 tests (one on related knowledge and one not) and being given information on the technologies. The results show that stability is unrelated to the filler task or to whether the second test is preceded by information. Stability does appear to be lower when the answer is opinion instead of recall.

Clarifying Questions and Comments

Q: When the questions are repeated, how it is determined what people think, as they know they’ve already answered, so maybe they subvert the question.

A: They were told beforehand how the survey will work and that they will be asked the same questions again. Besides it is not possible to reproduce the same results.

Comment: Additionally the test was spread over 8 conditions.

Comment: The results are not surprising as they are being asked to give grades, so therefore that is what people are most likely to do

A: In many surveys they don’t even ask the first question, but start with the second, so then you have no idea that people are guessing.

4.2. On the Stability of Uninformed Versus Informed CCS Opinions Regarding CCS; Marjolein De Best-Waldhober, ECN

Marjolein De Best-Waldhober presented finding on experiments to show stability of pseudo-opinions over time. After taking the ICQ, opinions were found to be more stable. Those who had not used the ICQ were found to have unstable opinions that can be influenced by outside factors. It was noted that after watching the film ‘The Day After Tomorrow’, uninformed people´s opinion of CCS decreased. An experiment was set up to see if reading about Lake Nyos would affect their opinions. The variables were using the Traditional Questionnaire (TQ) or the ICQ and whether the Lake Nyos information was received or not. The results showed that people are

willing to change their opinion based on new information, suggesting that the ICQ leads to better quality opinions and the Lake Nyos information had no effect.

Clarifying Questions and Comments

Q: These are only small numbers, therefore they are not definitive and variation can be expected

A: More surveys have been carried out, but the data has not yet been analysed.

Comment: It would be interesting to see if using information about the leakage in Europe instead of the information on Lake Nyos resulted in a different effect since the location of the impact would not be so far removed.

Comment: Stability over a week is a short timescale; it is possible that they will react differently to media in the future. For example, agreement to nuclear power decreased significantly after Chernobyl, but the next year the statistics had normalised again.

4.3. Stability of Public Preferences for CCS Before and After Group Discussion. Lauren Fleischman, Carnegie Mellon University

Lauren Fleishman presented the results of her study, which tested how respondents reacted to a portfolio of options that forced some amount of tradeoffs between technologies. The study used 7 technology portfolios that each cut emissions by 70% and relied on a combination of renewable, nuclear and coal combustion with CCS. The portfolios were explained in group workshops using easily understandable information sheets. The participants ranked the portfolios according to their preference, first individually, then after group discussion. The results showed that given tradeoffs, IGCC with CCS, ranked as the most preferred option.

Clarifying Questions and Comments

Q: Is one of the reasons that CCS is more acceptable with IGCC than PC because the contaminants are taken out in the case of IGCC?

A: Probably, respondents were shown the level of pollutants for each scenario.

Q: How are uncertainties in technologies treated when presenting information?

A: There is uncertainty related to cost, which is shown. Other uncertainties regarding technologies were also shown. The best we can do is to emphasis the uncertainties and explain what we do and do not know.

4.4 DISCUSSION ON SESSION 4

The discussion started by it being noted that studies often get at public opinion, but how motivated is that opinion? How likely are people to become active in the community based on

their opinions? This has not been investigated, and it is uncertain to know who will take action from such a study. It was pointed out that people often give their intentions, but do not necessarily carry through with them. However, this has been asked during other studies and found to not make a difference.

The session concluded that uninformed opinions can be moderately to highly unstable. Informed opinions are stable and resistant to vivid information on alleged risks of CCS. Also that it helps people to judge CCS in the context of portfolios with information on all dimensions. Portfolio preferences appear to be quite stable.

Session 5: Application into the Real World
Chair: Sallie Greenberg, University of Illinois

This session included four presentations describing the application of social science insights in actual projects.

5.0. Effective Public Engagements for Energy Planning: Lessons from the Decision Sciences, Joe Arvai

An additional talk was given by Joe Arvai. It was a shortened version of the talk to be given on the GCCSI meeting with the industrial partners on the 4th November, especially for those who would not be attending that day. He explained how communication studies from other areas can be applied to the field of CCS. One of the most important issues identified, was ‘making people partners’ in the decision making process. If people feel that they or their peers (other members of the public) were involved then they are more likely to be accepting of the outcome. Also helping people addressing difficulties in the decision making process is essential, or else they are likely to make purely emotional decisions which are not based on the facts. There are certain tools, which enable us to do this.

5.1. : Communication and Participation Near CCS Operations, Suzanna Brunsting, ECN

Suzanna Brunsting presented the Project. This project aims to develop effective strategies for objective communication with stakeholders and the public. It also aims to discover which mechanisms influence public attitudes through the CCS lifecycle. The presentation focused on the main differences between the Barendrecht, Ketzin, and Beeskow projects, to show why some are successful while others are not. The project will examine and compare five CCS projects, one wind project, two pipeline projects, two biomass projects and one gas power plant. Trust of the people giving the information was found to be of great importance.

Clarifying Questions and Comments

The work included a study on a wind farm. This project was initially accepted by the public but later changes to size and location were not consulted with the public and there were protests.

5.2. Social Aspects of the CCS Project in Lacq. Minh-Ha Duong, CIRED

Minh Ha Duong gave a presentation on the social aspects of Total's CCS project in Lacq, Southern France. Lacq has been producing natural gas for 50 years. There was already most of the infrastructure present, including 30 km of pipeline, giving favourable conditions for setting up the CCS project. Public meetings were held by Total and involved 300 attendees, including NGO's, administration and research institutes representatives. Face to face meetings with 40 key local actors were conducted. A local information and surveillance commission (CLIS) was constituted and a survey was carried out afterwards. The resulting information showed that most people received their first information from the media and that they find scientists and NGO's to be the most trusted sources. This project has been considered on track to be a success.

Clarifying Questions and Comments

Q: Did the questionnaire check if people were aware of living above a gas field?

A: No, we assumed that they already knew.

Q: How can you assume this?

A: They learn about the Lacq gas field at school.

5.3. Media Framing of CCS. Sarah Mander, Tyndall Centre

Sarah Mander gave a presentation to show the results of a study conducted within the UK to see the effect of the media on public perceptions of CCS. The study involved members of the public who regularly read newspapers and included tabloids as well as broadsheets. The results showed that only those already interested in climate change, chose to read articles relating to CCS and that there was less awareness of CCS over other low carbon energy sources. The newspapers showed a varying degree of information on CCS; some newspapers contained key articles on the subject, but never explaining the technology. It was also found that articles tended to prompt more questions than they answered.

5.4 DISCUSSION ON SESSION 5

The focus has been on projects that have failed or presented challenges, but it is also necessary to incorporate perspectives from projects that are on-track, in order to see what works. As this is a new area, it has been seen that public opinions and actions are currently fluid concerning CCS. It is important to focus on understanding turning points and catalysts, to see what causes the shift from a neutral to an opposing standpoint.

Session 6: Identification of Gaps
Chair: Sarah Wade, AJW Group

This session included two presentations and discussion.

6.1. What do we know? What do we need to know? Judith Bradbury

Judith Bradbury gave a presentation outlining what has been learned from previous CCS demonstration projects in the US. There was found to be differences in the main concerns within different regions, though the main key themes were consistent throughout the regions: trust in authority and concern about the fairness of implementation procedures, including what the benefit to the community will be.

Research shows that we need to be looking at the broader social context, such as what social factors affect perspectives on risk/benefit and what the social relationships are like at the proposed host site.

6.2 How to Get Valid Assessments of Awareness, Knowledge and Opinions of People living near Planned CCS Activities Before, During and After Implementation? Dancker Daamen, Leiden University

Dancker Daamen presented findings on a type of survey to get a true assessment people's opinions. It has been shown with other surveys that if asked directly about an issue, people are more likely to have a strong opinion about it. An example was given on a survey of people's annoyance with noisy neighbours. If asked directly a much higher percentage will say they are annoyed than if asked in an unobtrusive way if they are satisfied with their living conditions and what detracts from their satisfaction. Only if they cite noisy neighbours as an issue or select it off a tick list are they asked to rate their annoyance.

The presentation was carried out as a discussion inviting the audience to give their views about using this technique for gauging people's opinion of CCS, without affecting their opinion with the survey. Educated guesses are that there is low awareness of CCS within the local communities, and therefore, there is likely to be weak environmental annoyance.

Discussion from interactive session:

The discussion touched on the value of focus group interviews, surveys, ICQs, and other tools for developing an understanding of public concerns and opinions related to CCS. It was noted that the timing of using such tools could have a significant impact on their value. Focus groups have shown public intelligence, they want to know why they are not informed. They are different to open meetings where people may have strong opinions already.

The group also discussed the ethical issues associated with conducting social science research.

There was consensus that protocols should be used for conducting social science research and disseminating results.

The discussion included the relationship between the social research and how it is applied. It was suggested that there is not tight enough connection between the surveys and how the information gets used to help in policy decision making and that maybe it is necessary therefore to scale up focus group work, using a variety of methods, such as portfolios. Until the two areas cross, it would be difficult not to be sceptical of the process working.

It was thought that there will be tension between finding the storage site and the social research. People would need to be consulted, but it was pointed out that pure university researchers wouldn't have the compulsion to align a community to agree with a project as there are ethical issues, even though it was agreed that the work was necessary.

The discussion made the point that it is a bigger global issue that is now being dealt with and while it may have been easier being a pure researcher, but there is a moral obligation to help, when it comes to the issue of climate change.

In conclusion, the discussion showed strong differences and interest in both descriptive vs. prescriptive research and theoretical vs. applied. There needs to be a strong focus on the issues, processes, implications and reactions to the siting and implementation of projects. The discussion identified suggested research questions and unresolved issues. These are presented in the Conclusions section.

7. Conclusions and Recommendations

The aims and objectives for the Social Research Network discussed at the start of the workshop were reviewed. It was agreed that the social research network would focus on CCS and not to other low carbon energy sources such as nuclear and renewable energy, although there could be opportunities to involve guest speakers and other experts. One reason for the focus was to keep the network to a manageable size - workshops instead of conferences. It was also thought the group could have more input to policy by focusing on CCS.

As this was the first meeting of the Social Research network, the setting of the aims and objective was of upmost importance and can be summarised as below:

- Ensure high quality social science research
- Identify gaps in knowledge where social science research might provide valuable insight
- Promote a learning environment
- Build capacity within the social research network
- Translate studies into tools or applied lessons
- Create a database of social science research and a clearing house of tools

During discussion, participants noted several challenges facing the network:

- The need for institutional approval as well as government and industry sensitivity on 'live' projects can lead constraints on openness and academic freedom.
- It was noted that there is an abundance of non-objective, poor quality and/or inaccurate information about CCS available to the public. While some in the network would be interested creating information sources to address this, others raised concerns about not being seen as advocates for CCS or for comprising research integrity.
- Given the rate of development, there is a tension between taking the time for developing peer-reviewed, long-term studies and disseminating information in the short term where it could influence project development. Different agendas are inevitable so it is necessary to make agendas more explicit and clearly state starting assumptions and goals of individual research projects.

The session on current research concluded by raising concerns about constraints on openness and academic freedom, these constraints driven by the need for institutional and government approval and industry sensitivity on 'live' projects. Also the time burden of engagement for researchers and tensions with other pressures, such as the desire not to be seen as advocates. The discussion also noted concerns over quality of information sources available to the public, eg peer-reviewed articles versus immediacy of internet information. Different agendas are inevitable so there is a need to make agendas more explicit and clearly state starting assumptions and goals of individual research projects.

The session on measuring public awareness, highlighted the overall lack of awareness of CCS, along with common misconceptions. Public surveys for national populations are still useful to provide implication for policymaking, especially for setting baselines of public opinion and periodical assessment of public attitude toward greenhouse gas mitigation technologies, although it is costly to do well. Focus groups and interviews for the local public provide insights of local perspectives on the issues, as well working as a part of an outreach program. It was also noted in the debate of focus group vs. informed questionnaires (ICQ), that group discussion in focus groups might interfere with each participant to form a clear opinion on the projects or help them understand the projects from different views. Meanwhile ICQs may help participants keep thinking over the issues for a long time and reach relatively stable opinion.

The session on the strength of opinion showed that uninformed opinions can be moderately to highly unstable. Informed opinions are stable and resistant to vivid information on alleged risks of CCS. It also helps people to judge CCS in the context of portfolios with information on all dimensions. Portfolio preferences appear to be quite stable.

The session on application in the real world showed how project experiences are beneficial to understand firsthand public perceptions. The focus has been on projects that have failed or

presented challenges, but it is also necessary to incorporate perspectives from projects that are on-track, in order to see what works. As this is a new area, it has been seen that public opinions and actions are currently fluid concerning CCS. It is important to focus on understanding turning points and catalysts, to see what causes the shift from a neutral to an opposing standpoint. The media study shows how media can raise more questions than it answers. The focus needs to be on who is using media, what messages are delivered and if readers use this information to make decisions. This information indicates the value of cultivating knowledge in the media. An important point is framing CCS as a global or local issue and the focus on context may change depending on the community.

In the session on the identification of gaps the preliminary discussion showed strong differences and interest in both descriptive vs. prescriptive research and theoretical vs. applied. There needs to be a strong focus on the issues, processes, implications and reactions to the siting and implementation of projects.

Suggested research questions decided on were:

- How should we consider the broader social context?
- What is the link to other policy positions?
- What social factors affect perspectives on risk/benefit; how does this impact on the technical risks?
- How can one assess and/or develop social relationships at the proposed host site?
- How stable or valid are public opinions identified through social science research?
- Is a social characterization needed? How? When?
- How can we address the “what if things go wrong” concerns?
- What is the most effective way to communicate (in the broadest sense) with various stakeholders, and determine who they are?
- What is the impact of the social media on a complex policy issue?
- How can we facilitate the use of our social science knowledge by decision makers and policy makers?

And unresolved issues identified were:

- Identifying research priorities
- Addressing the ethical implications of social research in this area
- How to promote role and understanding of value of social science research

Meeting Conclusions agreed by the Workshop

The overall conclusions to the meeting involved finding ways to bridge basic and applied research, facilitating the use of insights from social science research by decision-makers. Two insights gleaned from the workshop were that social science should play an integral part of the

process of setting up a site for storage. It was also agreed that it cannot be too early to start in public engagement for a potential site.

Meeting Recommendations agreed upon by the workshop:

- To develop a research agenda
- To facilitate peer review and pre-review within the network
- To deepen international comparative research
- To promote greater evaluation of alternative methodologies
- To expand the exchange of information between researchers
- Learning to apply other social science experience to CCS
- To clearly identify the theoretical basis for applying insights from social science research to CCS
- To create a clearing house of easily accessible related information
- To bridge basic and applied research
- To share best practices, in order to create a more comprehensive manual

All of the presentations are available on the members area of the website:
://www.ieaghg.org/index.php?/2009112027/social-research-network.

Paris– City of Lights

1st IEA GHG Social Research Network Meeting

2nd-3rd November 2009

CIRED, Campus du Jardin, Tropical 45 bis, avenue de la Belle Gabrielle
94736 Nogent-sur-Marne Cedex France

Organised by
IEA GHG
Hosted by
CIRED

Sponsored by

C.I.R.E.D.
UMR N° 8568

GLOBAL CCS INSTITUTE

CIRED Institutional affiliations

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CIRAD
École des Ponts ParisTech

Chaire d'Enseignement et de Recherche sur le captage, le transport et le stockage du CO_2

2nd November 2009 Day 1

08.30 to 09.00 Registration

09:00 to 09.30 Welcome and Introduction (Tim Dixon, IEA GHG, Minh Ha Duong, CIRED, Peta Ashworth, CSIRO)

Session 1 Setting Objectives and Scope of the Research Network Chair: Peta Ashworth

09:30 to 10:30 Discussion in groups

10:30 to 11:00 Break

Session 2 Current Research in Social Science Chair: David Reiner

11:00 to 11.30 Australian Energymark Programme: Peta Ashworth, CSIRO

11.30 to 12.00 Review of Public Understanding and Public Engagement Studies for the IEA Roadmap: Simon Shackley, Edinburgh University

12.00 to 12.30 The General Public's (Mis)Beliefs About CCS and Related Issues: Vivianne Visschers, ETH Zurich

12.30 to 13.00 **Discussion**

13:00 to 14:00 Lunch

Session 3 Measuring Public Awareness on CCS – What are the Tools? Chair: Kenshi Itaoka, Jason Anderson

14:00 to 14.30 Quantitative Measurement: Public Survey: David Reiner, University of Cambridge

14.30 to 15.00 Focus Groups and GIS in Outreach: The Experience of the Plains CO_2 Reduction Partnership: Dan Daly, University N.Dakota

15.00 to 15.30 Comparison of CCS Communication Methods – Diana Schuman, Forschungszentrum Juelich, EF-STE

15.30 to 16.00 **Discussion**

16:00 to 16:15 Break

Session 4 Strength of Opinion – How these Move or Not – Impacts of Contextual Factors: Chair Dancker Daamen, Minh Ha Duong

16:15 to 16.45 When and Why are Pseudo Opinions on CCS Unstable – Dancker Daamen, Leiden University

16.45 to 17.15 On the Stability of Uninformed Versus Informed CCS Opinions Regarding CCS – Marjolein de Best-Waldhober, ECN

17.15 to 17.45 Stability of Public Preferences for CCS Before and After Group Discussion – Lauren Fleishman, Carnegie Mellon

17.45 to 16.15 **Discussion**

Close Day 1 18:15

19:00 Dinner at Chalet des Iles restaurant

3rd November 2009 Day 2

Session 5 Application into Real World Chair: Sallie Greenberg

09:00 to 09.30 NearCO2: Communication and Participation Near CCS Operations: Susana Brunsting, ECN

09.30 to 10.00 Lacq Project: Minh Ha Duong, CIRED

10.00 to 10.30 Media Framing of CCS: Sarah Mander, Tyndall Centre

10.30 to 11.00 **Discussion**

11:00 to 11:30 Break

Session 6. Synthesis - Identification of Gaps Chair: Sarah Wade

11:30 to 12.00 Factors Involved in Effective Public Involvement: Lessons Learned from Four CCS Demonstration Projects: Judith Bradbury, Battelle

12.00 to 12.30 How to get Valid Assessments of Awareness, Knowledge and Opinions of People Living near Planned CCS Activities Before, During and After Implementation? Dancker Daamen, Leiden University

12.30 to 13.30 **Discussion**

13:30 to 14:30 Lunch

Conclusions and Recommendations Chairs: David Reiner, Marjolein de Best-Waldhober, Tim Dixon

14:30 to 16:00 Discussion, Conclusions, Recommendations

16.00 to 16.15 **Close:** Tim Dixon, IEA GHG, Peta Ashworth, CSIRO

Close Day 2

Posters

1. Carbon Capture and Storage in Canada: Framing an Emerging Energy Technology: Amanda Boyd, University of Calgary
2. Social Acceptance of Carbon Capture and Storage in Germany: Katja Peitzner, Wuppertal Institute for Climate, Environment and Energy Future
3. Public Perceptions of Energy Futures and Carbon Capture and Storage (CCS) in New Zealand: Brendan Doody, GNS Science
4. Conditional Inevitability - Expert Perceptions of CCS Uncertainties in the UK Context: Ben Evar, University of Edinburgh

Steering Committee

Peta Ashworth, CSIRO (Chair)
Tim Dixon, IEA GHG (Co-Chair)
Jason Anderson, Institute for European Environmental Policy
Dancker Daamen, Leiden University
Marjolein de Best-Waldhober, ECN
Sallie Greenberg, Illinois University
Minh Ha Duong, CIRED
Kenshi Itaoka, Mizuho Information and Research Institute
David Reiner, University of Cambridge
Sarah Wade, AJW group

IEA GHG Social Research Network - First Network Meeting
2nd- 3rd November 2009, Paris, France.
Attendee List

Jason Anderson	Institute for European Environmental Policy	Lauren Fleishman	Carnegie Mellon University
Joe Arvai	Michigan State University	Lori Gauvreau	Schlumberger Carbon Services
Peta Ashworth	CSIRO	Sallie Greenberg	University of Illinois
Jeff Bielicki	Harvard University	Minh Ha Dong	CIRED
Amanda Boyd	University of Calgary	Kenshi Itaoka	Mizuho Information and Research Institute
Judith Bradbury	Battelle	Henrik Karlsson	Biorec
Suzanne Brunsting	ECN	Monica Lupion	IEA GHG
Naceur Chaabane	CIRED	Christian Oltra	CIEMAT
Joana Chiavari	IEA	Katja Pietzner	Wuppertal Institute
Dancker Daamen	Leiden University	David Reiner	University of Cambridge
Dan Daly	University of North Dakota	Hauke Riesch	University of Cambridge
Marjolein de Best-Waldhober	ECN	Diana Schumann	Forschungszentrum Jülich GmbH
Jane Desbarats	Institute for European Environmental Policy	Simon Shakley	Edinburgh University
Tim Dixon	IEA GHG	Emma ter Mors	Leiden University
Brendan Doody	GNS Science	Bart Tewel	Leiden University
Anne-Maree Dowd	CSIRO Exploration & Mining	Paul Upham	Tyndall Centre Manchester
Elisabeth Dütschke	Institut für System- und Innovationsforschung	Sander van Egmond	Utrecht Centre for Energy Research, Utrecht University
Ben Evar	University of Edinburgh	Samuela Vercelli	Universita di Roma
Dominique Finon	CNRS	Vivianne Visschers	ETH Zurich
Sarah Wade	AJW Group	Gabrielle Wong-Parodi	LBNL
Rebeca Neri O'Neill	CIRED	Marc Rijnveld	TNO
Alain Nadaï	CIRED	Ludmilla Basava-Reddi	IEA GHG

IEA Greenhouse Gas R&D Programme

IEA Greenhouse Gas R&D Programme

1st Social Research Network Meeting

Hosts : CIRED

Paris 2-3 November 2009

Sponsors
1st Social Research Network Meeting

CIRED

Chaire d'Enseignement et de Recherche sur le captage, le transport et le stockage du CO2

Global CCS Institute

IEA Greenhouse Gas R&D Programme

- A collaborative research programme founded by IEA in 1991
- Aim: *To provide information on the role that technology can play in reducing greenhouse gas emissions from use of fossil fuels.*
- Producing information that is:
  - Objective, trustworthy, independent
  - Policy relevant but NOT policy prescriptive
  - Reviewed by external Expert Reviewers
- Primary focus is Carbon Dioxide Capture and Storage
- Activities: Studies and reports (>120); R&D networks :- Wells, Risk, Monitoring, Modelling, Oxy, Capture, Biofixation; Communications (GHGT conferences, IJGGC, etc); facilitating and focussing R&D and demonstration activities

Contracting Parties and Sponsor Organisations of IEA GHG

IEA GHG Research Networks

- Bring together international key groups of experts to share knowledge and experience
- Identify and address knowledge gaps
- Act as informed bodies, eg for regulators
- Benefit experts and wider stakeholders
- Depend on experts' time and inputs – valuable and widely appreciated

- CO2 geological storage networks
- Started in 2004/5
  - Risk Assessment ; Monitoring; Wellbore Integrity; Modelling
- Also networks on Post-Combustion Capture, Oxyfiring, High Temp Solid Looping Cycles, Biofixation

Social Research Network

Adopting and building on C2S2RN

- *Overall aim:* To facilitate the exchange of ideas and experiences between experts in *social research around CCS, and ……*
- *Specific aims and objectives:*
- *Scope:*

1st Social Research Meeting Agenda

1. Setting Aims, Objectives and Scope
2. Current Research
3. Measuring Public Awareness on CCS
4. Strength of Opinion – How These Move or Not
5. Application into Real World
6. Synthesis – Identification of Gaps
7. Meeting Conclusions and Recommendations

+ Posters

IEA Greenhouse Gas R&D Programme

IEA Greenhouse Gas R&D Programme

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1st Social Research Network Meeting

CIRED – and hosts !

Chaire d'Enseignement et de Recherche sur le captage, le transport et le stockage du CO2

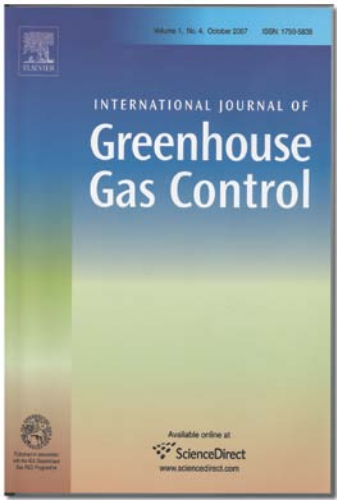
Global CCS Institute

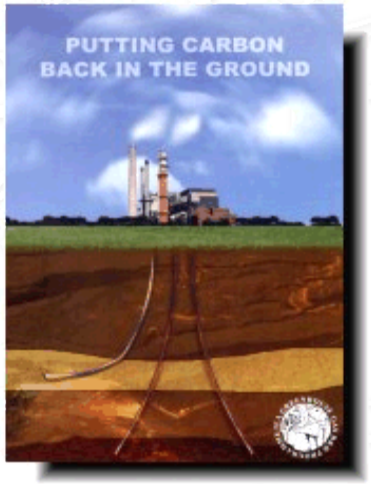
Steering Committee for 1st Social Research Network Meeting

- Peta Ashworth – CSIRO (Chair)
- Tim Dixon – IEA GHG (Co-Chair)
- Minh Ha Duong - CIRED
- David Reiner – University of Cambridge
- Dancker Daamen – Leiden University
- Sarah Wade – AJW
- Sallie Greenberg – Illinios University
- Majolein de Best-Waldhober – ECN
- Kenshi Itaoka – Mizuho Information and Research Institute
- Jason Anderson – WWF

IEA Greenhouse Gas R&D Programme

- General - www.ieagreen.org.uk
- CCS - www.co2captureandstorage.info
- Research Networks -
  http://www.co2captureandstorage.info/networks/networks.htm





Nick Otter, Interim CEO, GCCSI, April, 2009

Objective setting for the network

Previous examples:

- To provide a forum and resource network to assist social outreach and communication practitioners/researchers develop a level of expertise to enable them to engage with publics around the world on issues associated with climate change, low emission technologies, in particular clean coal, and the decision making processes surrounding possible mitigation strategies.
- “To foster the conduct and dissemination of social science research related to CCS in order to improve understanding of public concerns as well as improve the understanding of the processes required for deploying projects”

IEA GHG Research Networks

- Bring together international key groups of experts to share knowledge and experience
- Identify and address knowledge gaps
- Act as informed bodies, eg for regulators
- Benefit experts and wider stakeholders
- Depend on experts' time and inputs – valuable and widely appreciated

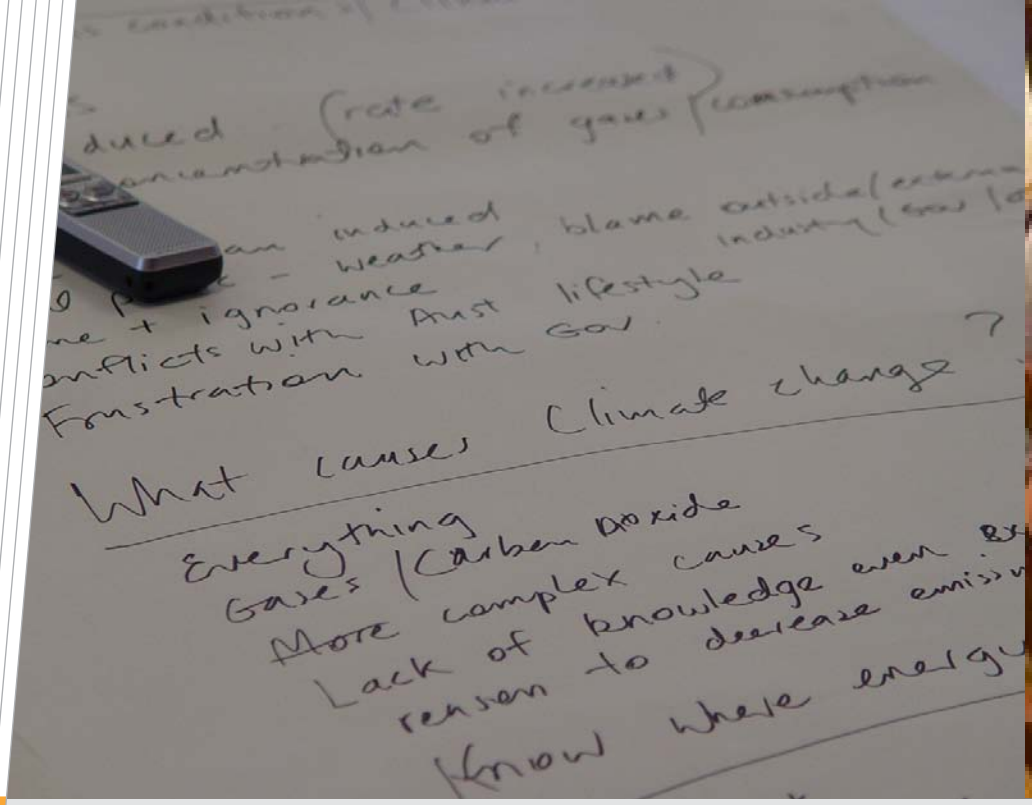
- CO2 geological storage networks
- Started in 2004/5
  - Risk Assessment ; Monitoring; Wellbore Integrity; Modelling
- Also networks on Post-Combustion Capture, Oxyfiring, High Temp Solid Looping Cycles

Monitoring Network -

- *Overall aim:* To facilitate the exchange of ideas and experiences between experts in the monitoring of CO2 storage, and to promote the improved design and implementation of monitoring programmes.
- *Specific aims and objectives:*
  - Assess new technologies and techniques
  - Determine the limitations, accuracy and applicability of techniques
  - Disseminate information from research and pilot storage projects
  - Develop extensive monitoring guidelines
  - Engage with relevant regulatory bodies

  - Monitoring Selection Tool

    http://www.co2captureandstorage.info/co2tool_v2.2.1/index.php



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Investigating the Effectiveness of Energymark

Changing public perceptions and behaviours using a longitudinal kitchen table approach

Energy Transformed Flagship

Peta Ashworth & Anne Maree Dowd

Monday 2nd November, 2009

National Research FLAGSHIPS

CSIRO

Who are we communicating to

Know the audience	
Influential Stakeholders	**$$$$**
Community – SME's	**Small group discussions**
Education	**Universities, Schools**
Project specific	**Local regions – working with industry partners**

Background to the Project

Majority of Australians are concerned **BUT** they do not necessarily relate their own energy behaviours as being part of the problem

The step between concern and action can often be huge particularly with the presence of information asymmetries and lack of incentives

***Research Question**:* How can CSIRO create national momentum around the topic of climate change and its relation to energy; that will change the way Australians think and act about energy and climate change?

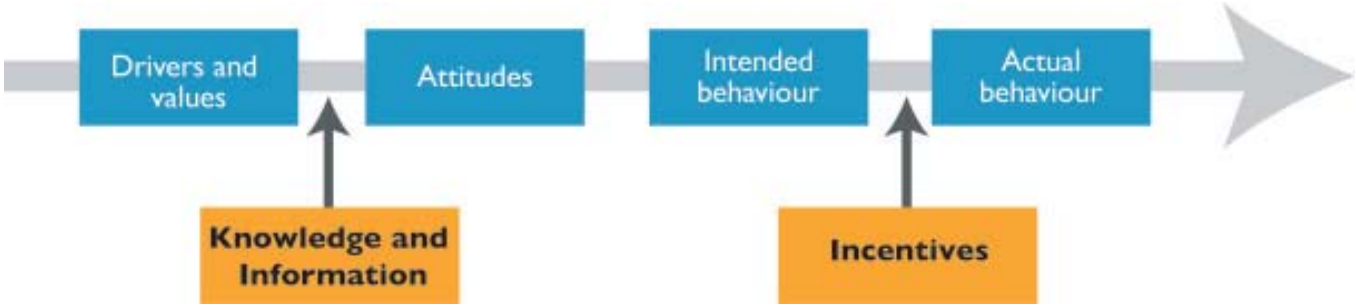

Figure 1: Behavioural change model

Is there a process that can transcend

contextual and cultural differences??

Creating Social Change

1. The need to reach people in a **safe environment**; people are anti major Government publicity campaigns, pro kitchen table discussions/workshops

2. Perspectives of participants involved in **deliberative processes** shift as they develop more informed opinions. In many cases this leads to a more positive attitude towards new technologies

3. **Trust in the messenger** is as significant as the message in shaping public perceptions

4. A lack of knowledge exists in communities about energy technologies and their relationship to greenhouse gas emissions and there is a clear need and demand for **education at all levels**

5. People want **balanced, accurate information** which is independent and credible

6. **Engagement** is a way to develop leaders within the community to move the debate forward

Foundations to Our Engagement Approach

Essential Engagement Principles

Inclusiveness - recognising that effort, acknowledge and incorporate ideas and perspectives

Mutual respect - provides the opportunity to explore, listen and understand different viewpoints, values and beliefs by encouraging others to share their experiences

Transparency - the open sharing of and access to information

Mutual responsibility and **accountability** - actively contribute to building a better solution, define boundaries and expectations helps to build confidence in the participants about the process

Adequate resources - confirm the overall commitment to the process

Mutual trust - trust is crucial if real outcomes are going to be achieved from any engagement activities

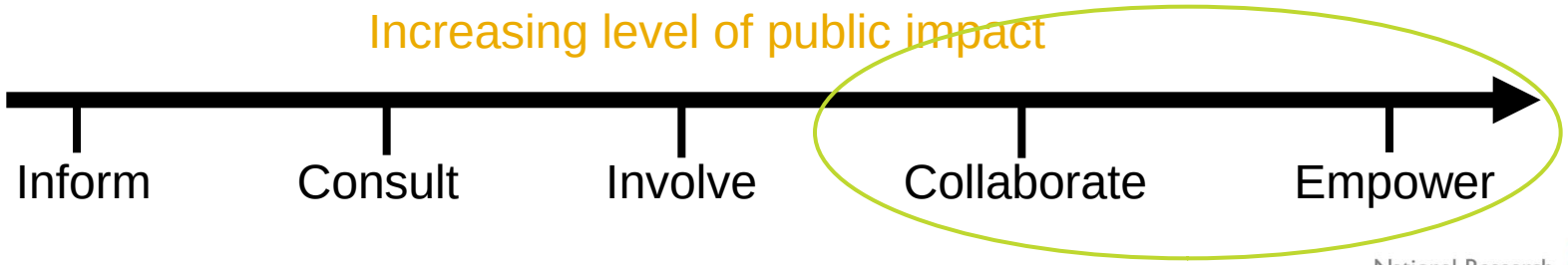

Figure 2: IAP2 Engagement Continuum

Theoretical Framework

- Social Identity Theory (Tajfel and Turner, 1986)
- Small Group Dynamics (Campion, 1986)
- Social Network Theory (Wasserman and Fraust, 1994)
- Cognitive dissonance theory (Oskamp, 2000)
- Theory of planned behaviour (Ajzen, 1989)
- Theory of reasoned action (Ajzen and Fishbein, 1980)
- Theory of consumer uptake and societal acceptance (Niemeyer, 2004)
- Theory of Communicative Action (Herbermas, 1979, 1984)

Energymark

Brings together small groups of people to discuss climate change, energy technologies and behaviour

The benefit of the process is twofold:

- ensure a coordinated approach to researching public perceptions to energy technologies across Australia
- engaging the public in this way ensures the information will be translated into action by individuals within their local communities

Session Topics

THE BIG PICTURE

***Session 1**:* Demystifying climate change

***Session 2**:* Energy and climate change

A PORTFOLIO OF SOLUTIONS

***Session 3**:* New and existing fossil fuel technologies

***Session 4**:* New and existing renewable technologies (part 1)

***Session 5**:* New and existing renewable technologies (part 2)

BRINGING IT HOME

***Session 6**:* Addressing energy and climate change in homes and businesses

***Session 7**:* Addressing energy and climate change in the community

***Session 8**:* Transportation

National Research FLAGSHIPS CSIRO

Some of the topics

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THE BIG PICT
Session 1: W

Energy Transformed

National Research FLAGSHIPS
Energy Transformed

Climate change may be due to natural inte composition of the atmosphere or in land most of us now have some understanding change, how we affect it, and how it affect

Discussion questions:

- What do you understand by climate change? What causes it?
- What climatic changes have you noticed over your life time?
- How would the types of changes mentioned above affect industry and communities in your region?
- What effect does climate change have on Australia? What are your views on Australia's carbon emissions?
- When thinking about climate change, what are your key issues and concerns?

We live in a greenhouse

In a greenhouse the glass prevents radiation from getting out. Similarly, some gases in the Earth's atmosphere prevent some of the heat the Earth receives from the Sun from radiating back out into space; hence their name, greenhouse gases (GHGs) – see figure below. GHGs are necessary to support life on Earth because they keep the planet within a habitable temperature range, without them Earth's temperature would be -18 degrees [3]. Increasing or decreasing the volume of GHGs causes the planet to retain too little or too much heat, which over time changes Earth's average temperature and climatic dynamics [3].

In the past, naturally occurring climate change caused by Earth's geographic dynamics has altered rainfall patterns, and has displaced or even destroyed

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THE BIG PI
Session 2: E

Energy Transform

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Discussion questions:

- What other ways do think clima might affect your electricity sup
- Where is the nearest electricity home? What fuel does it use to
- What other issues and concern energy?

Energy generation has a particularly close relationship to climate change Energy Futures Forum found climat change to be one of the dominant challenges affecting energy in Austr alongside geopolitical change, innov and level of community concern ab sustainability. Climate change was deemed primus inter pares, or first among equals, of the challenges [23].

Burning fossil fuels releases t carbon they hold

As demonstrated in the chart belov showing energy consumption by fue Australia for 2005, 95% of our ener needs are met through fossil fuels [2 When fossil fuels like coal are burne CO_2 is formed during the process; CO_2 contributes to the enhanced greenhouse effect [25].

Energy generation produces 37% of Australia's total GHG emissions; up 50% since 1990 [26,17]. Australia's GH emissions per capita are relatively h mainly due to coal being the major for electricity generation [25]. The m contributors to GHG emissions fro the industrial and residential sector shown following.

If the use of a car was not included the calculation of residential energy consumption, then the percentages assigned to household use increase example, water heating would incre from 16% to 26-28% [26]. For a more

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A PORTFOLIO OF
Session 3: New and e

Energy Transformed

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CSIRO

Discussion questions:

- What do you believe are the most important benefits and barriers to carbon dioxide capture and storage (CCS) and why?
- What would be your key message(s), about CCS, that you would like to see communicated to the public?
- What type of effective education and outreach activities would recommend in order to raise public awareness about CCS?

Activity

Developing

What energy at the energy to you where Action Plan how you can have a discus available at th

Coal and Natural Gas in Australia

The planet has abundant sources of coal, and it will continue to be important in the global energy mix [1]; particularly as Asia Pacific nations continue to develop [36]. Australia is rich in coal, and it is considerably cheaper than other fuel sources (if the cost of environmental impact is not included). Coal dominates Australia's exports as well as providing the fuel source for the bulk of our electricity generation; however, coal-fired power generation produces more GHG emissions than other fuel sources [28]. Similarly, gas is a fossil fuel used increasingly for electricity generation, and is becoming known as a transition fuel [17]. Gas has roughly one quarter to a third less GHG of electricity in for example hot water heating and half the GHG emissions of coal-fired generation in cooking [35].

The figures right depict the current locations of black coal and natural gas throughout Australia.

Carbon dio Storage

Australia's go coal industrie reduce GHG ways that mai our secure an supply. They dioxide captu technologies

Source: http:/ http://www.a

www.csiro.au

A PORTFOLIO OF SOLUTIONS
Session 4: New and existing renewable technologies (part I)

Energy Transformed

National Research FLAGSHIPS
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CSIRO

One approach taken by the Australian Government to combat climate change is to increase the production of renewable energy. Many measures have been implemented to ensure this aim is achieved, including the establishment of a Mandatory Renewable Energy Target (MRET).

Under the target, all electricity retailers and wholesale buyers have a legal liability to contribute towards the generation of additional renewable energy – achieved by acquiring a renewable energy certificate. Renewable technologies typically emit low levels or no GHGs, and so they assist electricity retailers and wholesale buyers meet MRET obligations set, and when they displace fossil-fuelled generation they also help Australia to pursue Kyoto targets for reducing GHG emissions.

Discussion questions:

- Who in the discussion group (if anyone) has solar power (hot water, or other installations)? What has been the experience of those using solar power?
- How could you use solar technologies in your own home, business, or place of work?

Activity

Reviewing your Action Plan

What energy saving behaviours are you going to commit to this week? Have a look at the energy audit and carbon footprint data you collected - what areas stand out to you where you could make a small change to reduce your carbon footprint? Your Action Plan will help you identify areas you would like to address and also detail how you intend to change that behaviour. To assist you in developing your Action Plan, have a discussion with your Energymark group to address the issue of water heating in your home. Since hot water heating accounts for about 16% of household GHG emissions, it may be a perfect opportunity to think about how your water is heated and is there an alternative method which would be more carbon friendly and save you money in the long term?

Solar

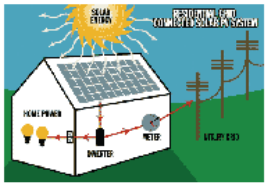
Solar technologies appear well suited to Australia, because we have a lot of space, and abundant sunlight. There are two approaches to solar power, photovoltaic (PV) and thermal. There are significant differences between the two.

Solar PV: Solar PV uses sunlight falling on a semi-conductor to produce extra low voltage Direct Current (DC) electricity, which can be used directly or to charge batteries. When solar PV cells are connected to the electricity grid (interconnected electricity network of transmission cables or wires), DC power needs to be converted (by an inverter) into 240V Alternating Current (AC). Solar PV is a modular and decentralised technology; PV cells are connected together in groups, contained in glass covered panels and installed in appropriate locations and positions.

They were originally used in satellites and spacecraft, but their range of applications has expanded dramatically, and they are now being installed in many innovative ways to provide both off-grid and grid-connected electricity supply. For instance, in remote settings with no access to fossil fuel power, solar PV might be one of the few alternatives for power generation. In urban settings they are being installed on house roofs and office buildings and connected to the electricity supply grid [39]. The long term potential for solar PV is large, technology costs are likely to continue to decline, energy efficiency is expected to increase, and the potential for solar PV cells to be incorporated directly into new buildings (rather than retrofitting them) will save on material costs [39].

The cost of solar PV systems is currently high in comparison to other electricity technologies; predominantly due to the high cost of efficient solar PV cells. Rebates are available to assist with the payment of a new system, an extension to an old system, and community use buildings. For example, a new system will receive a rebate of $8 per peak watt of output of the new photovoltaic component of the system up to a maximum of $8,000. For further details, visit the Federal Solar Homes and Communities Plan: http://www.environment.gov.au/settlements/renewable/pv/index.html.

Source: Prosolarco



Energymark

The Expert Panel
- Defines a standardised topic sequence
- Approves information
- Safeguards process legitimacy

CSIRO (The Secretariat)
- Facilitates questionnaire completion
- Evaluates questionnaire responses
- Provides standardised, balanced information for a sequence of defined topics
- Supports the group convenor
- Evaluate convenor responses

The Group Convenor
- Coordinates discussion group
- Facilitates information flow
- Provides a written summary of each discussion

The group convenor role is crucial to the success of the project

Figure 3: Roles within *Energymark*

Energymark

Group convenors

- individuals who volunteer to bring together a small group of people, for example, family, friends, neighbours, and workmates

- organise and manage the meetings of their group and provide the link back to the project Secretariat.

- conduit for information/data and at the end of each session send a one page summary of the discussion results.

- are best to have some interest in the topic and may be recruited through a variety of methods including: word of mouth, through local interest groups, non government organisations or through advertisements in local newspapers and other media.

Methodology

Longitudinal design, mix methods

- Pre, interim and post questionnaires
- Carbon footprints, energy audits and Action Plans (T1 & T2)
- Social Network Analysis (T1, T2 & T3)
- Qualitative data (8 convenor summaries & open ended survey questions)

Location	State	Number of Group Convenors	Recruited from	Number of Network Members
Newcastle	NSW	17	Community + U3A	229
Sydney		4	SIFE	153
Brisbane	QLD	9	SIFE + Community	110
Gold Coast		1	SIFE	50
Perth	WA	18	Community	180
Adelaide	SA	20	Community	220
Melbourne	VIC	3	SIFE	150
	TOTAL	**72**		**1092**

Environmental beliefs

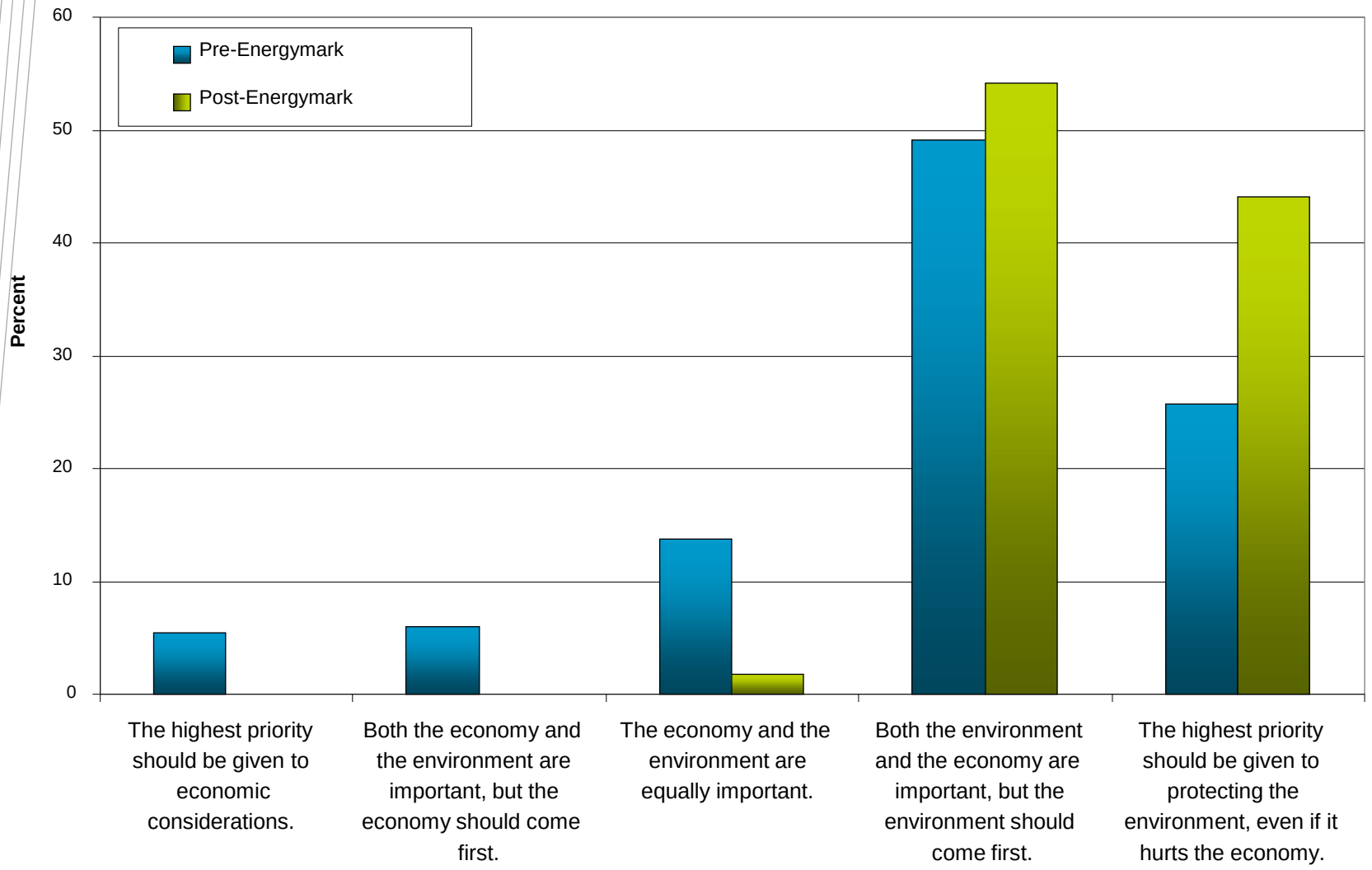


Figure 4. Participants' ratings of the environment and economy

Changes in knowledge (self-rated) of climate change mitigation

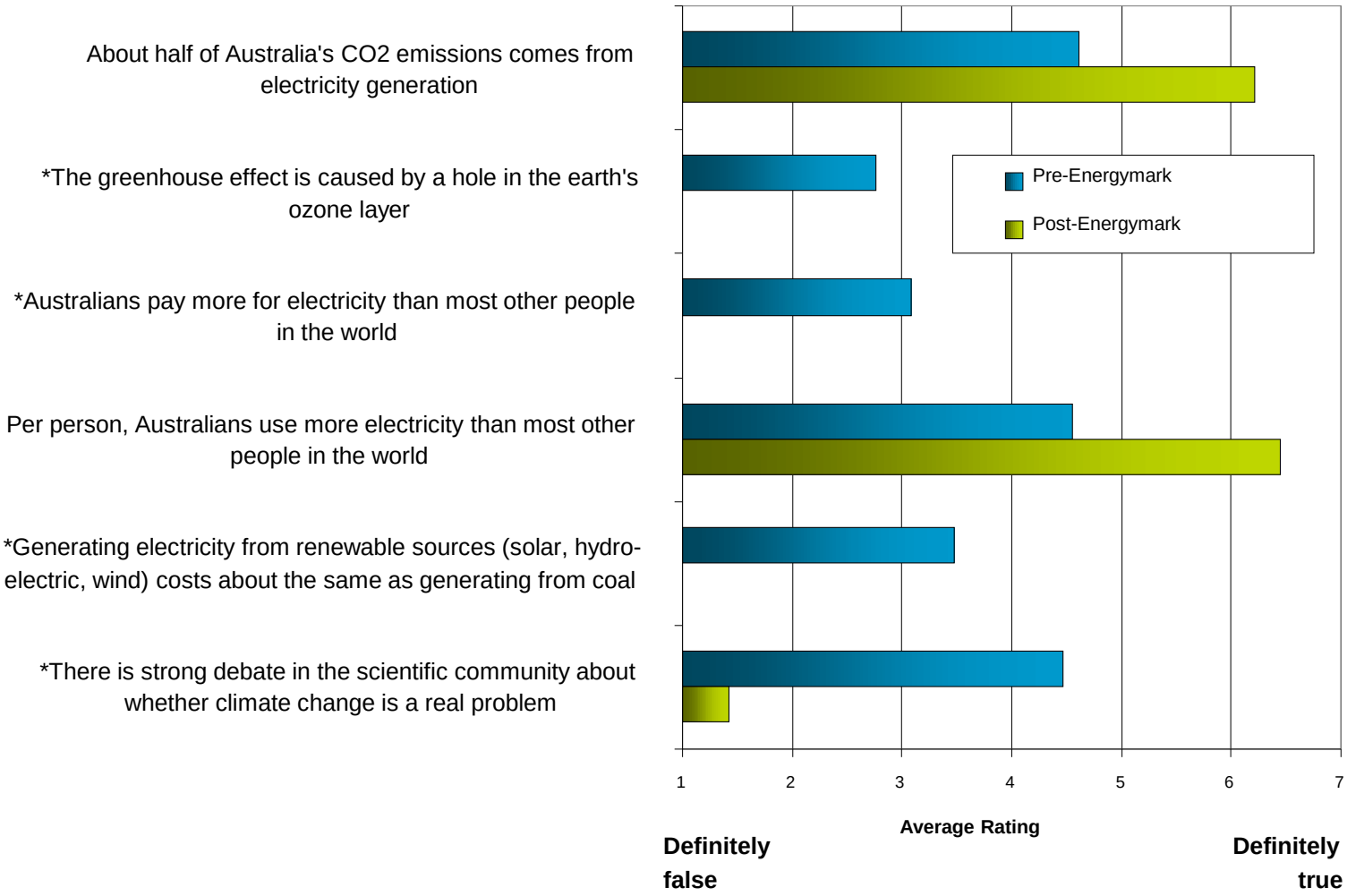


Figure 5. Positive change in knowledge of energy and the environment facts (definitely false statements*).

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Changes in knowledge (self-rated) of energy technologies

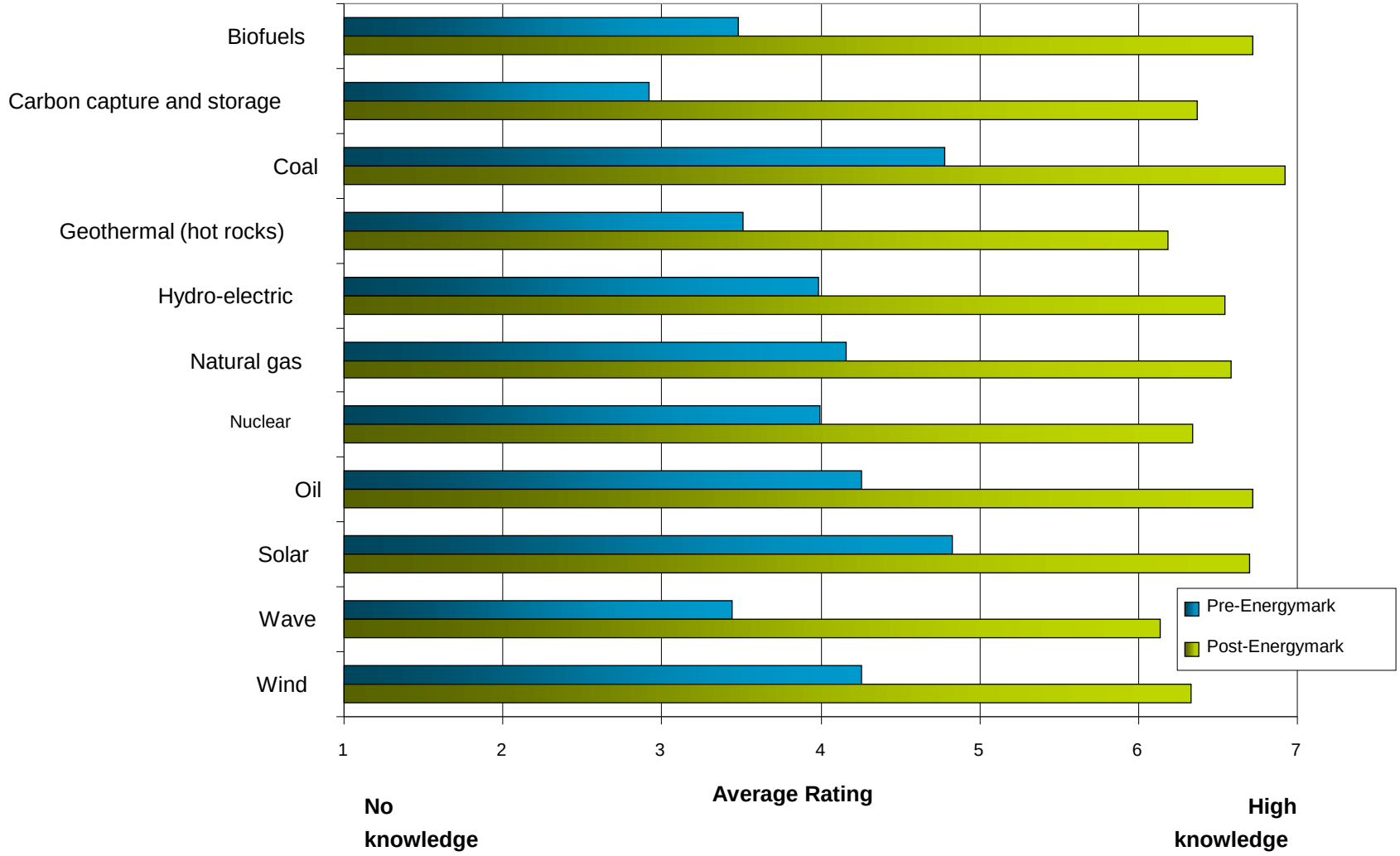

Figure 6. Positive change in average self-rated knowledge of energy sources and technologies

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Changes in attitudes toward climate change topics

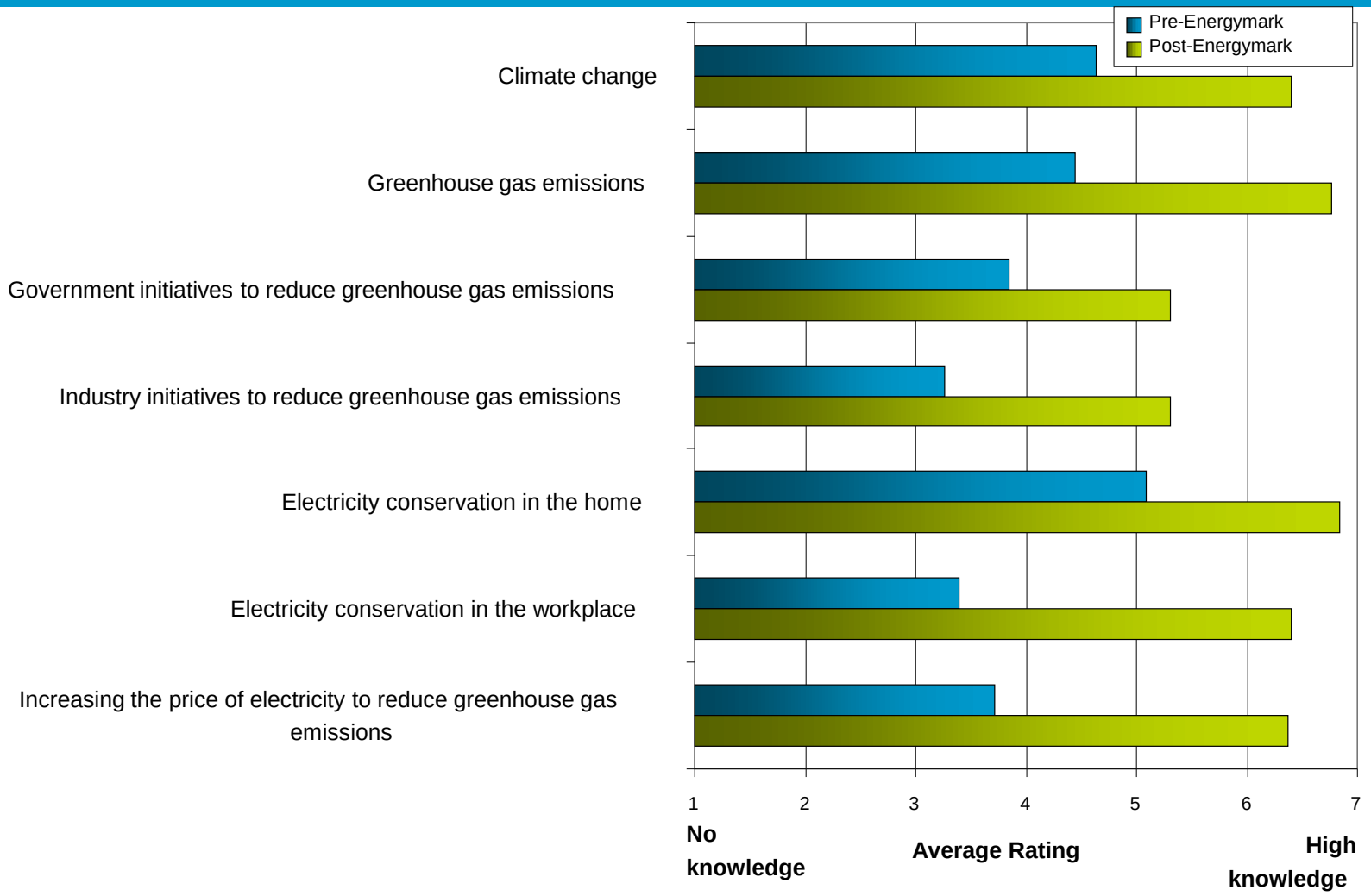
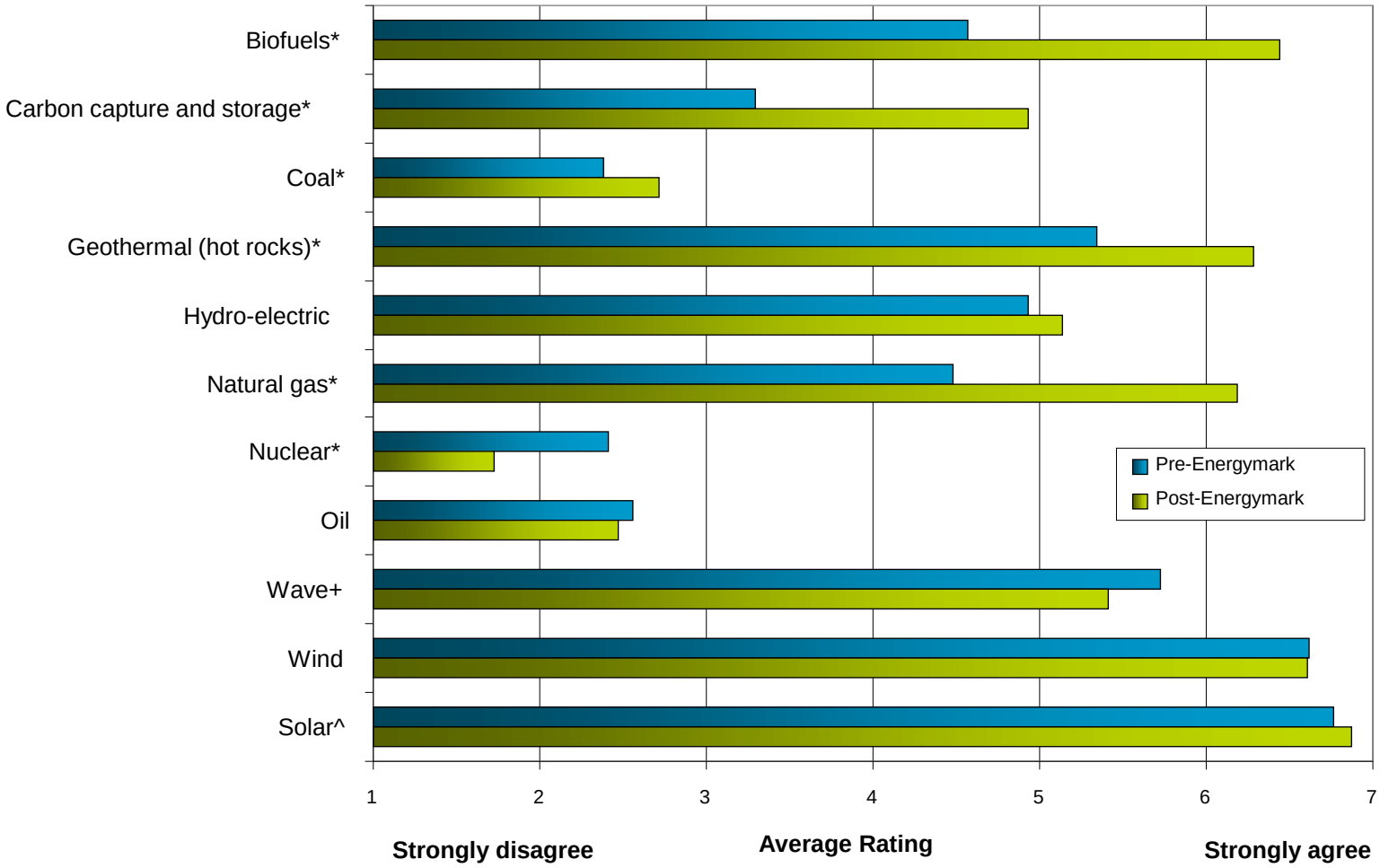


Figure 7. Positive change in average self-rated knowledge of climate change topics

Changes in attitudes toward energy technologies



* P values <0.001; +P values <0.01; ^ P values <0.05

Figure 8. Changes in average attitudes toward low emission technologies

Changes in behavioural intentions

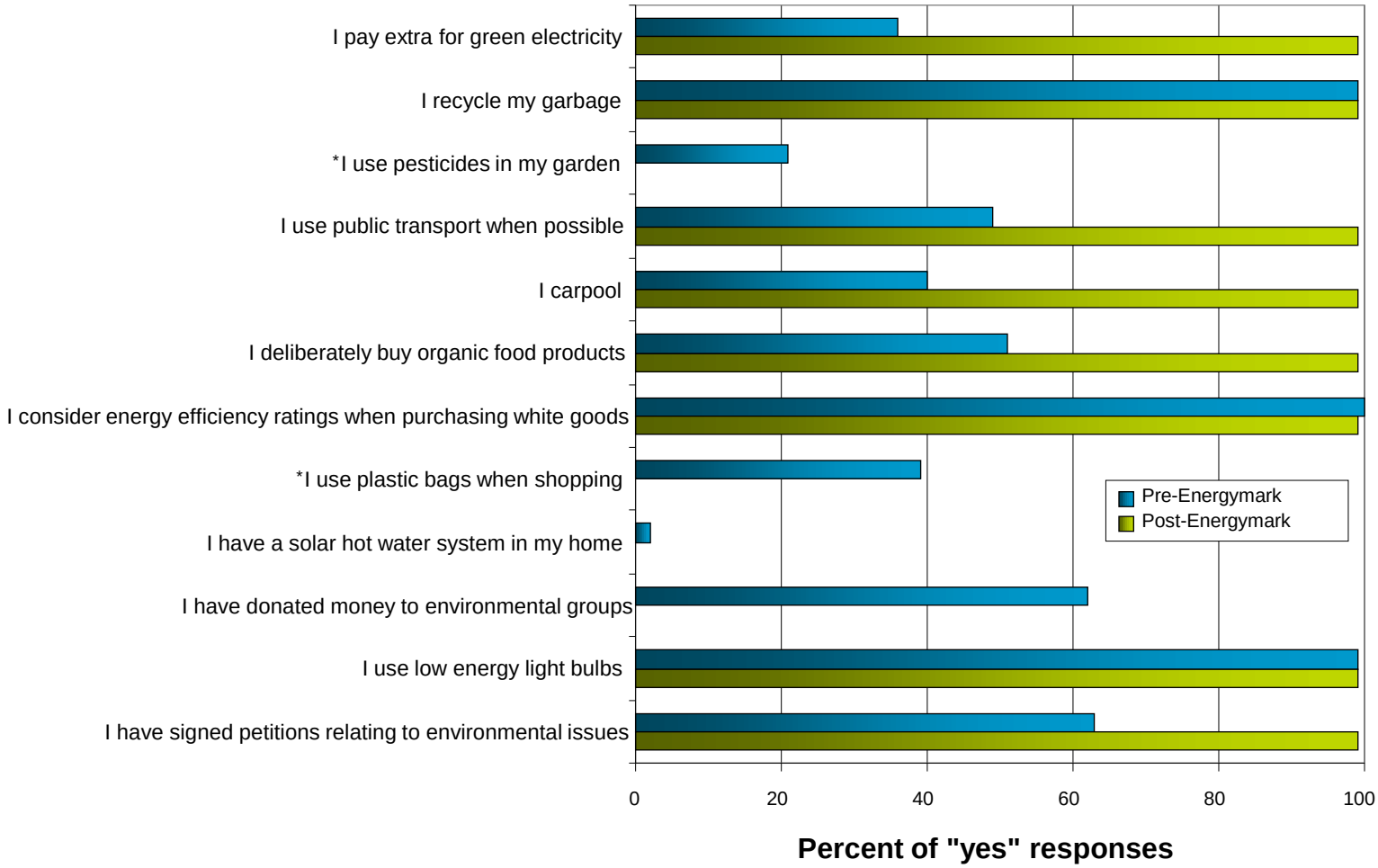


Figure 9. Change in environment and climate friendly behaviours

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Changes in behavioural intentions – end of the trial

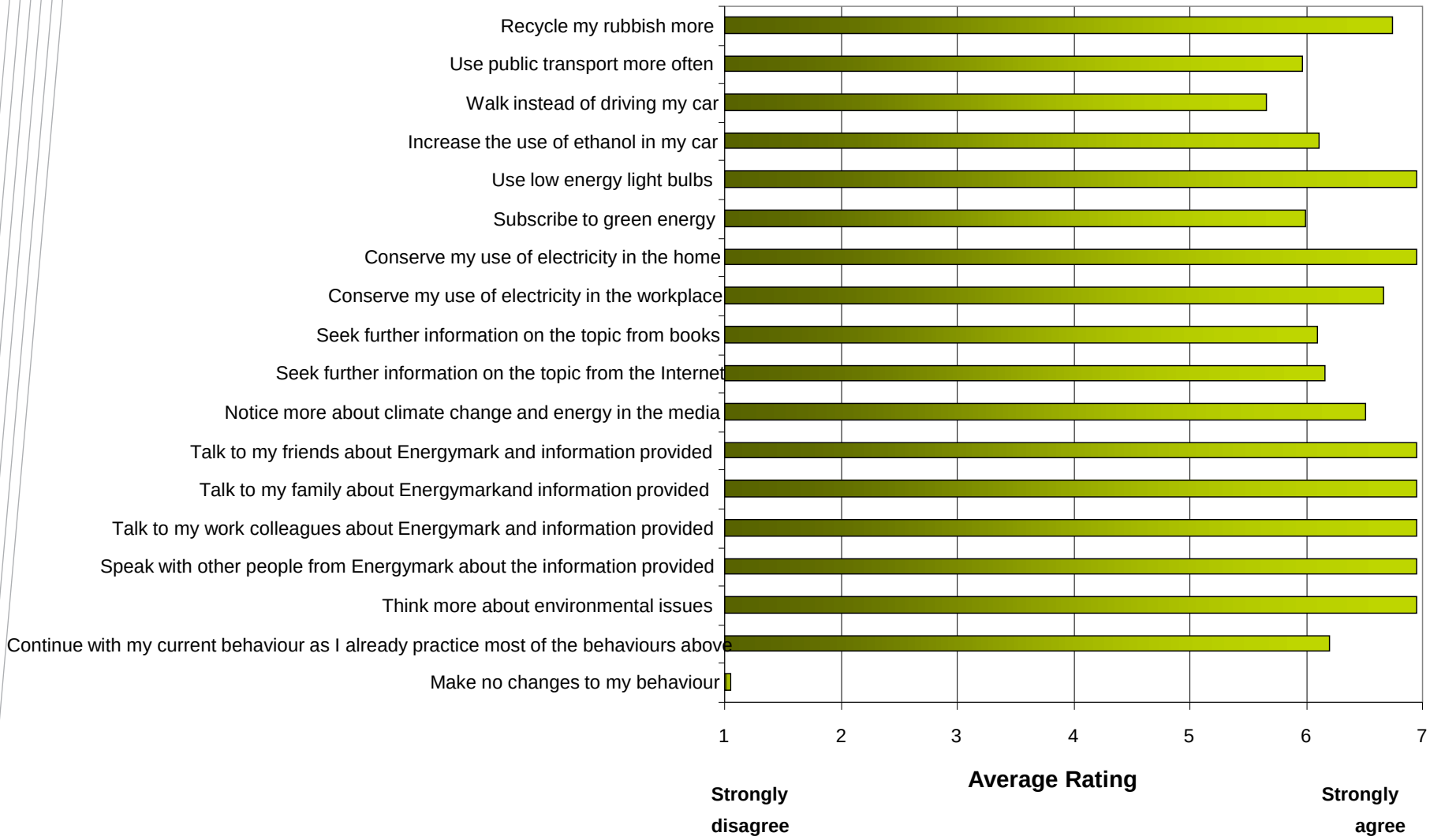

Figure 10. Behavioural intentions at the end of the trial

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Current Findings

Qualitative Results: Session Reports and Open Ended Survey Questions

Range of responses on the discussion summaries:

- Climate change (attitudes, values, beliefs)
- Energy technologies (fossil fuel, CCS, renewables)
- Behaviours (individual, household, work, community, national, global)

Key Triggers to behaviour change

- Family (children and their future)
- Economic benefits
- Social pressure
- Environmental and community concern

Barriers and challenges to behaviour change

- Economic
- Education and/or information (inadequate)
- Trust and individual impact
- Personal or cultural reasons
- Political barriers
- Living arrangements
- Physical and structural issues

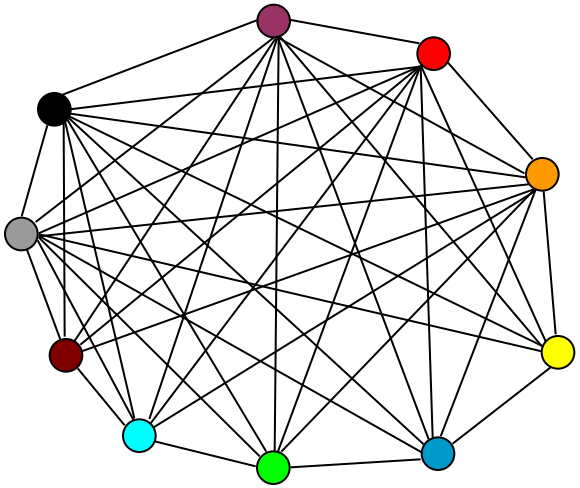
Current Findings

Session 1

(T1)

Quantitative Results: Social Network Analysis

Where does the information go?



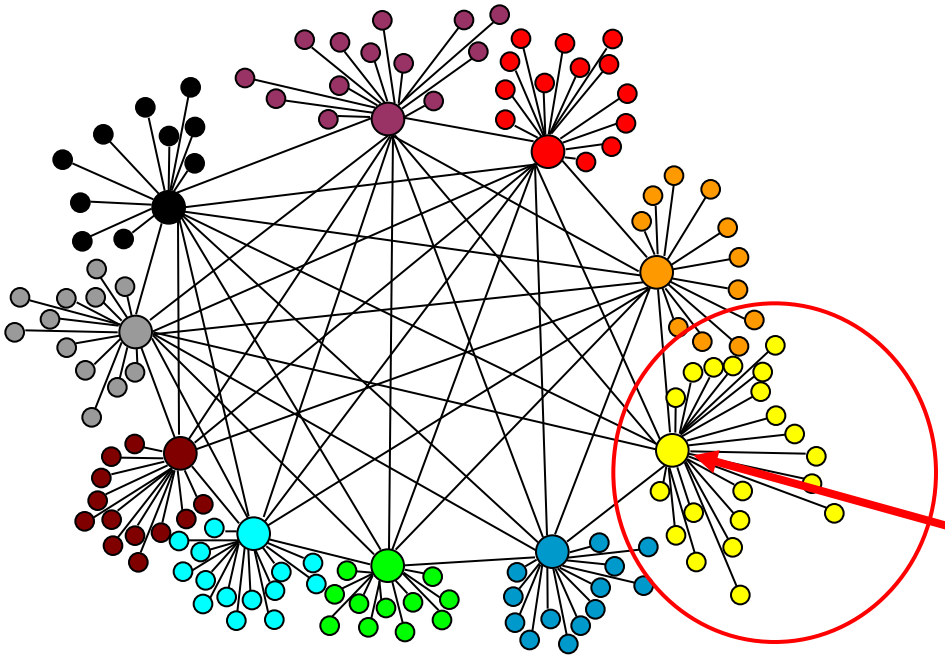
At the beginning of the process each node is actively communicating with all the actors in the network

Density = 1

Current Findings

Session 4
(T2)

Quantitative Results: Social Network Analysis



Useful tool in the quantifying of impact and identifying potential group convenors

This node has already communicated with 20 actors by the middle of the Energymark process

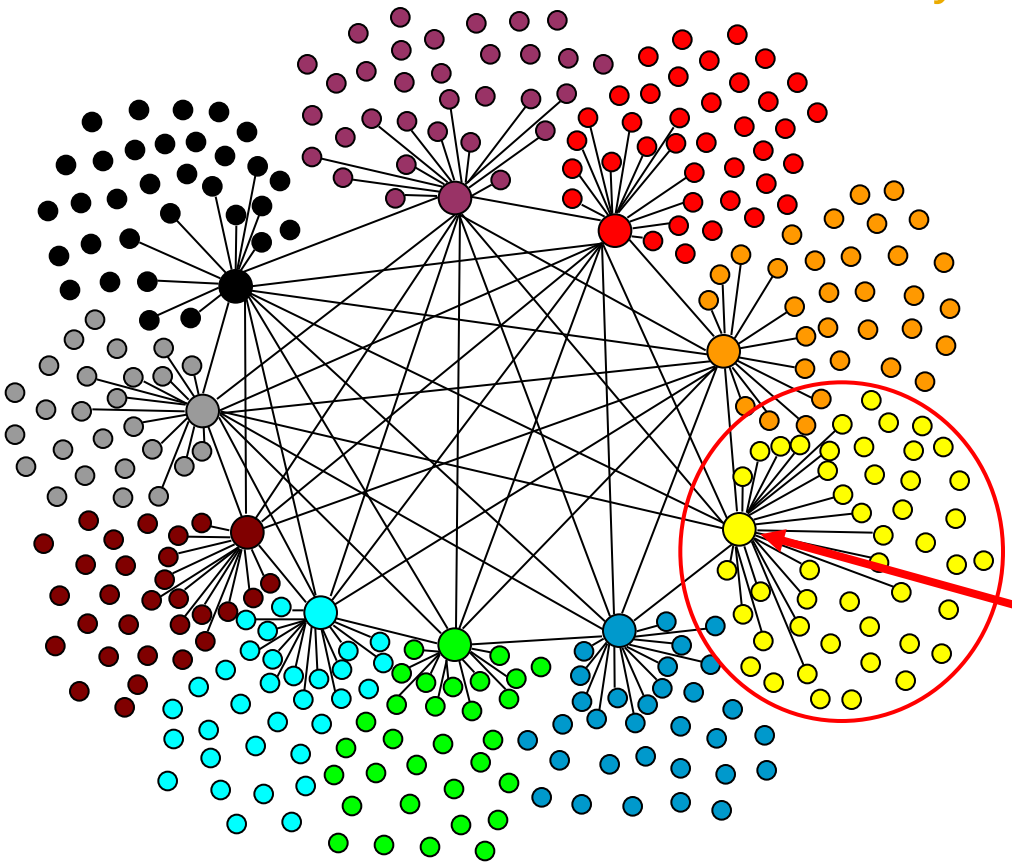
By the 4th session, each node has communicated/discussed about Energymark to an ***average of 13 additional actors*** external to their Energymark network

Current Findings

Session 8

(T3)

Quantitative Results: Social Network Analysis



This node has communicated with 45 actors by the end of the Energymark process

By the 8th session, each node has communicated/discussed about Energymark to an ***average of 34 additional actors*** external to their Energymark network

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REDUCING THE FOOTPRINT

ENERGYMARK TRIAL RESULTS

Measure	July 08*	July 09*	Difference (%)
Energy	6000kg	3900kg	35%
Waste	3700kg	3100kg	16%
Spending	4700kg	3800kg	19%
Beef consumption	1750kg	1250kg	28.5%
Transport	5500kg	4000kg	27%
Total	**22,000kg**	**16,050kg**	**27%**

*Average annual consumption

Healthy decrease

By **MELISSA LYONS**

A GROUP of Newcastle residents have slashed their carbon footprint by 27 per cent in a trial Energymark program, prompting calls for the initiative to be introduced city-wide.

The 12-month CSIRO program was launched in July last year to help individuals reduce their carbon footprint.

A CSIRO report to Newcastle City Council this month showed the program's 172 participants had become more active in addressing climate change.

Annual household electricity consumption had dropped from an average 14,420 kilowatt hours to 9029 kilowatt hours.

The installation of gas hot water systems, switching off non-essential appliances and removing second white goods helped participants cut energy consumption by 35 per cent.

More use of public transport and drove emissions from transport down 27 per cent.

CSIRO's Peta Ashworth said the program's success was due to one message.

"It made people realise that they can change their behaviour, even slightly, and get great wins without sacrificing their lifestyle," she said.

Newcastle City Council has asked the NSW Environmental Trust for a grant to expand the Energymark program across its local government area.

"We want to be an international testing ground for climate change solutions," council's environment and climate change services manager Peter Dormand said.

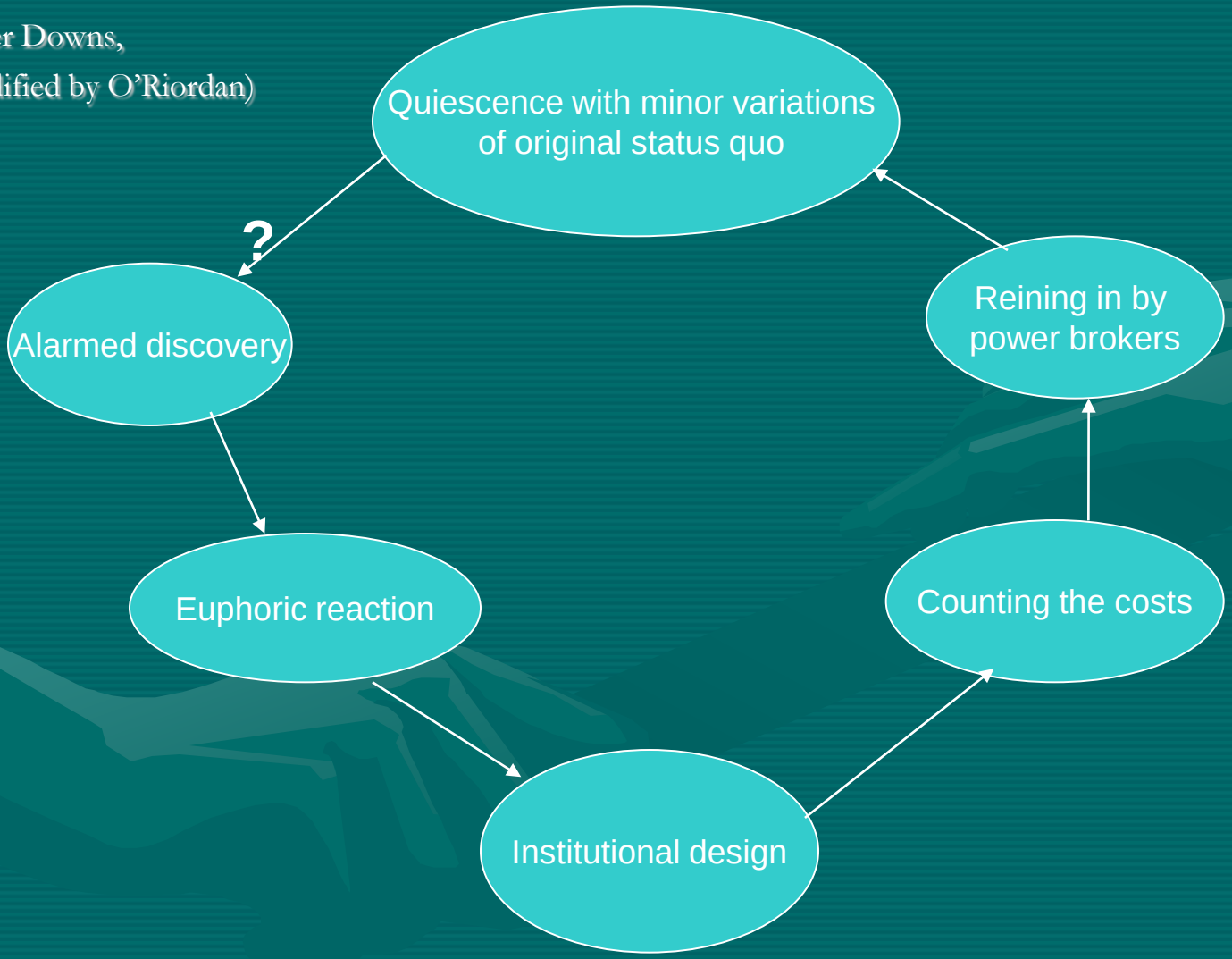
Politics, Knowledge and Public Engagement: The Case of CCS

Simon Shackley and Ben Evar

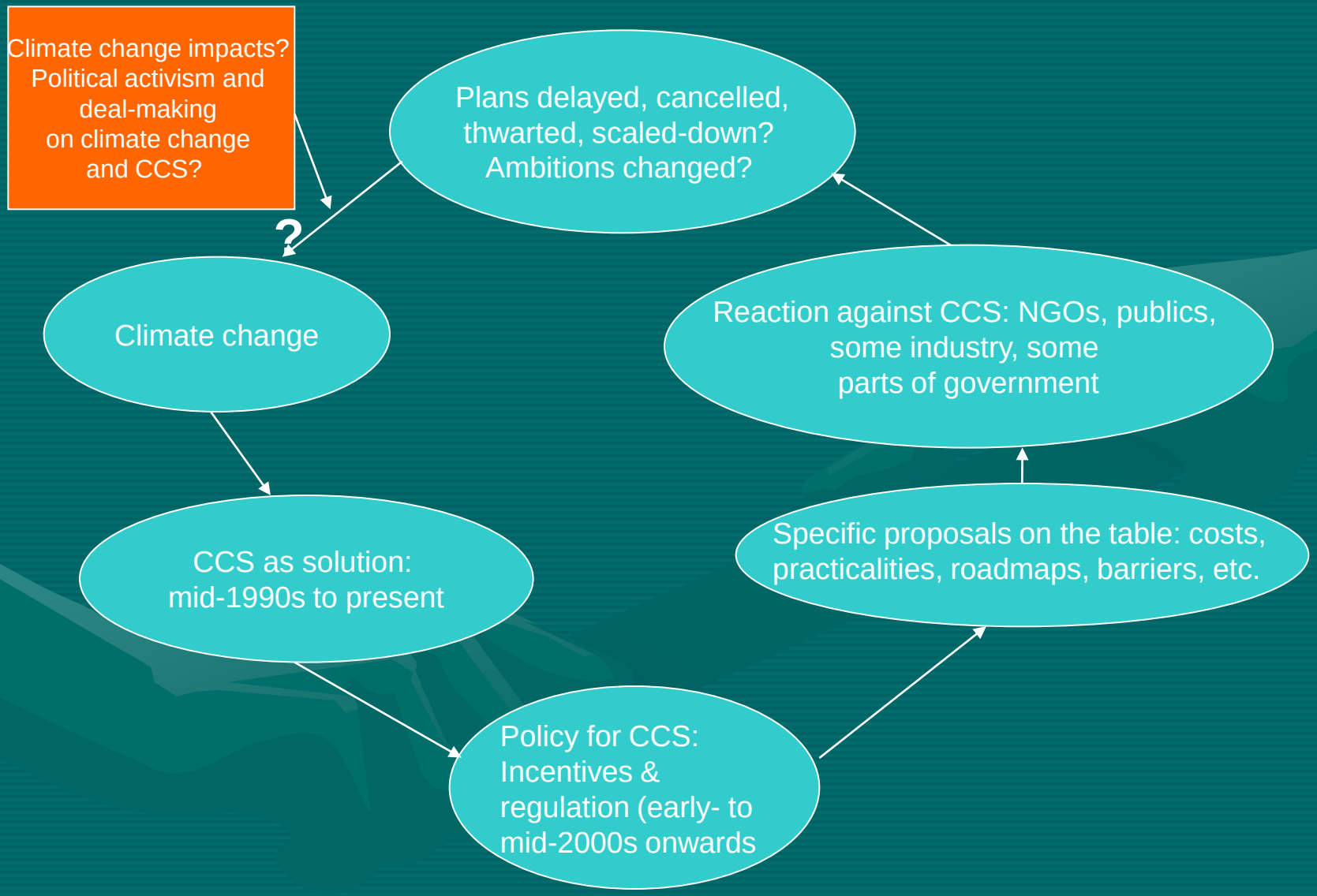
School of Geosciences, University of Edinburgh

Issue-Attention Cycle

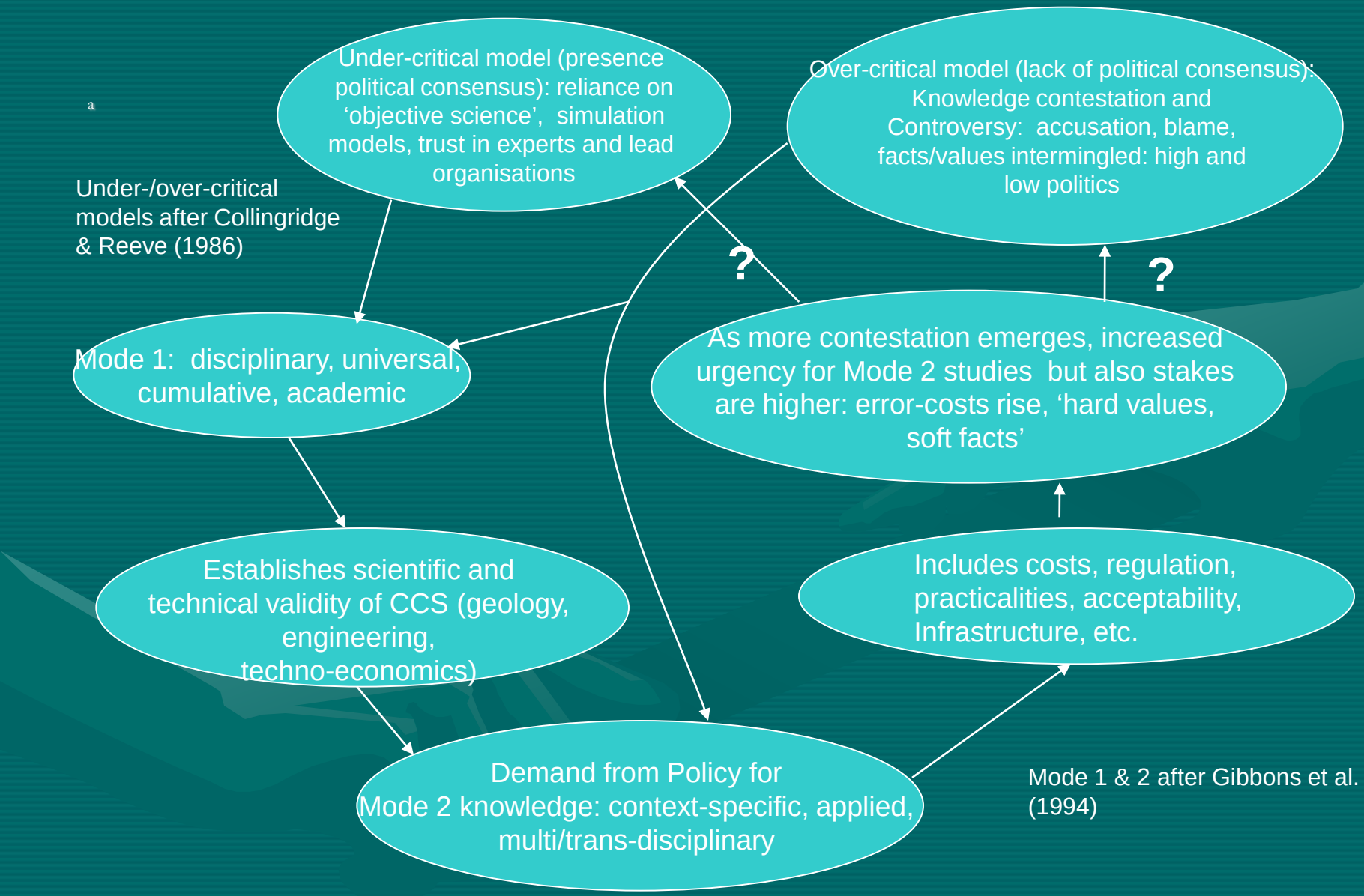
(after Downs, modified by O'Riordan)



Issue-Attention Cycle applied to CCS



Knowledge Production Cycle applied to CCS



Does this imply a retreat to the discipline?

"A discipline is defined by possession of a collective capital of specialised methods and concepts, mastery of which is the tacit or implicit price of entry to the field. It produces a 'historical transcendental', the disciplinary habitus, a system of schemes of perception and appreciation (where the incorporated discipline acts as a censorship)".

Pierre Bourdieu, *Science of Science and Reflexivity* (2004)

Can Mode 1 or Mode 2 science actually provide the consensual knowledge constructs needed?

Knowledge Implications of Non/Contestation

- Under-critical model: technocratic tools, knowledge-constructs adopted in Mode 2 but not sufficiently tested / scrutinised, so policies / projects are less robust and vulnerable to 'side-swipes' or shocks
- Over-critical model: technocratic backlash / retrenchment – i.e. *increased* use of instrumental techno-science in belief that 'we need to convince them we're right …'. Whilst also *diversification* of knowledge-constructs: from technical and scientific critiques, to social science critique, and range of participants in Mode 1 and Mode 2. More robust as discrete components, as more scrutinised; but less synthesis & integration – so messy, slow, confusing ……consensus elusive

Andrew Jamison: the need for a Mode 3 or hybrid imagination?

- ***At discursive / macro-level***: connecting science and technology explicitly to social and environmental problems
- ***At institutional or meso-level***: organising spaces or sites for collective learning across faculties and societal domains (experimentation in socio-technical transitions approach)
- ***At the personal or micro-level***: combining scientific-technical competence with socio-cultural understanding

The Techno-Science of Clumsiness?

- 'Gainly solutions & institutions': elegant, analytical, optimsing, objective, but ultimately brittle. (Mode 1 and Mode 2?).
- 'Clumsy solutions & institutions': messy, plural, frustrating, iterative, incremental and satisficing, but ultimately robust. (Mode 3?)
- If we need 'clumsy solutions & institutions', what kind of knowledge-constructs support clumsiness?

This is the complex and fraught context into which public understanding, engagement and communication studies and projects are being undertaken ……

Rationale for Studies of Public Perceptions

- **Substantive**: understanding *how* and *why* different groups of people think, perceive and feel the way that they do.
- **Instrumental**: undertaking a research and engagement activity to promote the successful design and / or implementation of a CCS project (where it is assumed *a priori* that this is desirable).
- **Deliberative**: meeting the moral imperative and legislative requirements of participative democratic decision-making.

1st Generation Studies

- Mostly focused upon gathering information on perceptions, knowledge, effect of information, role of trust, communications, etc.
- Academic-focused: advancing disciplinary knowledge and testing hypotheses, etc. (substantive + deliberative):
- Hypothetical project focused

2nd Generation Studies

- More focused upon 'actual', nearer-to-reality, projects
- More focused upon *engagement* and *communication*
- More instrumental
- Wider range of stakeholders involved

Main Findings Presented to IEA of Research and Demo Projects to Date

- *CCS project development is vulnerable to poor public communications and engagement and could be thwarted by effective advocacy.*
- *The local populace can (potentially dramatically) affect project development and should therefore be considered a stakeholder on a par with traditional expert and pressure groups such as government agencies, local development agencies, and NGOs.*
- *It is vital to explain CCS within the rationale of global warming, since the technology only makes sense to the public as a way of achieving deep cuts in carbon emissions to avoid the adverse impacts of climate change.*

Main Findings continued ….

- *The public is not a single entity, but encompasses multiple subgroups divided across lines of geography, income, education, historical interactions with industry and public institutions, and culture.*

- *Communities frequently struggle to engage with the technical and scientific detail and uncertainty surrounding a new technological innovation. Instead, the perceived trustworthiness of the institutions which are involved in the project and in the planning process will have a large influence upon public perceptions.*

Main Findings – continued

- *The transparency and quality of the engagement process can determine whether the public finds the developer legitimate and trustworthy, and will play an important part in the public's decision-making process.*

- *People generally respond more positively to issues when they deem that they have been treated fairly, and responsive project planning and risk communication activities may therefore yield increased public support for CCS.*

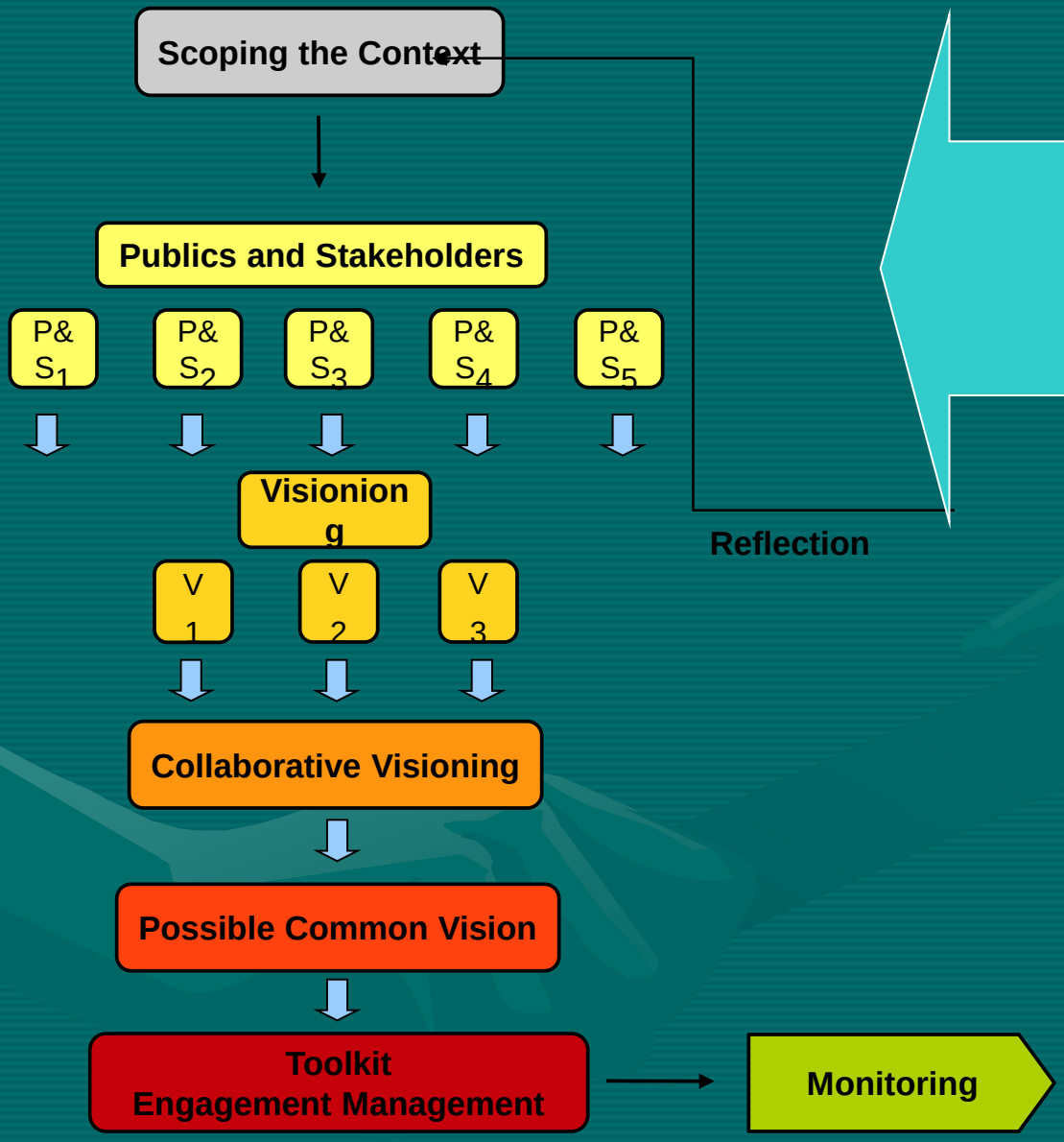
Main Findings continued ……

- *While it is difficult to estimate the costs associated with adequate public engagement, the incremental costs are likely to be very small relative to the overall project costs, and must be weighed against the considerable costs of project delays or cancellation.*

Project name	*Team*	*Applications*	*References*
ESTEEM	Einhoven, ECN (Netherlands)	Energy projects	Raven et al. (2009)
Carbon Capture and Storage Communication Workshops	University of Calgary, IISD, Climate Change Central (Canada)	CCS projects	Climate Change Central (2007)
An Integrated Roadmap of Communication Activities Around CCS in Austarlia and Beyond	Centre for Low Emission Technology, CSIRO (Australia)	CCS projects	Ashworth et al. (2007)
Breaking Ground: Engaging Communities in Extractive and Infrastructure Projects	World Resources Institute (USA)	Extractive and infrastructural projects	WRI (2009)
Communicating the Future: Best Practices for Communication of Science and Technology to the Public	National Institute for Standards and Technology (USA)	All science and technology projects	NIST (2002)
ZeroGen New Generation Power – A Framework for Engaging Stakeholders	ZeroGen Pty Ltd., CSIRO (Australia)	CCS projects	Simpson & Ashworth (2009)

Examples of Best Practice Public Engagement in CCS, Environmental and Energy Decision-Making and Planning (Mode 2 to 3?)

Project Engagement Management Flow



Clumsiness!!

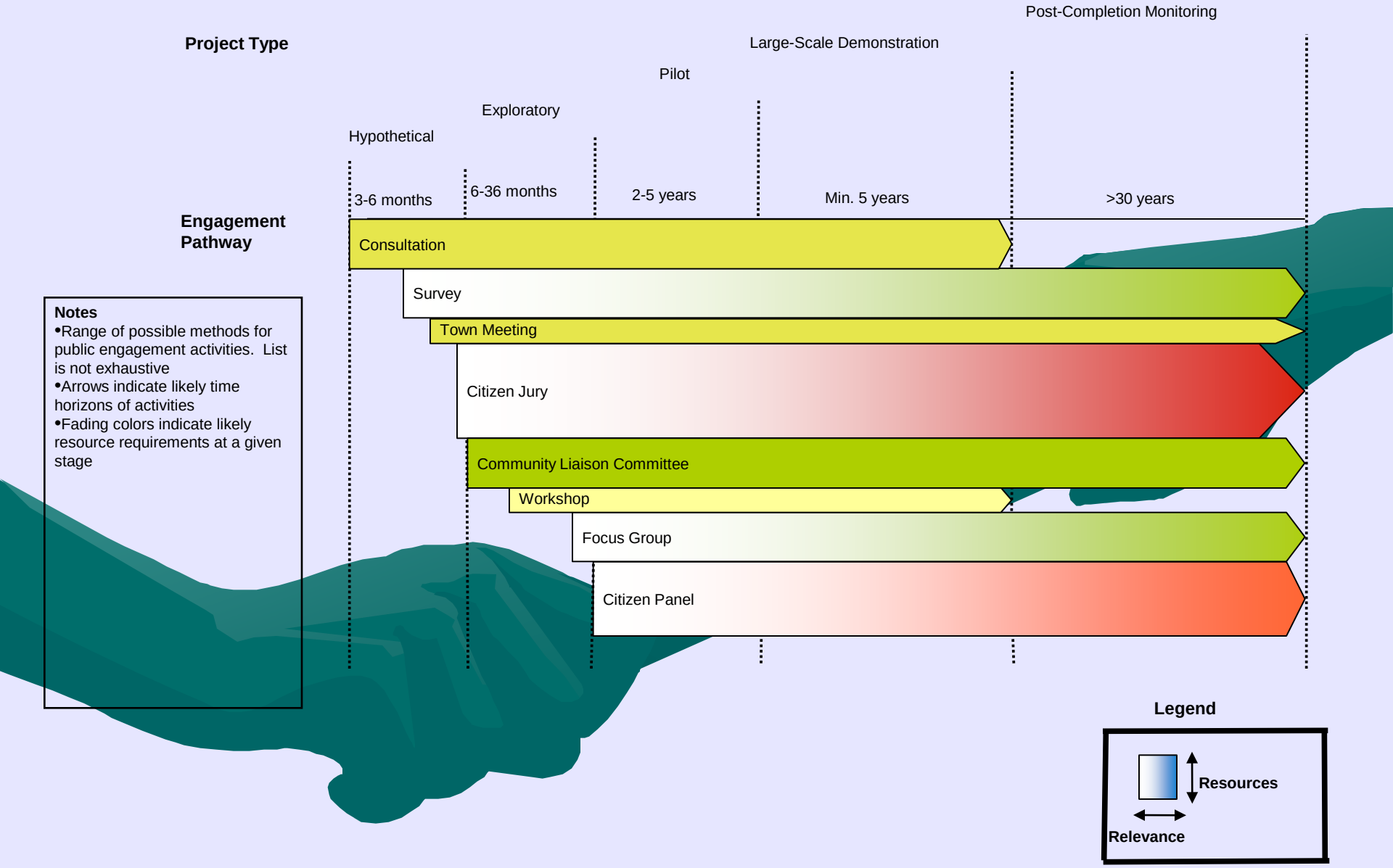
Proposed Collaborative Visioning Process for CCS Project Development: A Radical Departure from Existing Project Decision-Making?

Engagement: From Manipulation to Partnership

Number	*Name*	*Description*
1	Manipulation	Public involvement is focused upon trying to cajole the public into supporting a project
2	Therapy	Reassuring the public about a project
3	Informing	Provision of information on request
4	Consultation	Pro-active provision of information and response to questions
5	Placation / compensation	Engaging in face-to-face public consultation, but only in response to conflict, controversy, etc.
6	Partnership I	Open to suggestions from members of communities / stakeholders who are met individually or in a group
7	Partnership II	Designs shaped / influenced by members of communities / stakeholders (broadly representative) who are met individually or in a group (discrete process)
8	Partnership III	On-going process of influence by members of communities / stakeholders (broadly representative) who are met individually or in a group
9	Veto powers	Local community is given veto powers over plant design, operation, etc.

The Engagement Ladder (modified after Arnstein, 1969)

Project Engagement Process Overview



Criteria for Evaluation of Engagement Processes: Vital for Rapid Learning (adapted from Rowe & Frewer (2000))

Criteria	*Description*
Public Acceptance	
1. Representativeness	Representative sample of the affected population
2. Independence	Process conducted in an independent, unbiased way
3. Early involvement	The earlier the stage of involvement the greater the sense of ownership of the process, especially at the stage where value judgements are important
4. Influence	Any participatory process should have a visible impact on policy
5. Transparency	The public should be able to see progress and how decisions are being made
Effectiveness of process	
6. Resource accessibility	Access to appropriate resources (information, experts, time, materials) to enable them to fulfil their brief successfully
7. Task definition	The scope of the exercise, the expected output and the mechanism of the procedure should be defined at the outset
8. Structured decision making	To enable debate over the underlying assumptions of a decision, how the decision was made, the extent to which it was supported

Conclusions ….. Implications?

- The practice of effective & successful engagement on CCS is in its early days, but we have to learn rapidly.

- A Mode 3 clumsy knowledge-production, involving a 'hybrid imagination', is needed. This encompasses traditional academic knowledge, but also process-based facilitation skills and insights and other practical and socio-cultural knowledge (bureaucratic, regulatory, experiential, etc.)

- 'Silo' mentality of planning is convenient for government and industry, but not up-to-the-task of radical socio-technical transitions that are now required.

The Future ……

- Radical changes in project planning decision-making is desirable – e.g. how to relate CCS projects to peoples daily life experiences? How can CCS contribute to a local community's sense of well-being and sustainability (as defined by them, not government or a company or academics)?

- This is more complex than instrumental 'planning gain' or compensation packages. Its more about meeting peoples' aspirations for a better life whilst also addressing climate change.

- E.g. how can sustainable transport, domestic energy efficiency, cultivation of new energy technologies and jobs, or more sustainable communities be dealt with *as part of* a CCS project?

Making Clumsiness Work?

- Clumsiness can help in joining-up (finding commonality between) divergent perceptions, values, issues and agendas, but it needs a theory and practice.
- Work needs to be done to find a way of structuring clumsiness - rather than (or perhaps in addition to) a top-down theory, this might require bottom-up experimentation driven by local context and conditions ….. grounded theory + top-down heuristics?
- Learning processes likely to be vital ….. But institutions have a poor track-record here, so understanding *why* learning is hard is also important.

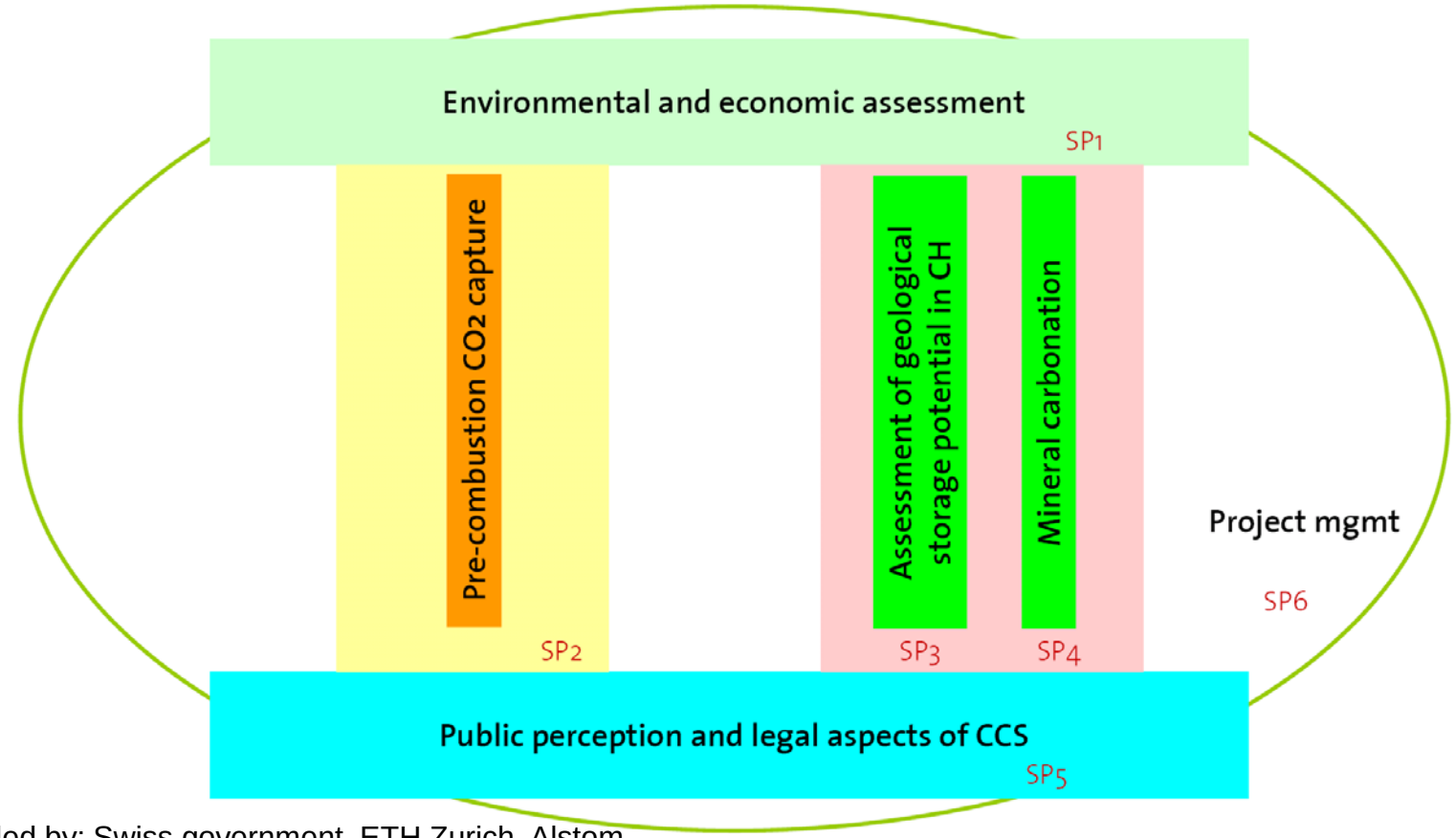
Lay People's Beliefs about CCS

Insights from Switzerland

Lasse Wallquist, Vivianne Visschers & Michael Siegrist
ETH Zurich, Institute for Environmental Decisions, Consumer Behavior

CCS in Switzerland?

CARMA - Research on CCS in Switzerland



Funded by: Swiss government, ETH Zurich, Alstom

Public perception studies

Pre- Study: Expert Model

Aim

Identify all relevant aspects concerning CCS.

>> Qualitative inventory

Method

- Literature review
- Expert interviews

Study 1: Lay Model

Aim

Identify beliefs, misbeliefs and attitudes of laypeople (N=16)

>> Qualitative inventory

Method

- Semi-structured interviews with laypeople

Study 2: Survey

Aim

Check for the prevalence and the stability of the concepts. Can misbeliefs be corrected?

>> Quantification

Method

- Representative survey among laypeople in CH
- Experimental survey to study effect of information provision

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Study 1: Why Interviews?

- Previous research: the public seems to associate a variety of risks with CCS (e.g. Gough et al., 2002; Palmgren et al. 2004)

- What kind of beliefs and attitudes determine the acceptance and perception of CCS?

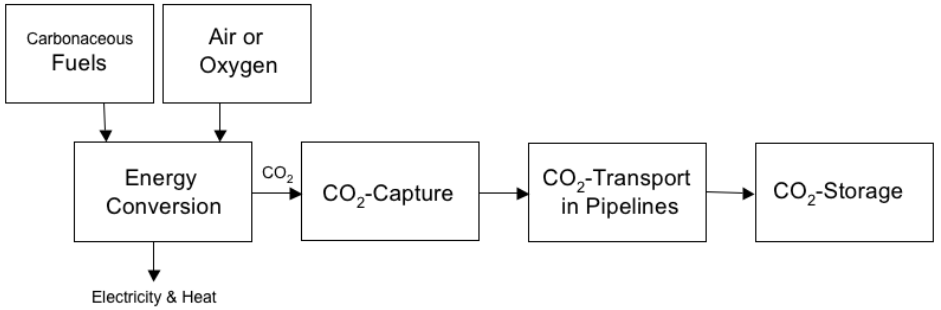
>> A qualitative method allows a deep exploration of people's thoughts

(Wallquist, Visschers & Siegrist, 2009)

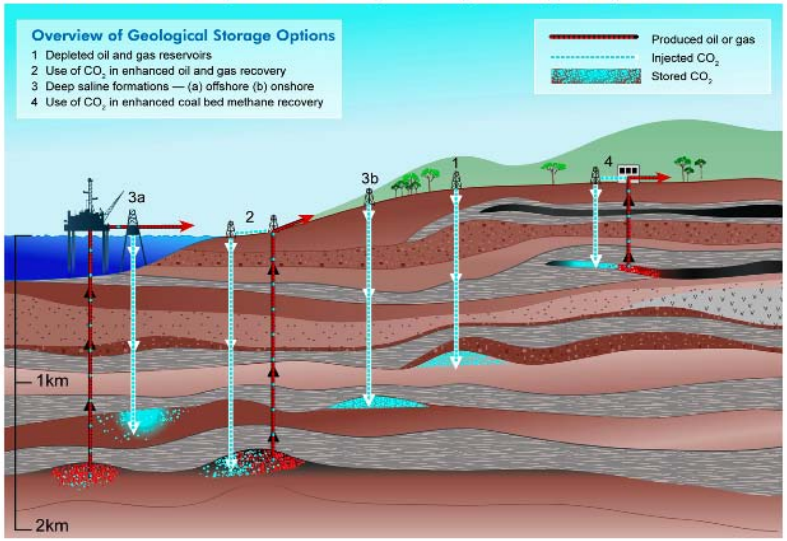
Interview Design

- Neutral information provided
- No information about risks or benefits
- No information on the nature of CO_2

- Open-ended questions:
  - First impression
  - Perceived benefits & risks, etc.
- Respondents stimulated to explore their first impressions and beliefs in detail.



Methods for storing CO2 in deep underground geological formations



Technical Concepts		*n*
Over- pressurized reservoir	“The area could burst like a balloon if pressure is too high. The ground could collapse and earthquakes could be caused.”	10
Earthquakes	"This is like drilling into wood, suddenly a piece can break off. This was shown in Basle"	7
Gas is rising （Leakage）	“Leakage is possible, one day it must come up, it's a gas, it's lighter”	9
Characteristics of CO_2	“If this was done under my village I would be angry because it could make the air worse. It‘s smelly, affecting the quality of life in general, like living in a city”	3
Diffuse harm to ecosystems	“It's a very young research area causing a huge interference and perhaps damages to nature will be recognized too late “	9
Impact on microorganisms	"Spiders and other microorganisms that live down there could be poisoned by CO_2"	3
Groundwater impact	“Groundwater might get sour, but this is no big deal they are checking it and they will clean it”	2
Atomic waste associations	“This reminds me of the atomic waste problem but I think it's not that bad”	5
Genetic modification associations	“Carbon dioxide could change the DNA of organisms and this will cause a vicious circle”	2

Socio-economical Concepts		*n*
Renewables	"It's a legitimate help to mitigate climate change, but one needs to take care, that renewables are not slowed down in their development"	10
Sustainability	"It's like fighting the symptoms but not curing the underlying disease. There is a principle mistake in this solution"	9
Rebound effect	"This is offering the wrong incentives, because people will think the problem is solved"	8
NIMBY effect	"The US should do it, they have the biggest emissions"	4

Study 1 Conclusions

- CCS and renewable energy technologies should never be plaid off against each other in communication.

- This study gave a first impression of laypeople's beliefs and misbeliefs

>> More objective method needed to quantify them.

Pre- Study: Expert Model

Aim
Identify all relevant aspects concerning CCS.

>> Qualitative inventory

Method
- Literature review
- Expert interviews

Study 1: Lay Model

Aim
Identify beliefs, misbeliefs and attitudes of laypeople (N=16)

>> Qualitative inventory

Method
- Semi-structured interviews with laypeople

Study 2: Survey

Aim
Check for the prevalence and the stability of the concepts. Can misbeliefs be corrected?

>> Quantification

Method
- Representative survey among laypeople in CH
- Experimental survey to study effect of information provision

Study 2a: Aims

- Quantify the prevalences of:
  - lay (mis)beliefs about CO_2 and CCS
  - their socio- economical attitudes.

- Investigate the influences of socio-economical and technical lay concepts on benefit and risk perception of CCS.

(Wallquist, Visschers & Siegrist, in prep)

Survey construction

- Expert consulted for development of neutral information

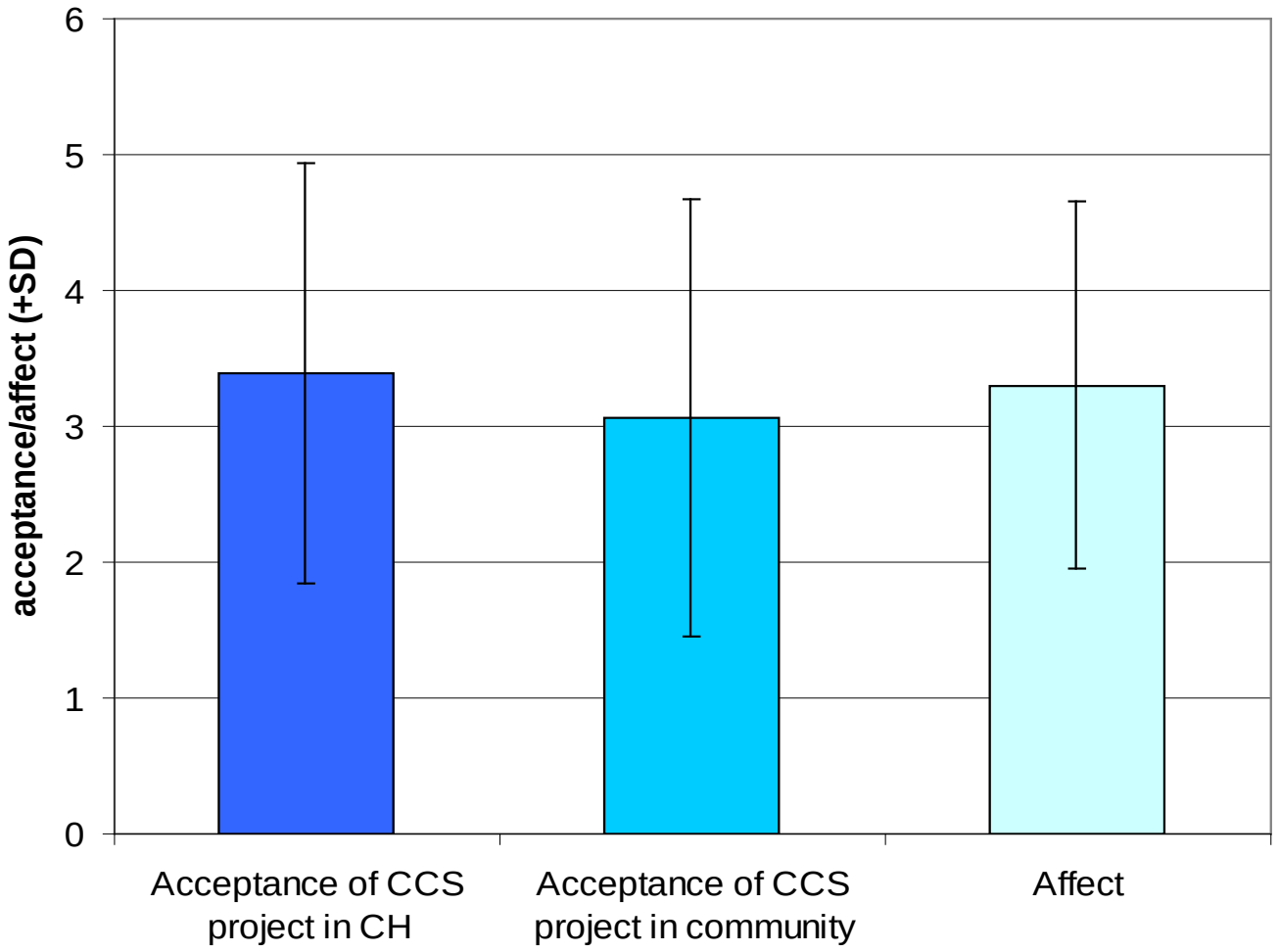
- Items based on findings from interview study
- Topics:
  - Acceptance of CCS
  - Risk perception
  - Benefit perception
  - Beliefs
  - Affect
  - Awareness of climate change

- E.g. “CO_2 storage is possible in every underground”.

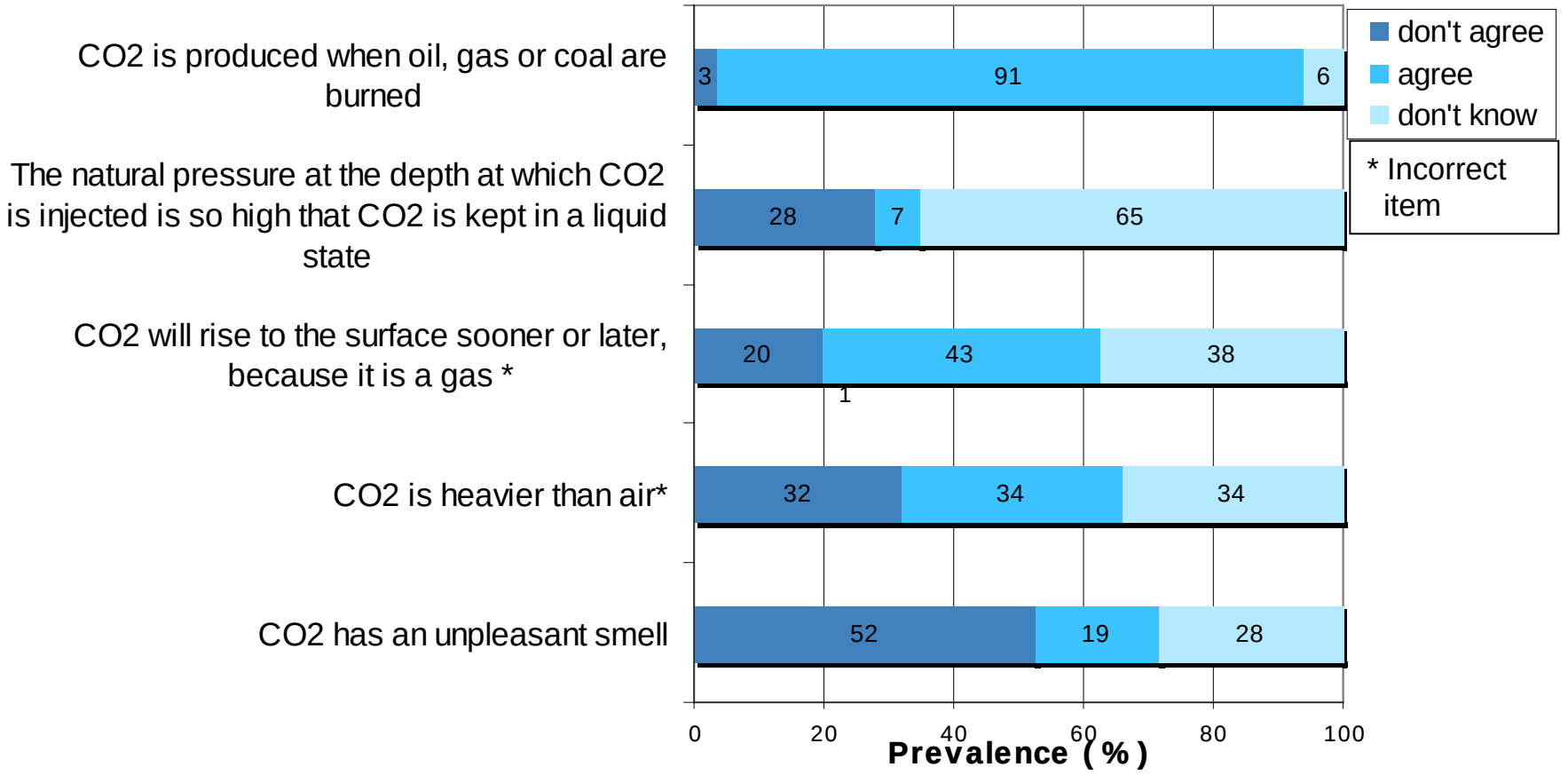
Respondents

- Mail survey
- Representative sample of the German-speaking Swiss population (N = 2,000)
- 654 completed questionnaires (response rate: 33%)
- 36% of respondents had heard about CCS before
- Summer 2009

Acceptance of CCS



Beliefs: Carbon Dioxide



Beliefs: Containment Mechanisms

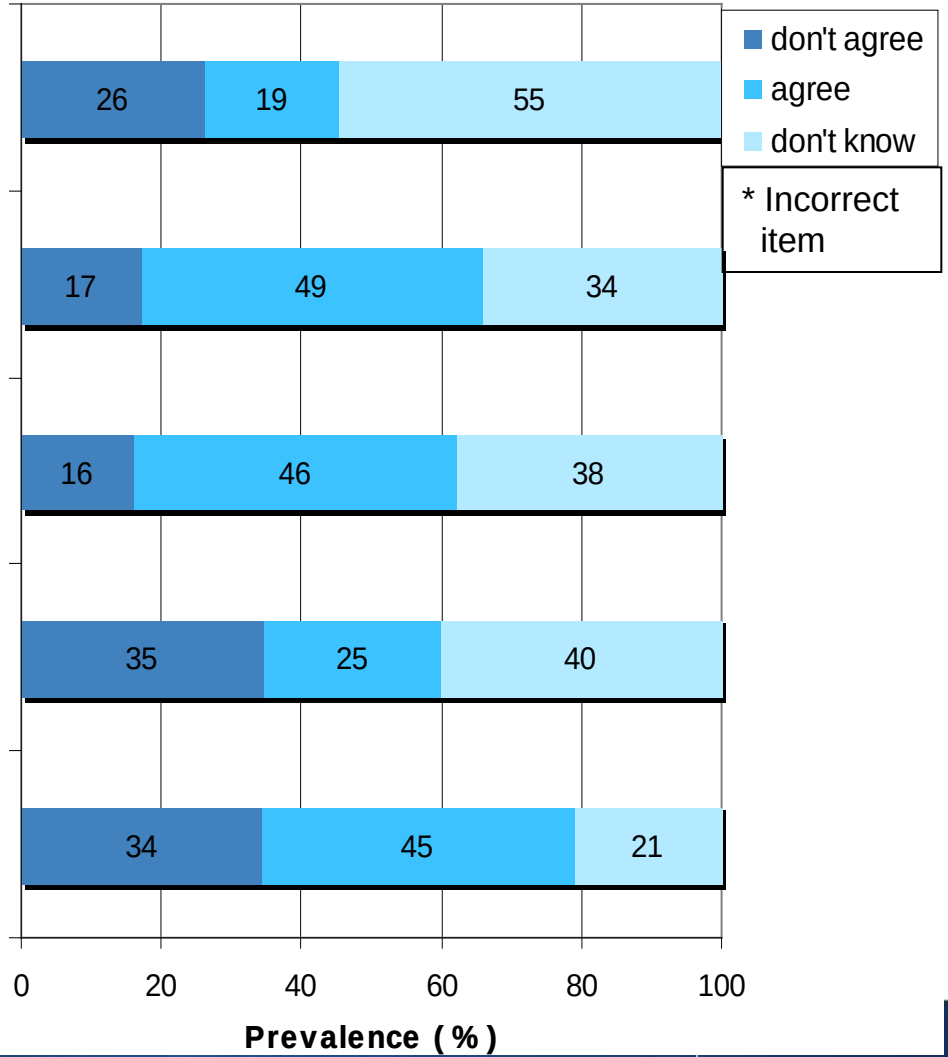
The longer CO2 stays underground, the more it conjoins with the rock and the safer the storage gets

The deeper you drill in the subsurface the bigger the pressure gets

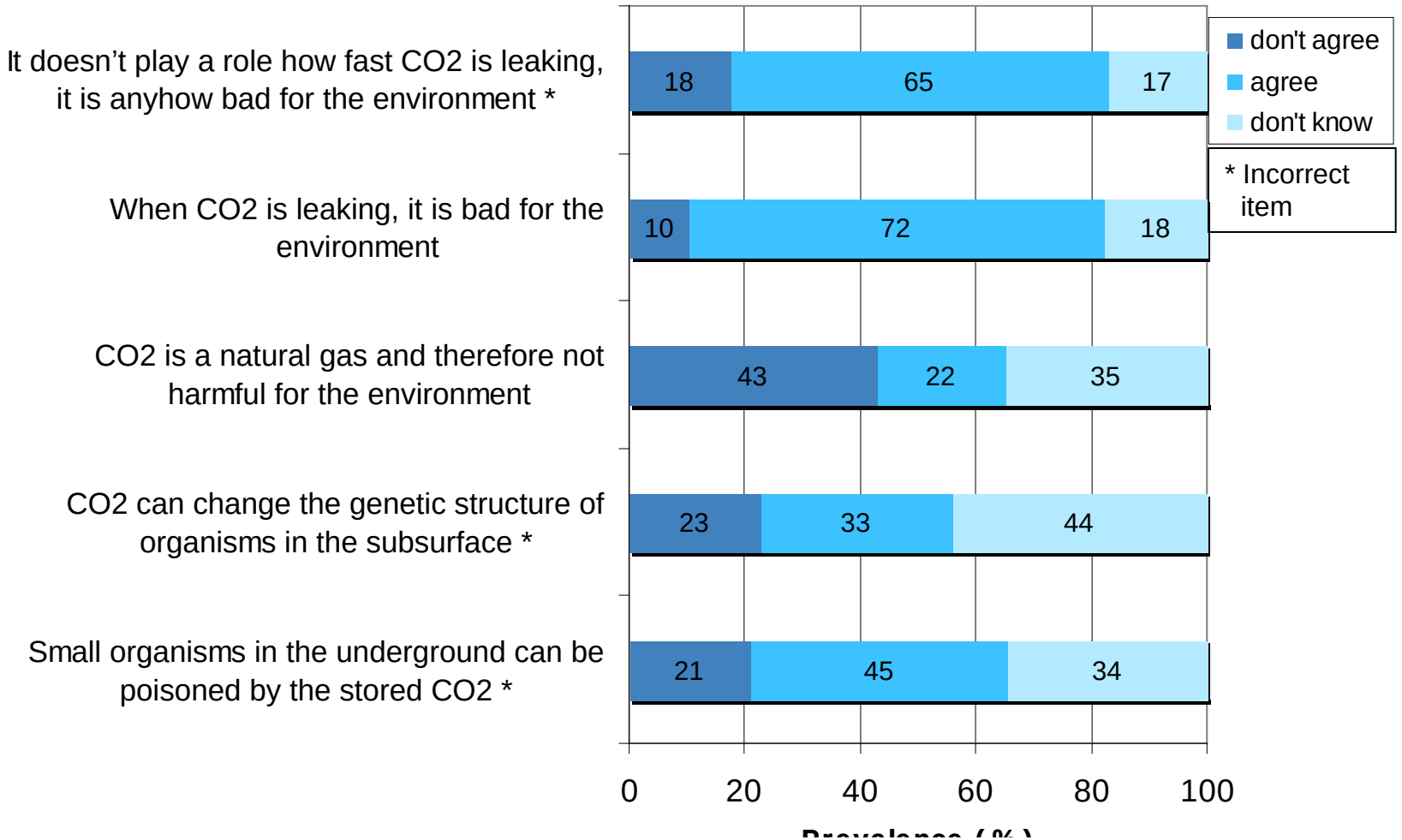
The injection of large amounts of CO2 in the underground lead to permanent pressure change in the subsurface *

I imagine that the injection of CO2 is comparable to a sponge which is soaking up the CO2

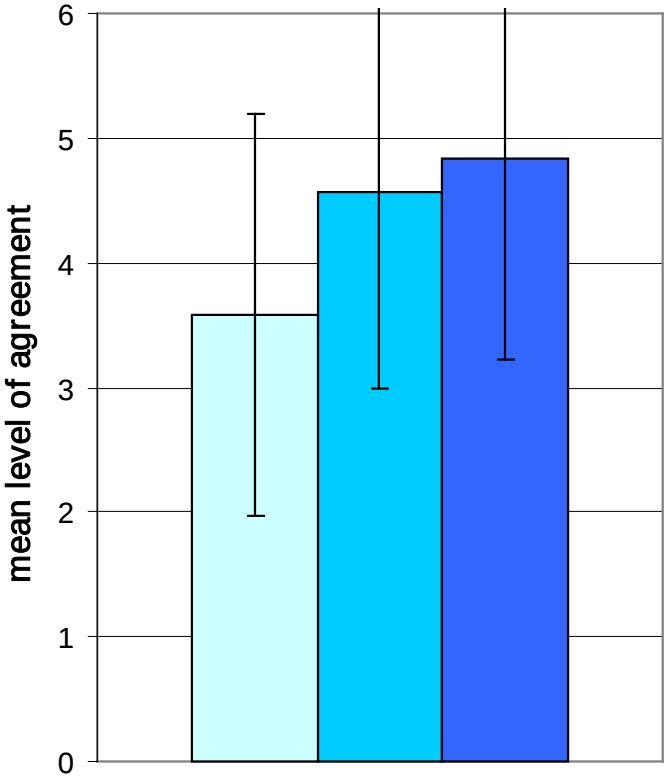
I imagine injecting CO2 into the subsurface being comparable to pumping up a huge balloon underground *



Beliefs: Impact



Attitudes: Socio-economical



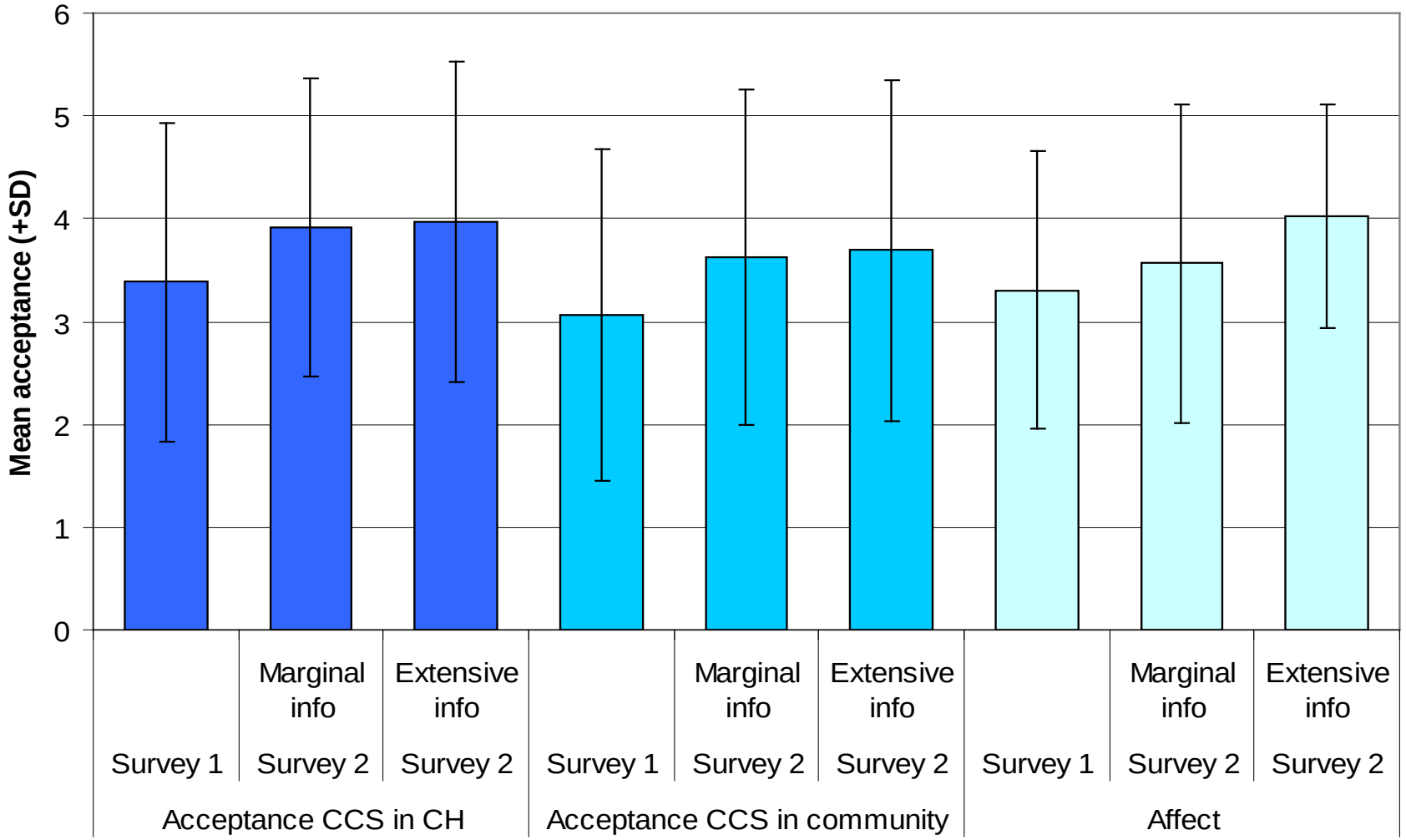
- The development of CCS competes with the development of renewable energy technologies
- ‚CCS is giving wrong incentives people could think, that the problem of climate change is solved
- CCS is only fighting the symptoms of climate change but not the underlying disease

Study 2b: Information about CCS

- Aim: Examine the stability people's technical and socio-economical concepts on CCS.

- Experimental follow up of survey (*N* = 130)
- 2 Conditions: extensive information vs. marginal information
- Same items as in the previous survey
- September 2009.

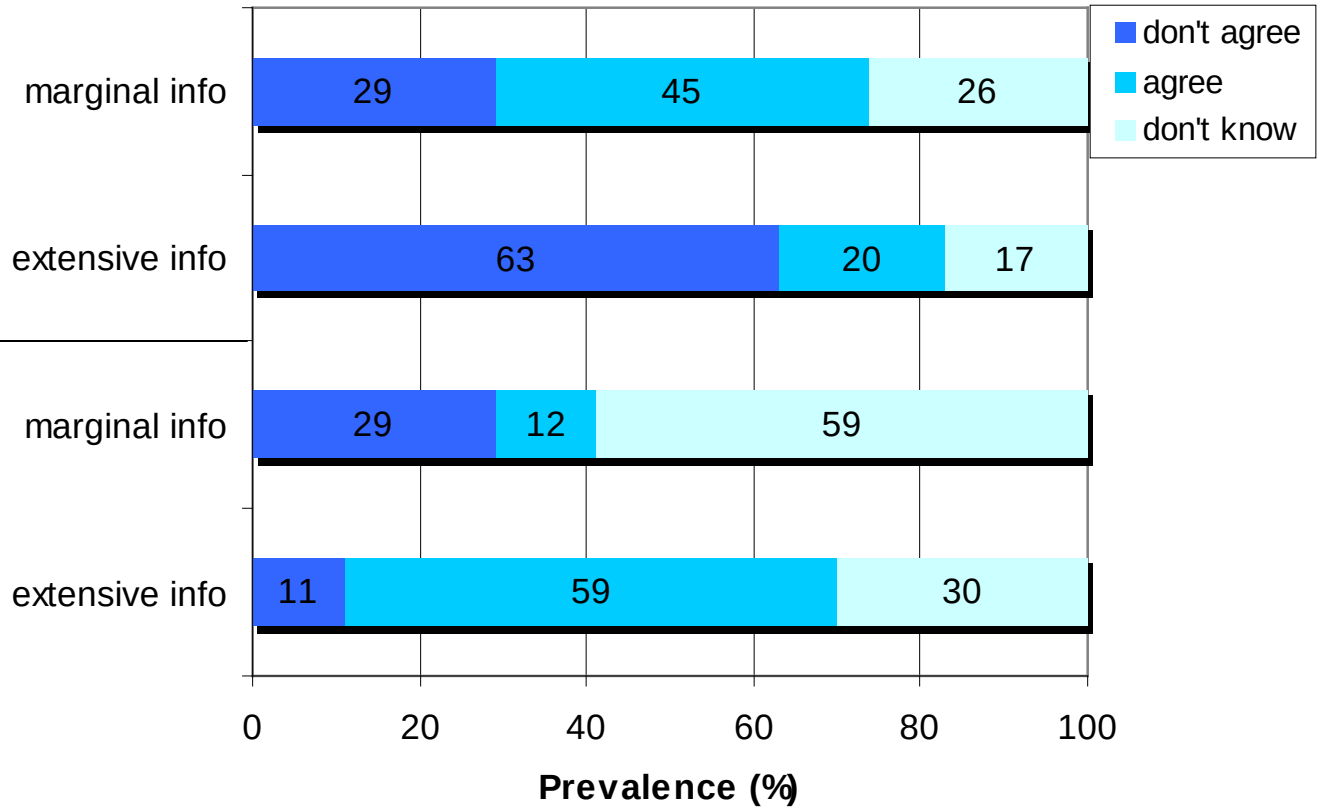
Results: Acceptance



Type of information and beliefs

CO_2 will rise to the surface because it is a gas. *

The natural pressure at the depth at which CO_2 is injected, is so high, that CO_2 is kept in a liquid state. *



* χ^2s > 14.85, *p*s < .001

Conclusions

- Many laypeople have intuitive beliefs about CO_2 and CCS.
- Only clear and simple misbeliefs can be solved with extensive information
- Acceptance and knowledge slightly changed over time:
  - Information should be repeatedly offered?
  - Other factors more important? E.g. socio-economical attitudes, trust.

Thank you!

JÜLICH
FORSCHUNGSZENTRUM

IEA GHG Social Research Network Meeting,
November 2-3, 2009, CIRED, Paris

Comparison of CCS communication methods

November 2, 2009

Diana Schumann

Outline

- Point of departure
- “Impact of communication”
  - Assumptions
  - Research question
- Concepts
  - Opinion quality
  - Effectiveness of communication methods
- Comparative study of CCS communication methods
  - Methodological design
  - Implementation in Germany
  - Results of the comparison in Germany
- Discussion

Point of departure

- Varying levels of awareness, knowledge and attitude formation with regard to CCS within society
  - Stakeholders: high level of awareness and knowledge; varying attitudes towards CCS
  - General public: very low level of awareness and knowledge; attitude formation process with regard to CCS is still only beginning
- The need to communicate CCS to the public results in a number of communication activities performed by stakeholders, but

  ⇨ to date there have been no studies on the effectiveness of different communication methods

Point of departure (2)

- “Scrutinizing the impact of CCS communication on the general and local public (Impact of communication)”
- Collaborative project: 11 partners from six European countries: Germany, Greece, the Netherlands, Norway, Romania and the United Kingdom
- Initiated by the Fossil Energy Coalition’s (FENCO ERA-NET) 1st Joint Call for Proposals
- Financed by the National Funding Agencies
- Duration: 1st January 2009 – 31st December 2009

“Impact of communication” - Assumptions

- Communication on CCS should enable the public to develop well-informed and well-considered opinions on the technologies
- Opinions that are not well-informed or well-considered are unstable, inconsistent and not based on conviction

  ⇨ worthless for a prediction of the public supporting or opposing CCS in future

- Opinions of high quality will allow us to better predict future public approval or non-approval of CCS

“Impact of communication” - Research question

How should information on CCS be communicated in order to increase the quality of public opinion?

Concept of opinion quality (Price and Neijens 1997*)

Most important criteria for assessing the quality of opinions:

- Relative stability = degree to which people's opinion remain consistent over time
- Consistency = extent to which people's opinion are logically or ideologically consistent with other views they hold or their general values and attitudes
- Conviction = how intensely a viewpoint is held, how important an issue is thought to be, or how confident a person is in his or her opinion

* PRICE, V. & NEIJENS, P. (1997) Opinion Quality in Public Opinion Research. *International Journal of Public Opinion Research,* 9:4, 336-360.

Concept of effectiveness of communication methods

Extent to which communication triggers information processing that in turn results in well-informed and well-considered opinions that are stable and consistent and hence are of high quality.

Methodological design of the comparative study

- Comparison of Focus Groups Discussions (FGD) and Information-Choice Questionnaire (ICQ)
- Most important precondition: identical composition of the focus groups and ICQ groups ⇨ **Matching**
- Three focus groups, each of them with 10 participants, in all countries involved in the project
- All focus groups met only once
- Course of focus groups' meetings in all countries were identical (moderator and expert scripts)

Methodological design of the comparative study (2)

- Computer-aided questionnaire in order to measure the knowledge and attitudes of the focus groups participants concerning CCS
- ICQ: in most of the countries the participants were invited to fill in the questionnaire in the rooms of the professional polling firm which conducted the FGD and ICQ
- Data of focus groups' and ICQ surveys = basis for the evaluation and comparison of the two communication methods

Information that was conveyed in the FGD and ICQ

- Identical information to the focus groups' and ICQ participants
- Identical information in all countries
- Information content:
  - sources and consequences of energy use in Europe,
  - international agreements and ways to reduce CO2 emissions, and
  - two options of the implementation of CCS (country-specific)

Implementation of the comparative study in Germany

- Three focus groups, each of them with 10 participants, carried out in May 2009
- Criteria for the recruitment and matching: gender, age, occupation held and whether the participants have a completed education or not
- “Double matching” of participants
- Focus groups’ and ICQ participants were recruited by a professional polling firm
- FGD and ICQ took place in Mannheim

Implementation of the comparative study in Germany (2): CCS options presented in the focus groups and ICQ survey

1. “Cluster of four coal-fired power plants with CO_2 capture and storage” (technology 1)
2. “One power plant using coal gasification with CO_2 capture and storage” (technology 2)

Results of the comparison in Germany: Overall opinions on CCS technology 1

Scores	Focus groups' participants		ICQ survey participants	
	First measure	Second measure	First measure	Second measure
Very bad	6	11	9	11
2	7	2	9	7
3	11	6	4	7
4	4	5	4	2
5	1	2	3	2
6	0	3	1	1
Very good	1	1	0	0
Total	30	30	30	30
Mean	2.70	2.93	2.53	2.33
SD	1.343	1.874	1.479	1.398

24 19 22 25

Results of the comparison in Germany: Overall opinions on CCS technology 2

Scores	Focus groups' participants		ICQ survey participants	
	First measure	Second measure	First measure	Second measure
Very bad	9	5	3	8
2	6	4	7	7
3	4	5	6	3
4	6	5	6	3
5	0	4	6	6
6	3	5	1	2
Very good	2	2	1	1
Total	30	30	30	30
Mean	2.97	3.73	3.40	3.07
SD	1.921	1.911	1.545	1.856

19 14 17 18

Results of the comparison in Germany: Self-evaluation of certainty about the overall opinion

Scores	Technology 1		Technology 2	
	Focus groups' participants	ICQ participants	Focus groups' participants	ICQ participants
very uncertain	5	0	5	0
2	3	0	4	1
3	6	1	5	2
4	3	5	2	4
5	4	8	4	6
6	6	14	5	13
very certain	3	2	5	4
Total	30	30	30	30

13 24 14 23

Results of the comparison in Germany: Choice between technology 1 and technology 2

	Focus groups' participants		ICQ survey participants	
	First measure	**Second measure**	**First measure**	**Second measure**
Technology 1	16	12	6	5
Technology 2	14	18	24	25
Total	30	30	30	30

Results of the comparison in Germany: Consistency of opinions concerning technology 1

Consequence	Overall opinion technology 1 (second measure)	
	Focus groups' participants	ICQ participants
Contribution to pollution due to coal mining	.236	-,517**
Miners' safety	.166	-,529**
Safety of CO2 transport in onshore pipelines	,452*	,430*
Contribution to quality of drinking water	,424*	,761**
Safety of underground CO2 storage	,461*	,397*
Less CO2 emission reduction	,474**	,572**
The number of years this technology can be used	,699**	,750**
Reliability of energy supply	-.046	-,382*
Price	,518**	,470**
Contribution to the greenhouse effect	,373*	,707**

Results of the comparison in Germany: Consistency of opinions concerning technology 2

Consequence	Overall opinion technology 2 (second measure)	
	Focus groups' participants	ICQ participants
Contribution to pollution due to coal mining and miners' safety	,461*	-.234
Safety of CO2 transport in onshore pipelines	,588**	,702**
Safety of CO2 transport in offshore pipelines	.283	,768**
Safety of underground storage	.334	,760**
Less CO2 emission reduction	.324	,750**
The number of years this technology can be used	.266	,406*
Reliability of the energy supply	.340	-.216
Contribution to acidification and ill health	,464**	.207
Hydrogen as a by-product	,498**	,718**
Price	,537**	,600**
Contribution to the greenhouse effect	,694**	,484**

Discussion

- Results of the comparative study in Germany are not unambiguous with regard to the evaluation of opinion quality
- No statistical significant differences between focus groups' and ICQ participants with regard to the stability of overall opinion concerning technology 1 and choice between the two options
- Overall opinion of focus groups' participants concerning technology 2 are less stable compared to ICQ participants
- Consistency of overall opinions of focus groups' participants with regard to both technologies seems to be lower compared to ICQ participants

Discussion (2)

- Some results of the comparative study in Germany indicate differences in the effectiveness of FGD and ICQ in terms of opinion quality, however
  - ⇨ generalisable conclusions concerning the effectiveness of the two communication methods are not possible on the basis of the German data due to the small sample sizes
- Generalisable conclusions concerning the effectiveness of FGD and ICQ will be drawn on the basis of cross-national comparisons

JÜLICH
FORSCHUNGSZENTRUM

Thank you very much for your attention!

EERC

EERC Technology… Putting Research into Practice

Focus Groups and GIS in Outreach: PCOR Partnership Experience

International Energy Agency
Social Sciences Network Workshop

November 2, 2009
Paris, France

Daniel J. Daly, Sheila K. Hanson, Wesley D. Peck, and Jared T. Auch
Energy & Environmental Research Center
University of North Dakota
Grand Forks, North Dakota

PCO2R Partnership

DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA

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Outline

- Plains CO_2 Reduction (PCOR) Partnership
- Geographic information system (GIS) outreach information system
- Focus Groups, with an example from Williston, North Dakota (Hanson and others, 2005)
- Learn more

PCOR Partnership

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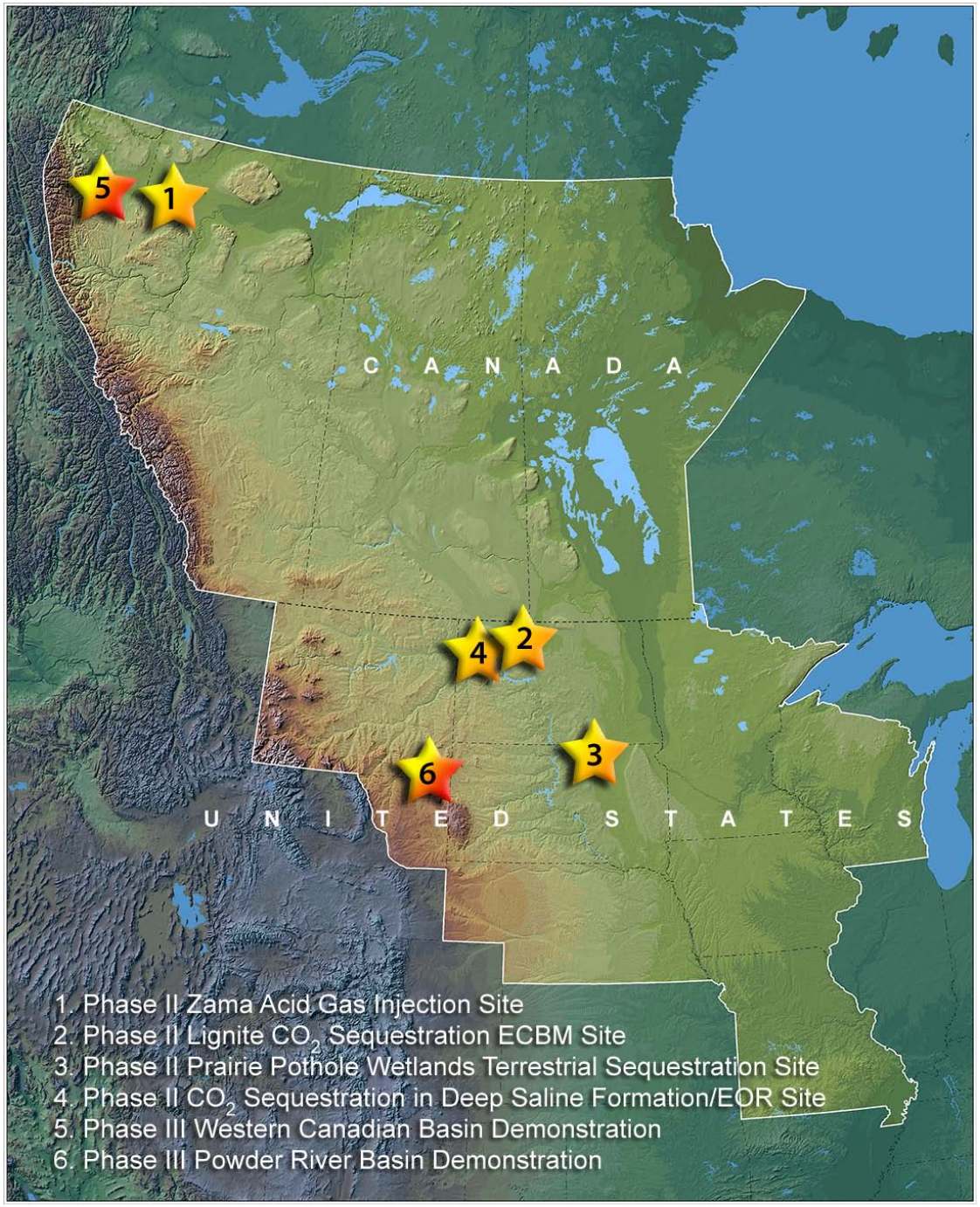
PCOR Partnership Region

Part or all of nine U.S. states and four Canadian provinces; one of seven regional partnerships under the U.S. Department of Energy (DOE) Regional Carbon Sequestration Partnership (RCSP) Program.

- **2.5% of Earth's land surface**
- **0.5% of world's population (30 million) in 10 million households**
- **3% of world's gross domestic product (GDP)**
- **3% of world's anthropogenic carbon emissions**
  - **2/3 of carbon emissions from stationary sources**
  - **Significant near-term opportunities for carbon capture and storage (CCS)**
  - **Significant near-term opportunities for geologic storage**



PCO2R Partnership

CO_2 Situation

Commercial carbon dioxide (CO_2) enhanced oil recovery (EOR) projects and CO_2 pipelines

CO_2 storage verification projects and demonstrations

Multiple EOR and CO_2 storage projects under consideration

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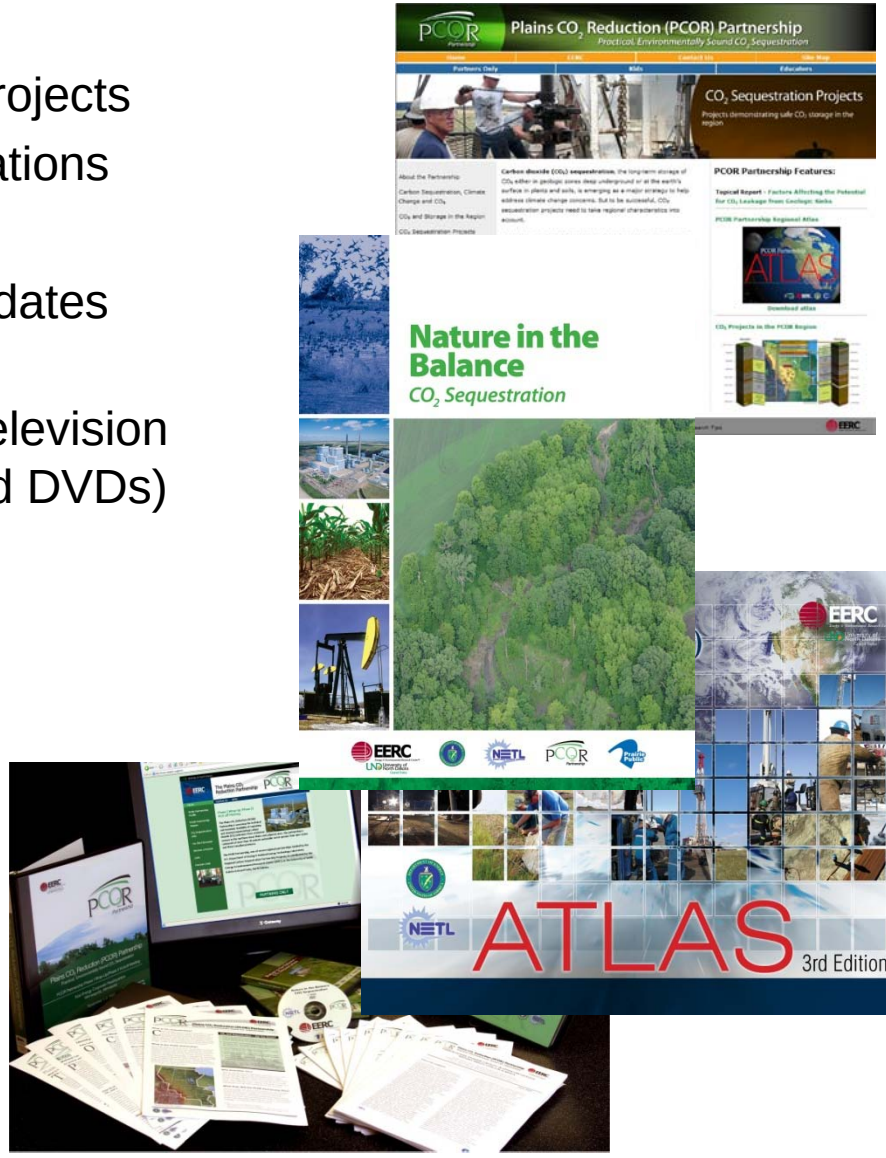
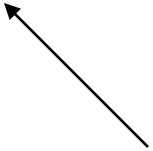
Public Outreach and Education

- Outreach tools
  - Fact sheets on key topics and projects
  - A variety of PowerPoint presentations
  - Display booth and materials
  - Public Web site with monthly updates and downloadable materials
  - Sequestration documentaries (television broadcasts, Web streaming, and DVDs)
  - Video clips
  - 65-page regional atlas
- Integrated outreach activities
  - Regional- and project-level coverage
  - Forums for decision makers
  - Community presentations



Situation Analysis, Tracking, and Feedback

- Baseline social characterization
- Message coverage tracking
- Qualitative feedback
  - Audience feedback forms
  - Formal and informal audits
  - Focus groups
  - Op-ed
- Quantitative feedback
  - Public surveys
  - Focus group questionnaires



Outreach Information System

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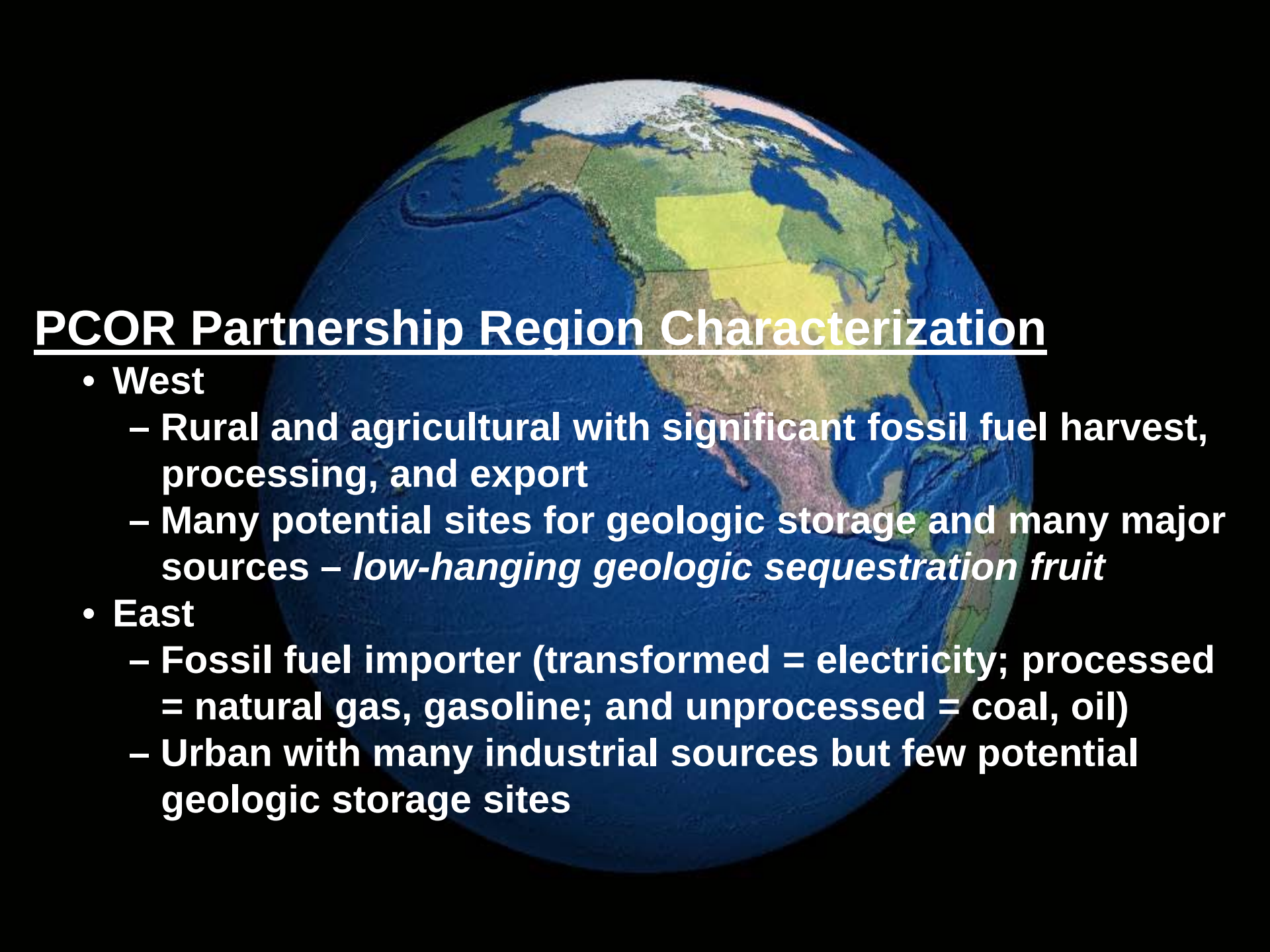
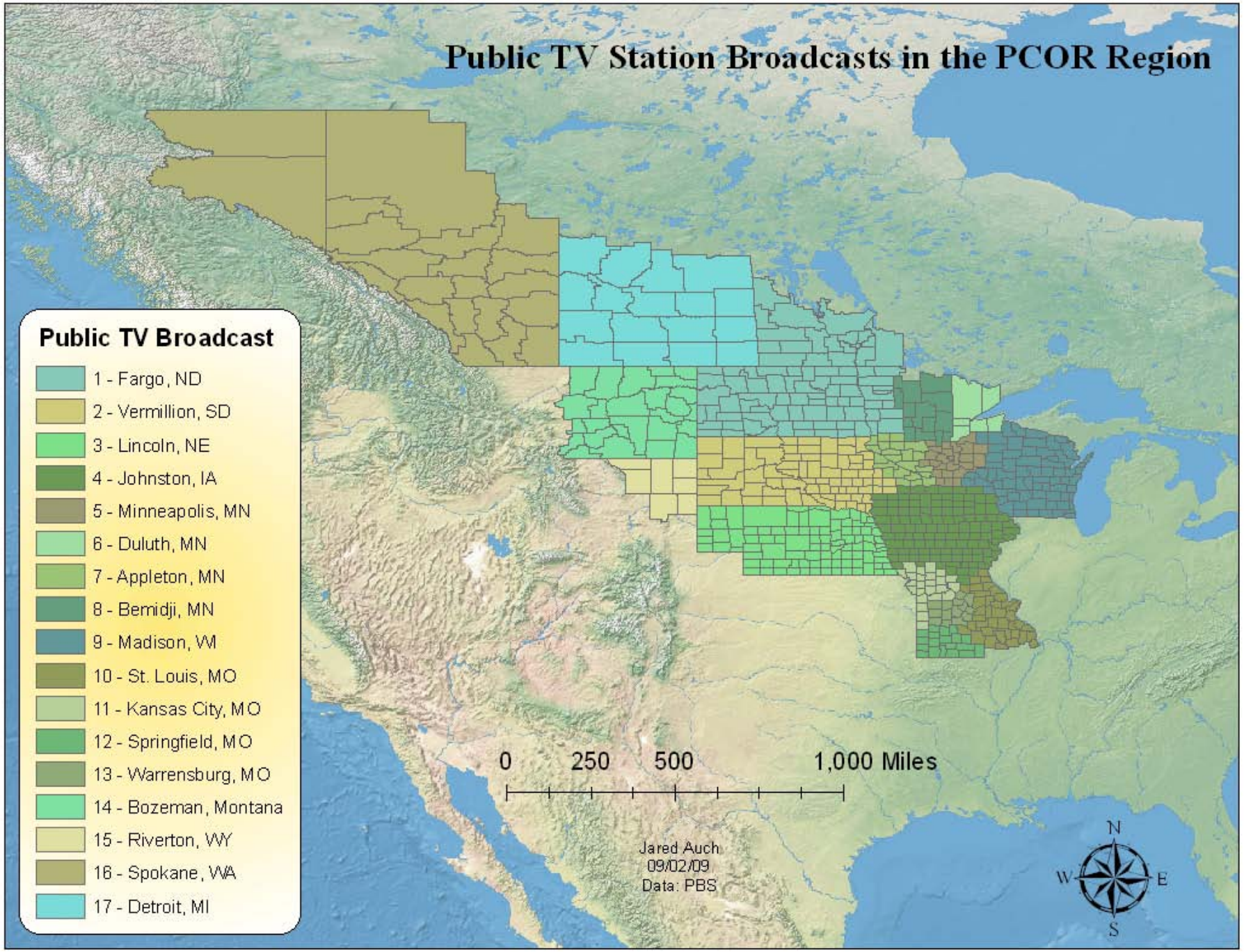


PCOR Partnership Region Characterization

- West
  - Rural and agricultural with significant fossil fuel harvest, processing, and export
  - Many potential sites for geologic storage and many major sources – *low-hanging geologic sequestration fruit*
- East
  - Fossil fuel importer (transformed = electricity; processed = natural gas, gasoline; and unprocessed = coal, oil)
  - Urban with many industrial sources but few potential geologic storage sites


Public TV Station Broadcasts in the PCOR Region
Public TV Broadcast
1 - Fargo, ND
2 - Vermillion, SD
3 - Lincoln, NE
4 - Johnston, IA
5 - Minneapolis, MN
6 - Duluth, MN
7 - Appleton, MN
8 - Bemidji, MN
9 - Madison, WI
10 - St. Louis, MO
11 - Kansas City, MO
12 - Springfield, MO
13 - Warrensburg, MO
14 - Bozeman, Montana
15 - Riverton, WY
16 - Spokane, WA
17 - Detroit, MI
0
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500
1,000 Miles
Jared Auch
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Data: PBS
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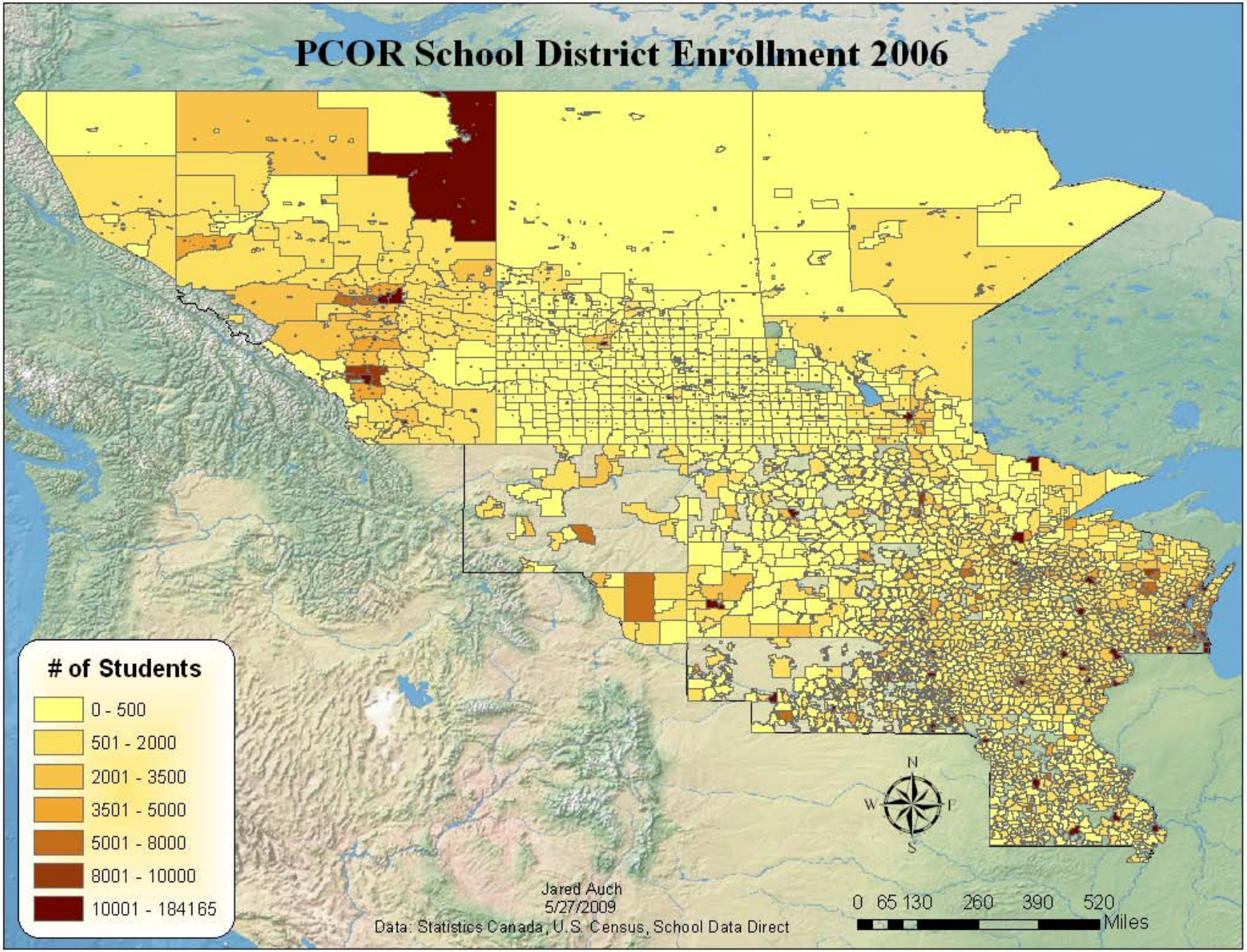
PCOR School District Enrollment 2006
# of Students
0 - 500
501 - 2000
2001 - 3500
3501 - 5000
5001 - 8000
8001 - 10000
10001 - 184165
N
W
E
S
Jared Auch
5/27/2009
Data: Statistics Canada, U.S. Census, School Data Direct
0 65 130 260 390 520
Miles

Situation Analysis, Tracking, and Feedback

- Baseline regional population characterization
- Message coverage tracking
- Qualitative feedback
  - Audience feedback forms
  - Formal and informal audits
  - Focus groups
  - Op-ed
- Quantitative feedback
  - Public surveys
  - Focus group questionnaires – provide context, but cannot be generalized to population

Williston, North Dakota, Focus Groups

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A Focus Group Is…

…a method of gathering qualitative data on the preferences and beliefs of consumers through group interaction and discussion, usually focused on a specific topic or product. It is a group of respondents brought together for this purpose.

American Marketing Association

…a way to hear the voice of the consumer and understand a topic from the consumer's point of view.

S. Hanson, PCOR Partnership

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Focus Group – Steps

- Establish purpose
- Choose research team (previous focus group experience recommended)
- Plan logistics
- Recruit the group
- Design discussion guide
- Focus group event (facilitated by team)
- Analyze the focus group results
- Utilize the lessons learned

From Hanson, S., and Daly, D., 2009, Focus group best practices: Available as handout and as appendix in Outreach Best Practices Manual, U.S. Department of Energy Regional Carbon Sequestration Partnership (RCSP) Program, in preparation.

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PCOR Partnership Example
Williston, North Dakota

A typical focus group setup

Group 1

- April 20, 2005
- Seven participants

Group 2

- April 21, 2005
- Nine participants

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Williston Focus Groups – Purpose

- Feedback on 30-minute “introduction to sequestration” video
- Attitudes on climate change
- Attitudes on sequestration activities of PCOR Partnership
  - How does the public grasp the concepts
  - Best ways to relay messages
- Attitudes on personal action (best ways to reach and involve audiences)

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Why Williston, North Dakota?

- Center of Williston geologic basin
  - Oil and coal production
  - Electricity generation
- Proximity to proposed and active CO_2 EOR
- Located in area with major CO_2 storage potential

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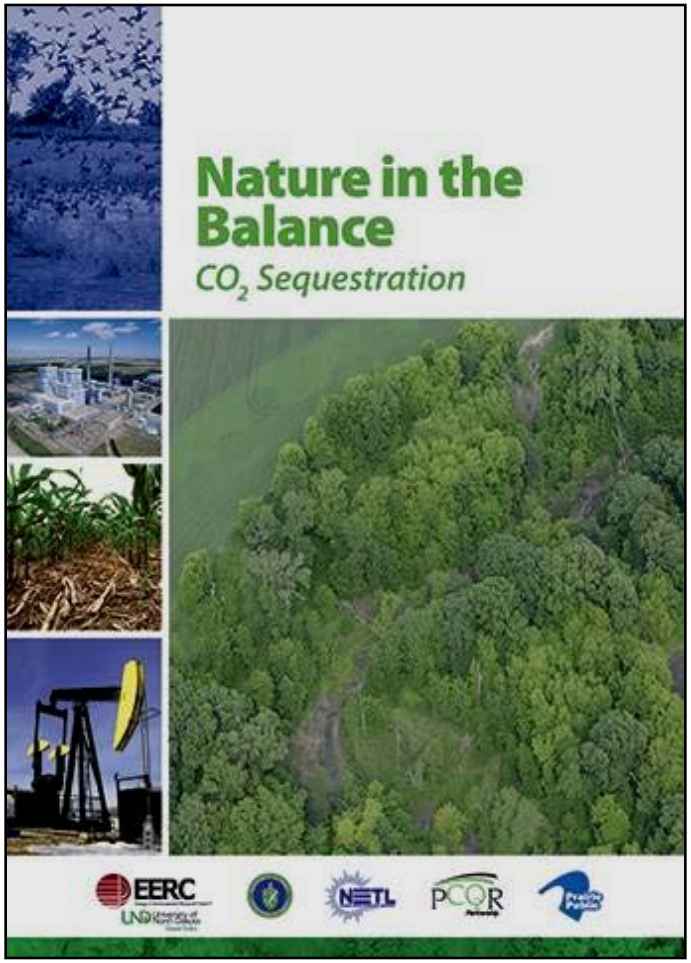
Williston Focus Groups



Watched 30-minute "Nature in the Balance" video.

90 minutes of discussion.

Groups recorded (audio, video) to aid in analysis.

Thank you mailing with $20 stipend.

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Approach to Analysis

- Qualitative analysis of recorded data
  - Analyzed for consistent patterns
  - Analyzed within group context
  - Analyzed for hot button issues

Findings – Video

- Demonstrated basic understanding of CO_2 sequestration after watching video
- Overall impression of video
  - Informative
  - Memorable images and messages
- Confirmed basic approach and provided basis for improved outreach
- Suggested adding a glossary of terms

Findings – Video and Beyond

- Salient topics, concepts, and attitudes
  - Liked the concept of “partnership” approach to issue
  - Wanted information on international treaties and domestic legislation
  - Growing population = growing CO_2 emissions
  - Industry produces CO_2 emissions and so do individuals (e.g., vehicles, housing)
  - Realized need for new mitigation technology
  - Terrestrial sequestration – understood in terms of gardening and farming
  - Geologic sequestration – understood practice and economic impact of CO_2 EOR

Findings – Questions and Concerns

- Pressure of CO_2 – what is the pressure in the subsurface?
- Terrestrial sequestration – since many have farming backgrounds, questions about exactly how terrestrial works.
- Status of the technology – wondered where power plants were at with CO_2 mitigation technology developments.
- Oil recovery – detailed questions from the oil industry-savvy group.
- Oceans – can sequestration be done in the ocean?
- Geologic storage – analogies to storage problems of chemicals and nuclear waste.
- Earthquake – would an earthquake trigger CO_2 release (not in North Dakota, but other places)?
- The big picture – how much CO_2 is emitted, how much is captured, how much will be captured?

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Findings – Questions and Concerns

- Costs – what does the technology cost industry? Individuals?
- How exactly does CO_2 storage work?
- Role of CO_2 in global warming?
- Commercial use of CO_2 – surprised at the Dakota Gasification role in EOR and storage research and at the economic impact of EOR
- Smog – does that involve CO_2?
- Wind – how does wind fit in? (pros and cons of renewables)
- Personal action – how can individuals get involved in reducing CO_2?

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Findings – Future Outreach

- Framing the message – content that would interest them:
  - Personal – the message should have some personal stories that people can relate to.
  - Attention-getting – something that catches their attention or “they’ll be like me and hit the mute button.”
  - Economics and economic impact.
  - Quality of life.

Findings – Future Outreach

- Who did the focus group participants think should hear about carbon sequestration?
  - Youth
  - Oil industry
  - Agricultural community
  - Business community
  - Government
  - Opinion leaders

Outcomes and Benefits of Focus Group Research

- Topics for messaging
- Means of messaging – media
- Wording for messaging

Situation Analysis, Tracking, and Feedback

- Baseline population characterization
- Message coverage tracking
- Qualitative feedback
  - Audience feedback forms
  - Formal and informal audits
  - Focus groups
  - Op-ed
- Quantitative feedback
  - Public Survey
  - Focus group questionnaires

Outreach Information System

Geology, CO_2 emissions, economic activity, energy use, and other variables are related to population features; exposure tied to messaging frequency and media coverage areas.

Williston ND Focus Groups

Individuals described their reaction to a 30-minute video and then talked in general about climate change, CO_2 sources, and CO_2 mitigation, including their role; information on questions and concerns, level of understanding, likes and dislikes.

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The PCOR Partnership says…

Thank you for this opportunity!

Please visit our Public Web site to learn more about the PCOR Partnership.

www.undeerc.org/pcor

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For more information on the PCOR Partnership, please contact:

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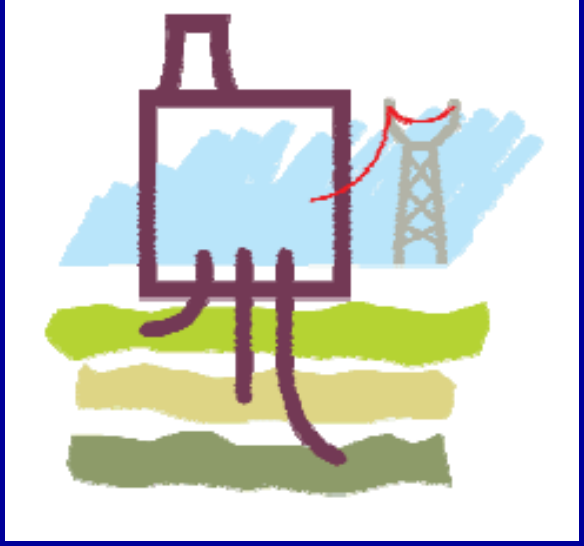
Learning to Crawl?: Surveys of Public Attitudes towards Carbon Capture and Storage Technologies

David M. Reiner
Judge Business School
University of Cambridge

Presented at IEA GHG
Social Research Seminar
Paris
2 November, 2009

Why Survey the Public?

- Snapshot of understandings, attitudes, and mental models of representative sample
- Explore subsample views in greater depth (gender, region, education, age, etc)
- Test hypotheses and reactions to information
- Inform ongoing public debate
- Develop time series that can link shifts in views to exogenous events



ZEP Strategic Deployment Document Action Plan (Nov 06)

- *Plan an information campaign - now*
  - Groups such as national and European parliamentarians, journalists, environmental pressure groups and representatives of civil society are particularly important targets.
- *Ensure communication is a dialogue, not one way*
  - we must use professional agencies to help define the message, the messenger, the medium used and the target public
- *Assign a significant budget*
  - A well-organised outreach campaign is not cheap – around €250k per country
- *REGULARLY MONITOR THE PUBLIC REACTION & RESPOND WHEN NECESSARY*
  - BOTH BEFORE AND AFTER THE LAUNCH OF ANY CAMPAIGN, WE WILL NEED TO GAUGE PUBLIC OPINION, AND LISTEN TO IT REGULARLY (EUROBAROMETER PLUS FOCUS GROUPS)

Past, Present, Future?

- Series of international surveys conducted in US, UK, Netherlands, Spain, Sweden, Canada, Australia, Japan from 2003 to 2007
- Swiss survey, new US survey, six current Fenco survey in UK, Germany, Greece, Norway, the Netherlands, Romania currently in the field
- **Takeaway Message:** Efforts to survey general publics to date have been piecemeal, sporadic, opportunistic and, to date at least, not especially illuminating

Some ‘Recent’ Data

Views of the Need for Action

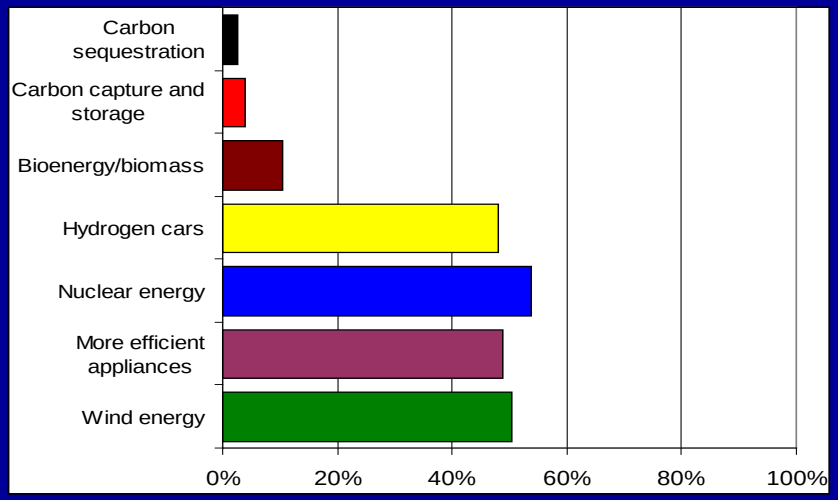
Answer	US 03	US 06	UK	SWE	SPN	OZ	JPN
I believe that firms and government researchers will develop new technologies to solve the problem	21	19	26	37	26	25	22
I believe we will have to change our lifestyles to reduce energy consumption	32	35	27	22	26	45	66
I believe we will learn to live with and adapt to a warmer climate	17	13	13	19	21	8	4
I believe global warming is a problem but [my country] won't do anything about it	24	28	21	14	21	16	6
I believe we will do nothing since global warming is not a problem	7	5	3	2	1	2	NA
Not sure	NA	NA	10	6	6	3	2

Top Two Environmental Priorities

	US03	US06	UK	SWE	SPN	OZ
Toxic Waste	30	22	14	17	19	3
Ozone depletion	22	22	16	29	44	13
Endangered species	4	3	6	3	1	3
Global warming	**21**	**49**	**49**	**55**	**47**	**55**
Acid rain	1	2	0	20	0	1
Smog	11	7	2	2	23	2
Urban sprawl	16	13	22	10	NA	7
Water pollution	39	25	9	21	38	7
Overpopulation	24	23	29	2	9	7
Destruction of ecosystems	31	32	18	24	18	14
Water Availability	NA	NA	NA	NA	NA	77
Resource Depletion	NA	NA	24	11	0	10
GM Crops	NA	NA	11	NA	NA	1

Public Awareness
(heard/read of the following in the past year)

US 2003



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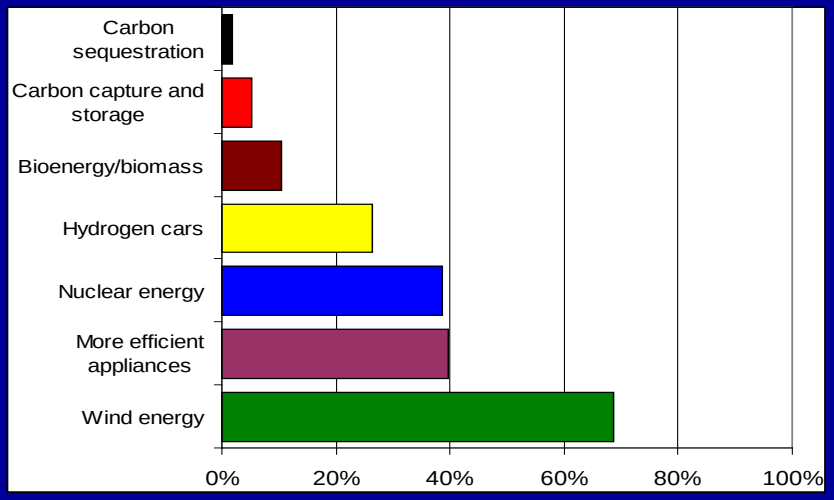

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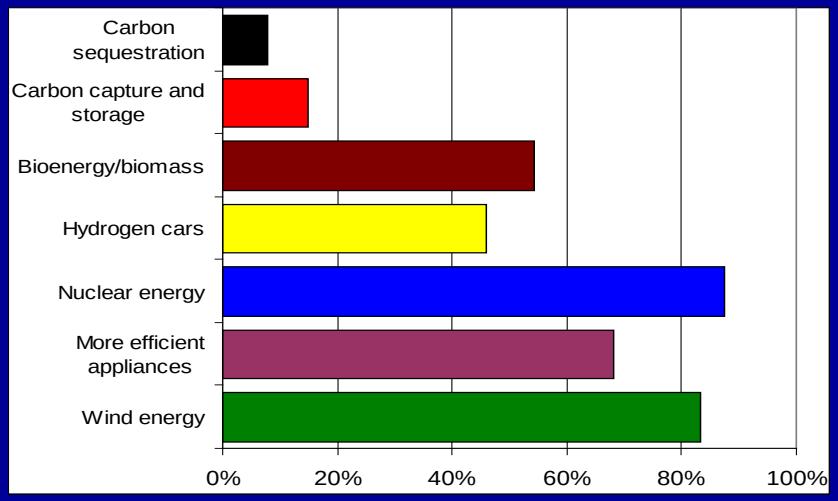

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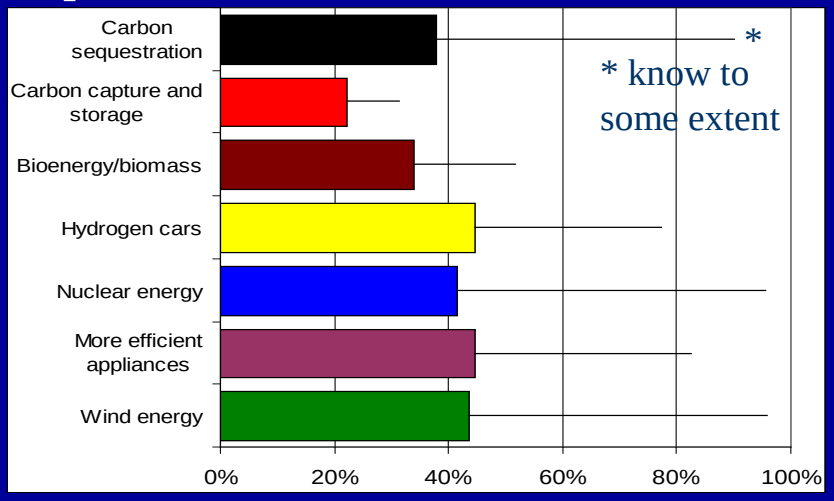
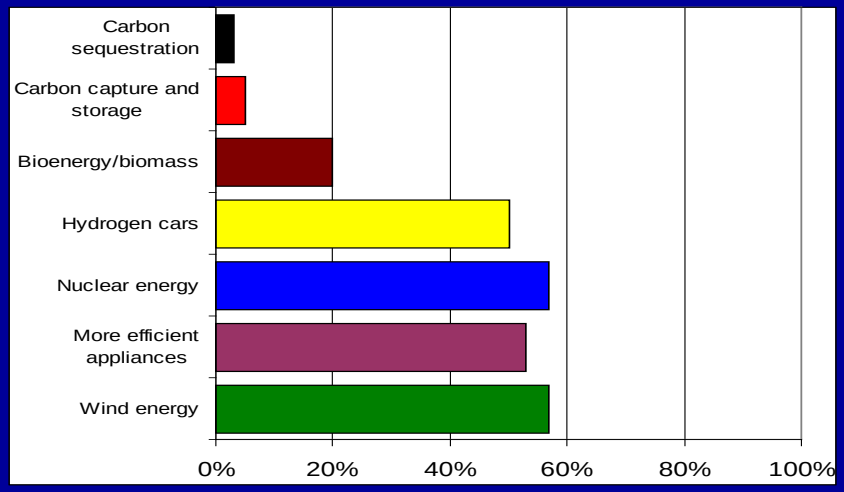
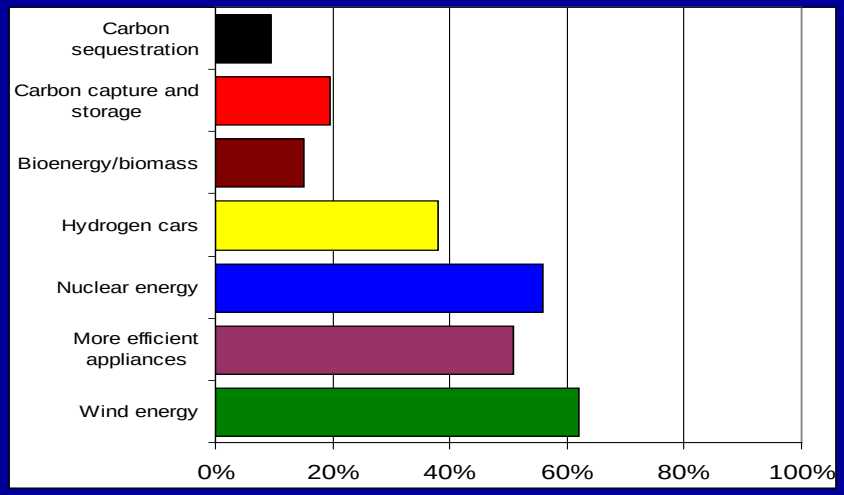


Public Awareness
(heard/read of the following in the past year)

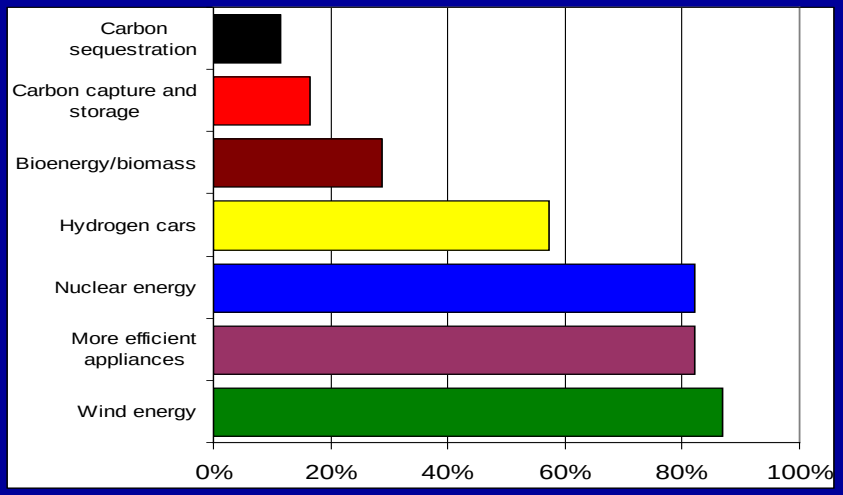
US 2006



Australia

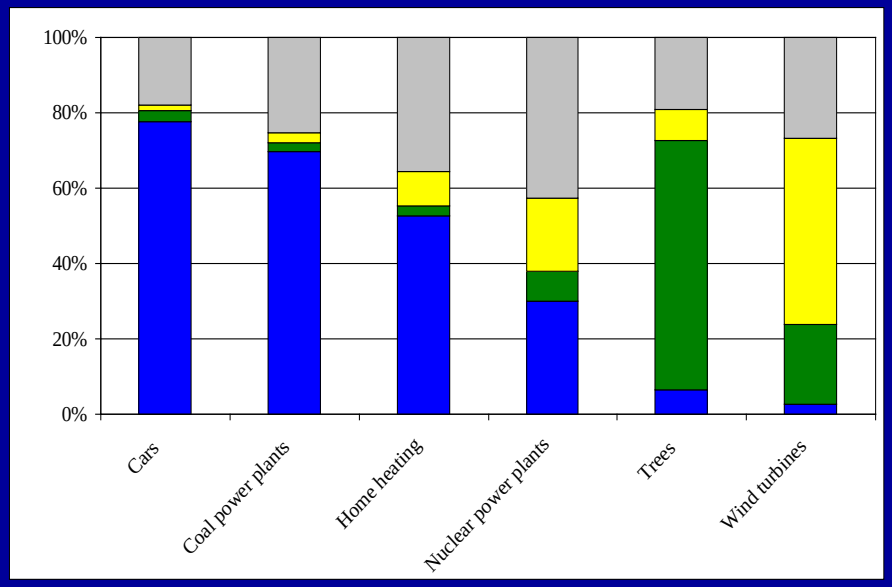


Spain



How do the Following Contribute to Carbon Dioxide Levels?

US 2003



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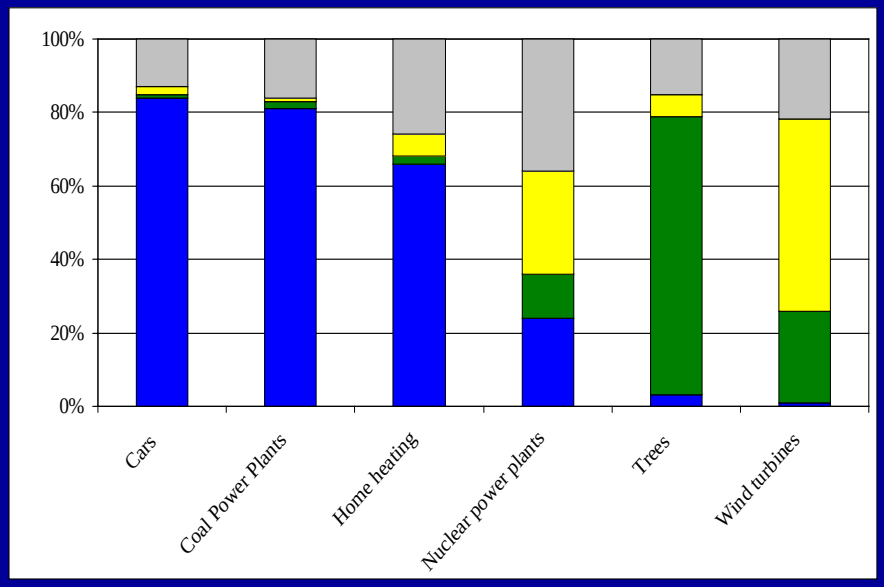

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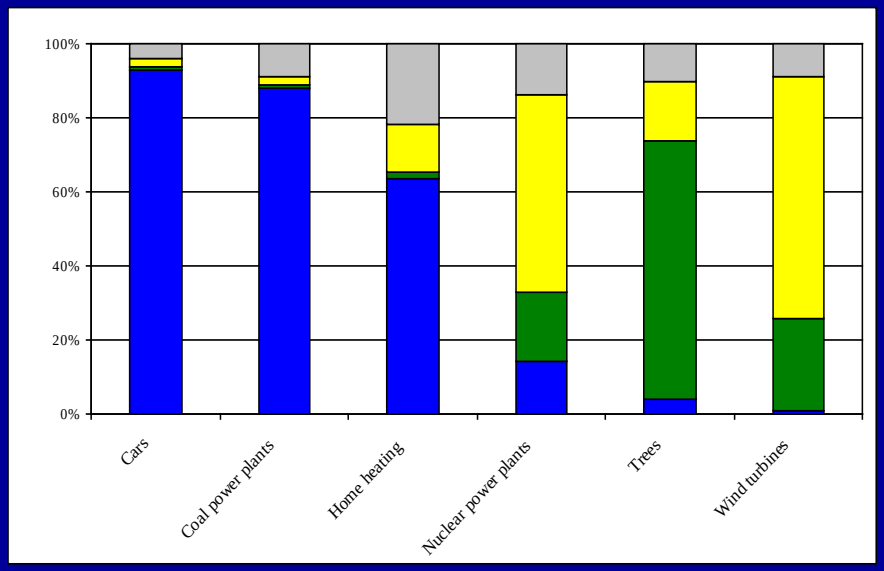
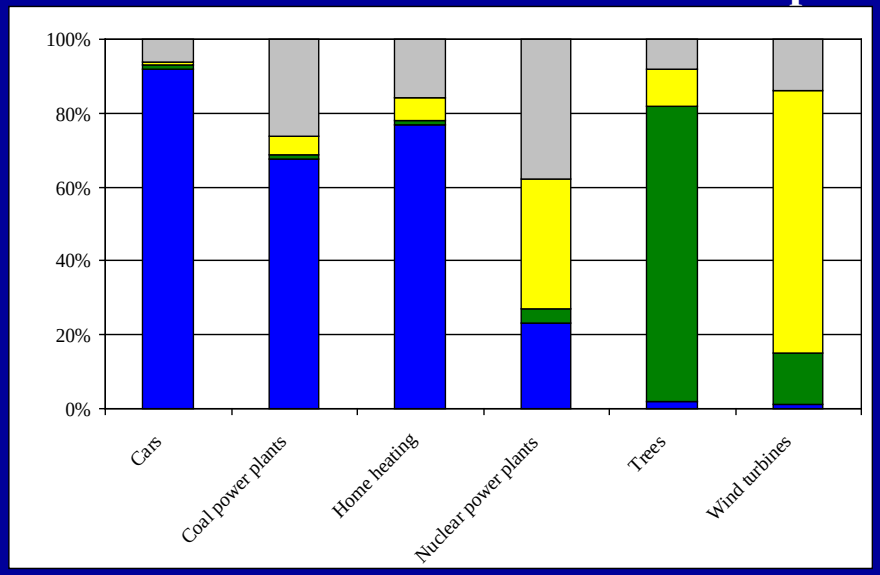


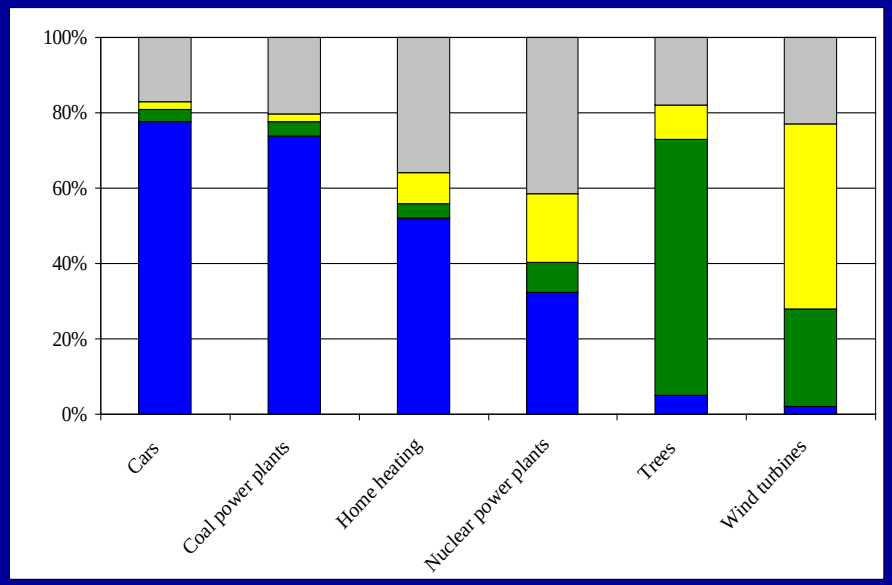
Japan



Increases Decreases No Effect Not Sure

How do the Following Contribute to Carbon Dioxide Levels?

US 2006



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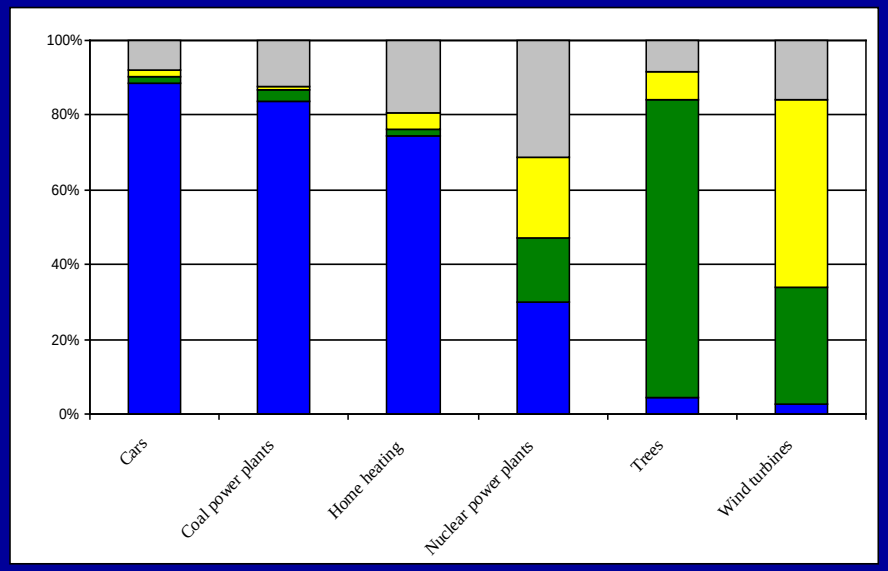

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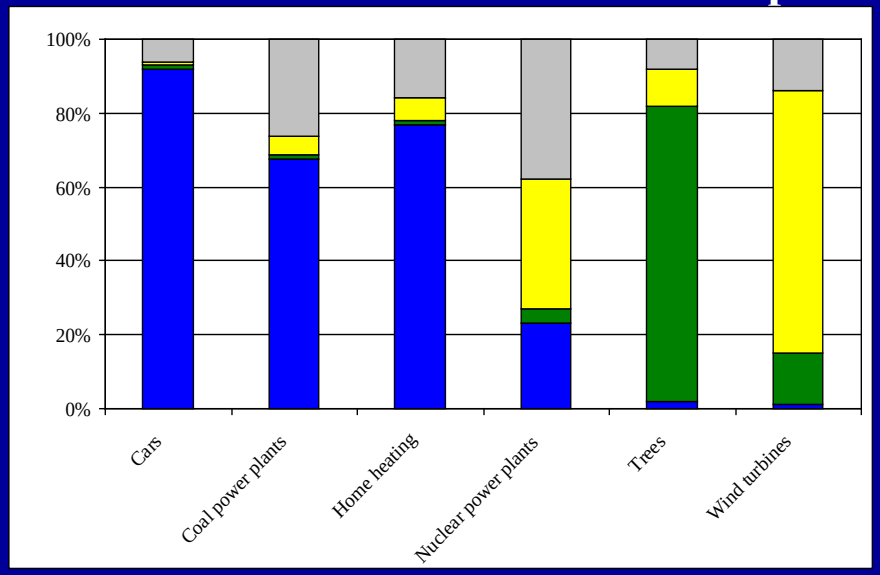
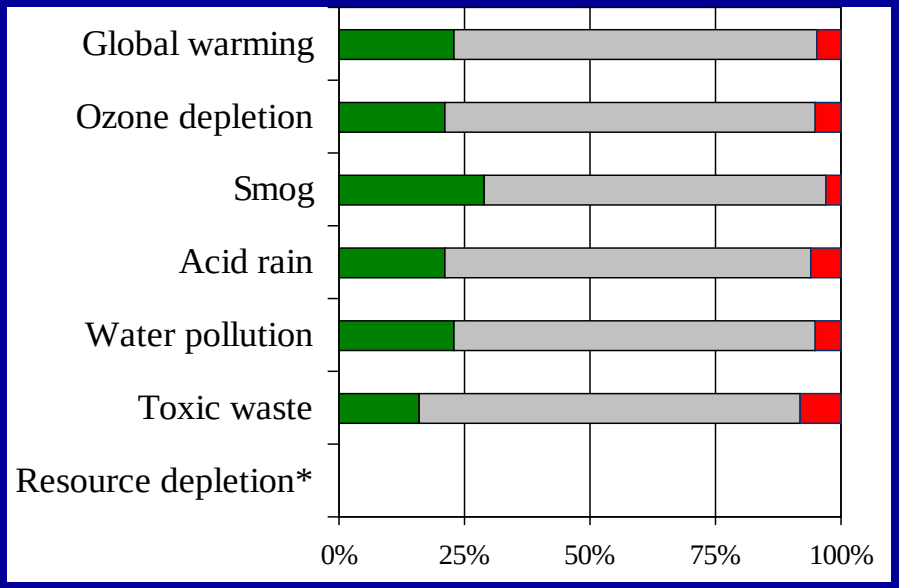


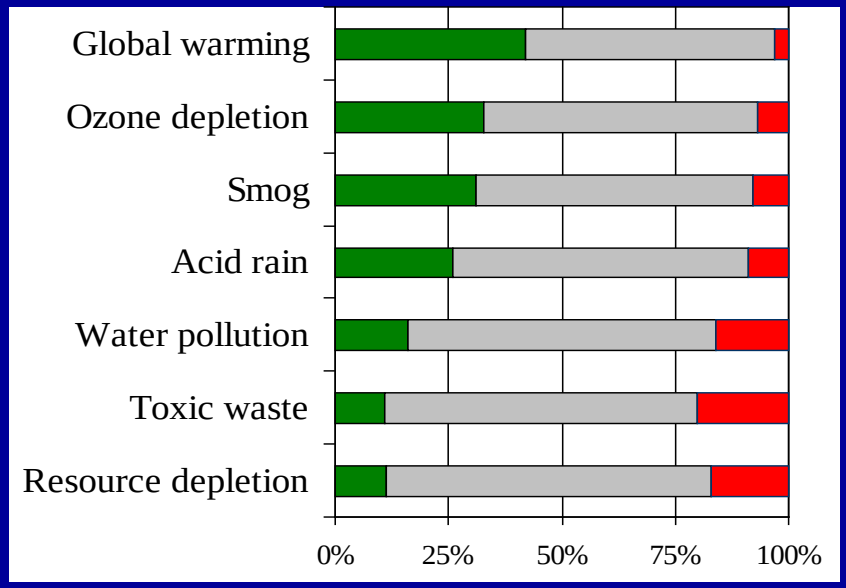
Increases Decreases No Effect Not Sure

Can CCS Reduce These Environmental Concerns?

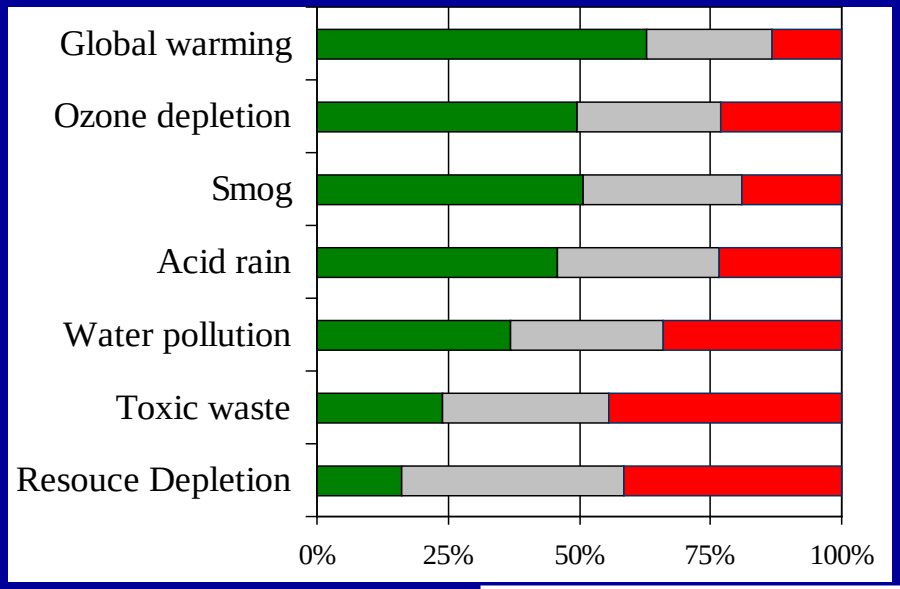
US 2003



UK



Sweden



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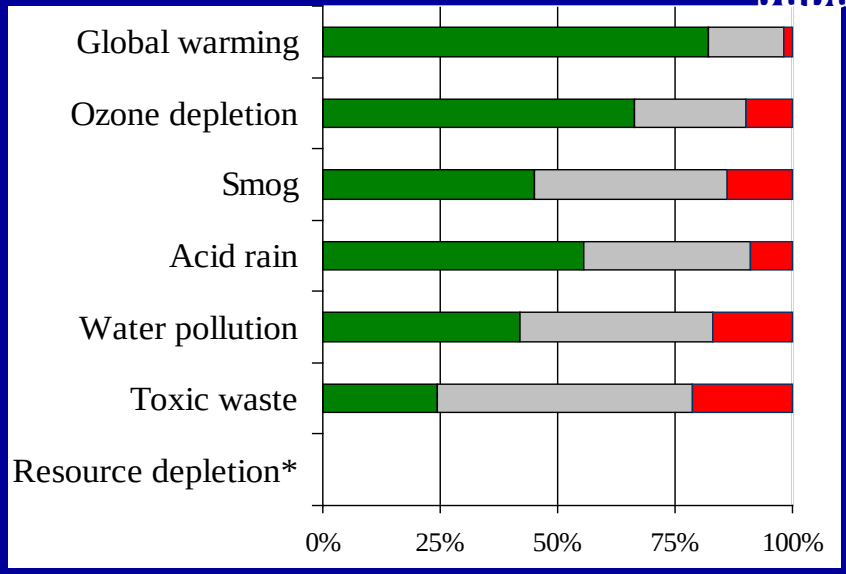
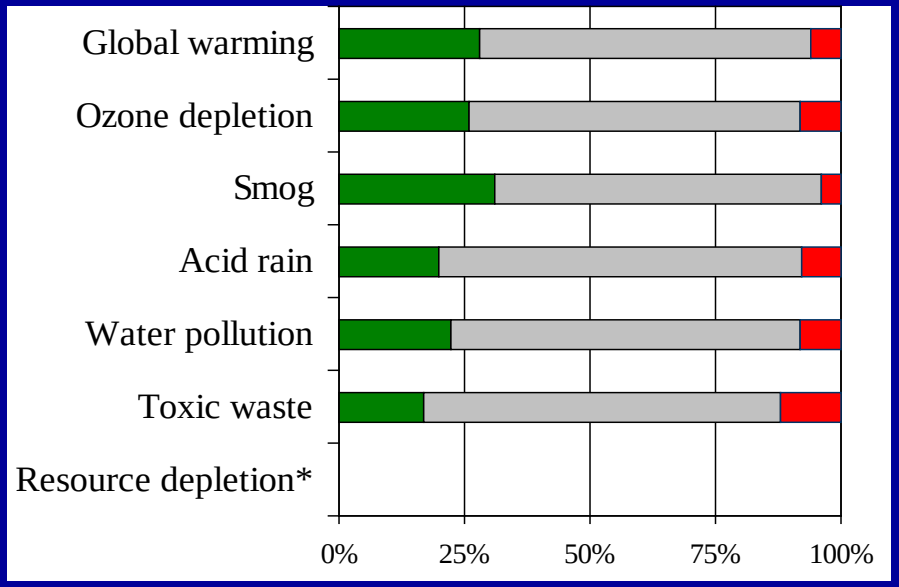


Can reduce Not sure Does not reduce

Can CCS Reduce These Environmental Concerns?

US 2006



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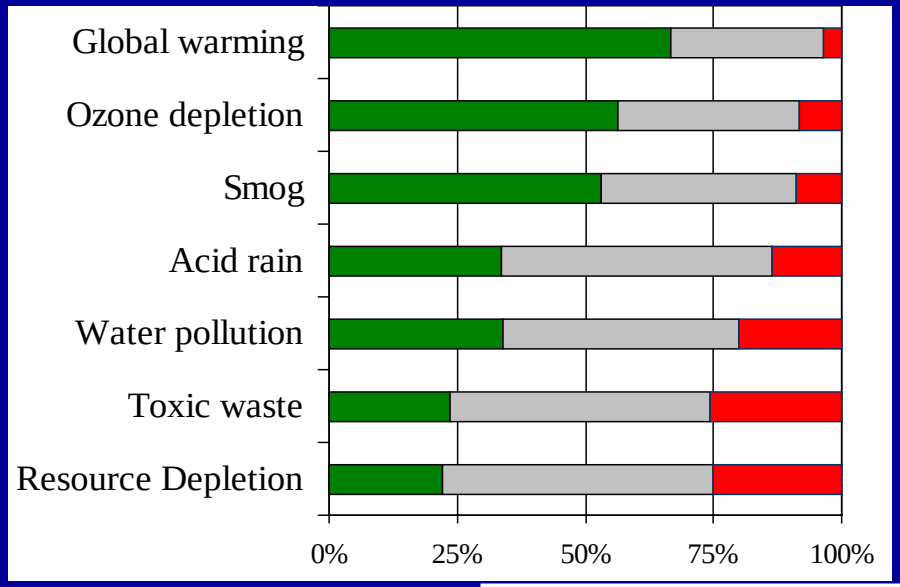

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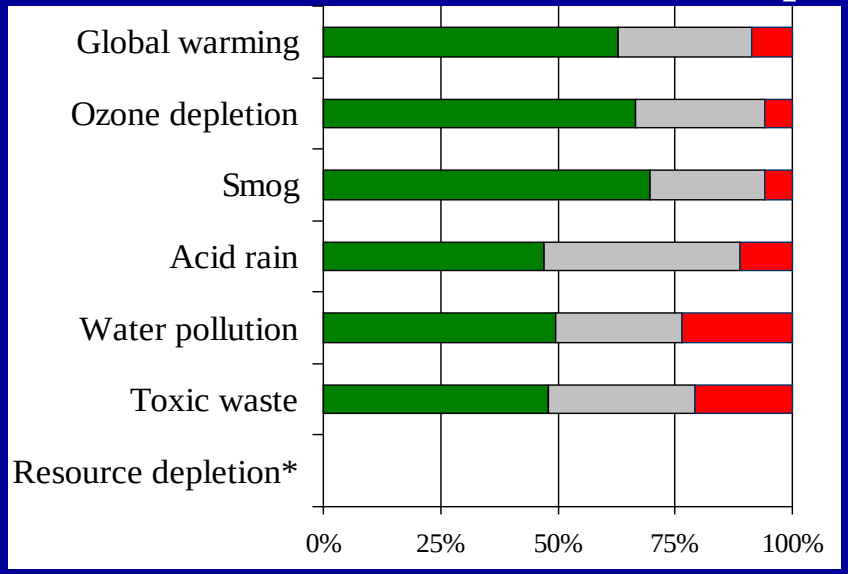
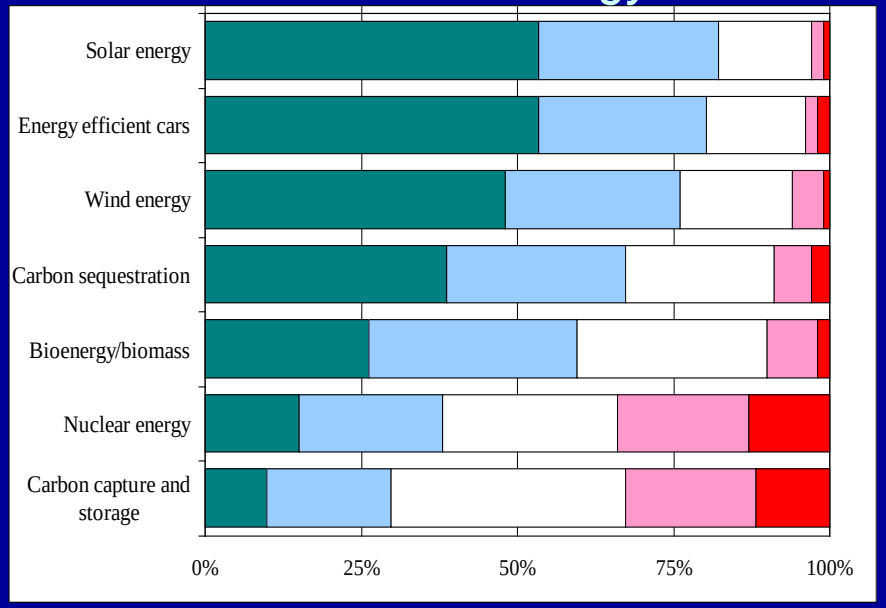


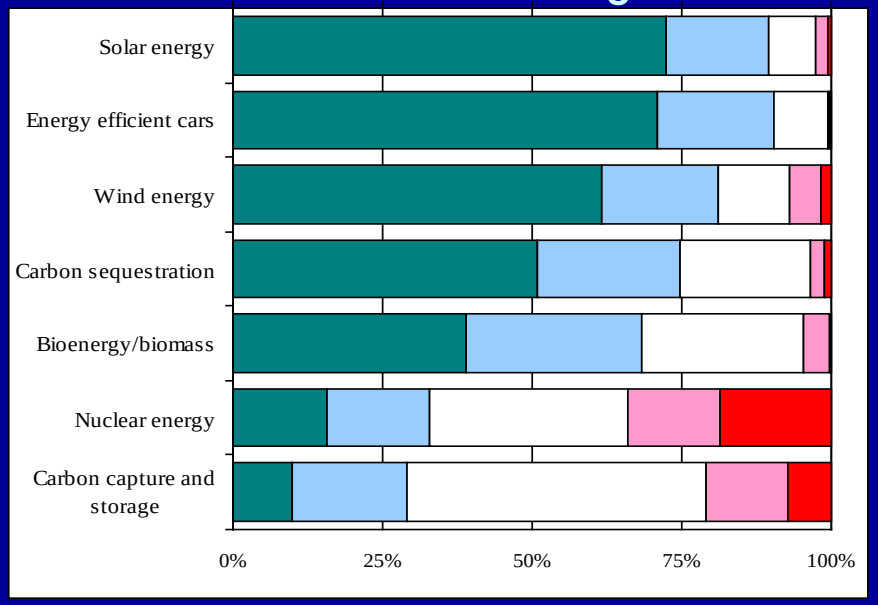
Can reduce Not sure Does not reduce

Preferred Energy Technology to Address Global Warming

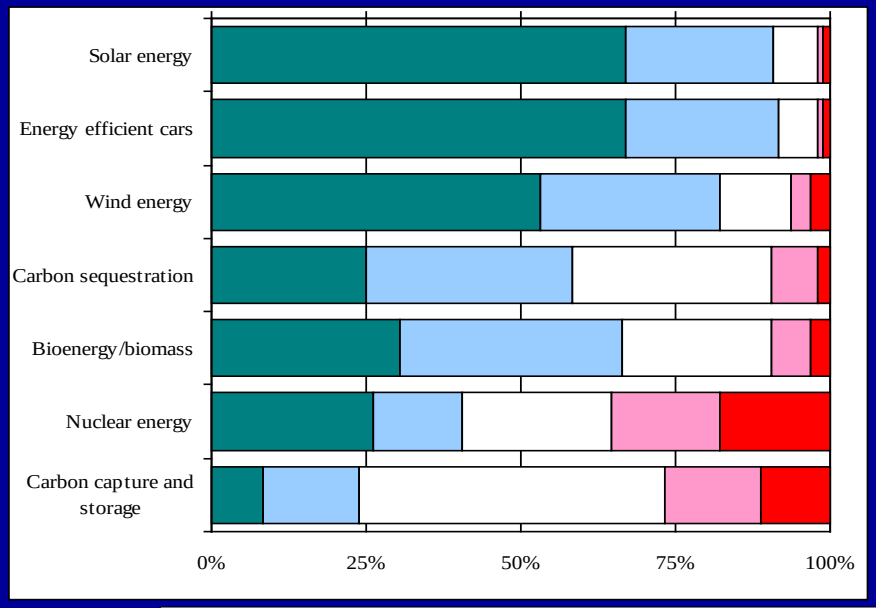
US 03



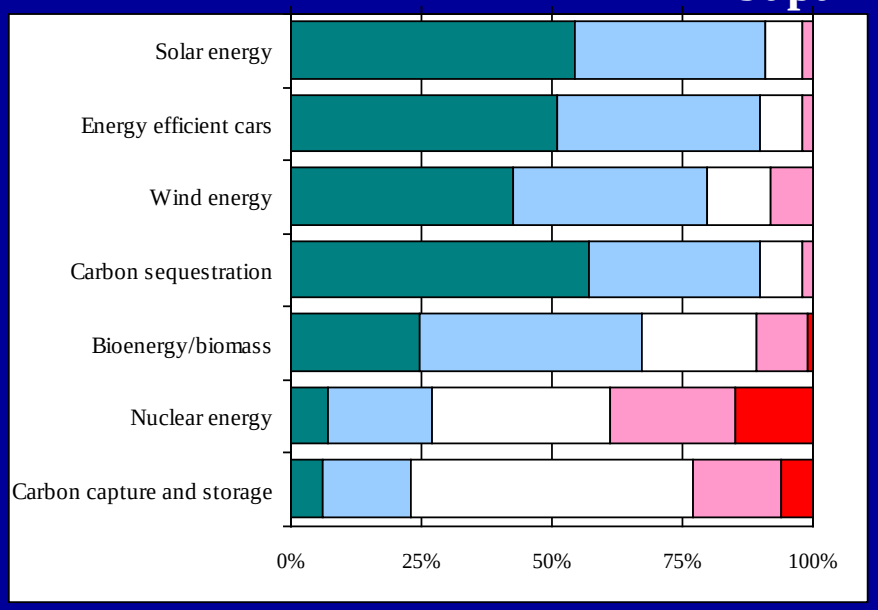
UK 04



Sweden



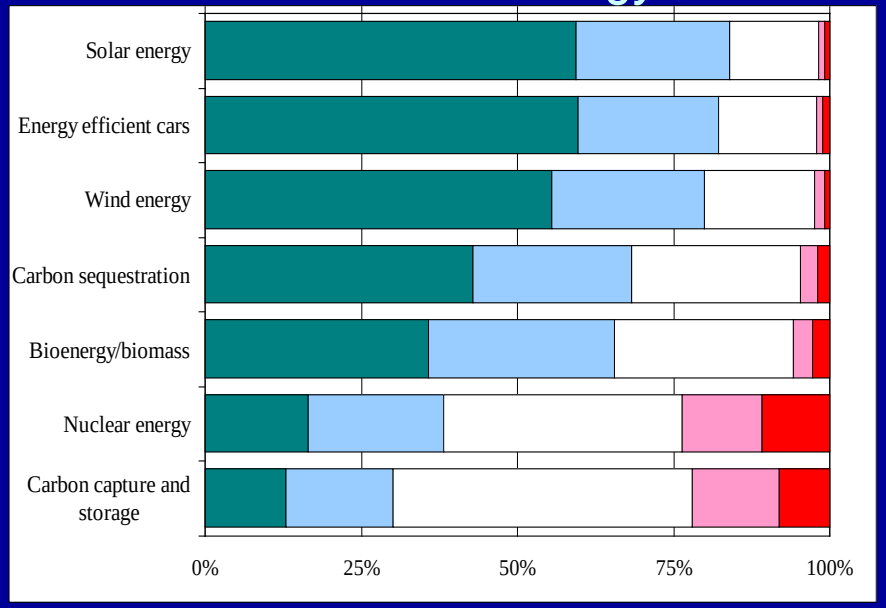
Japan



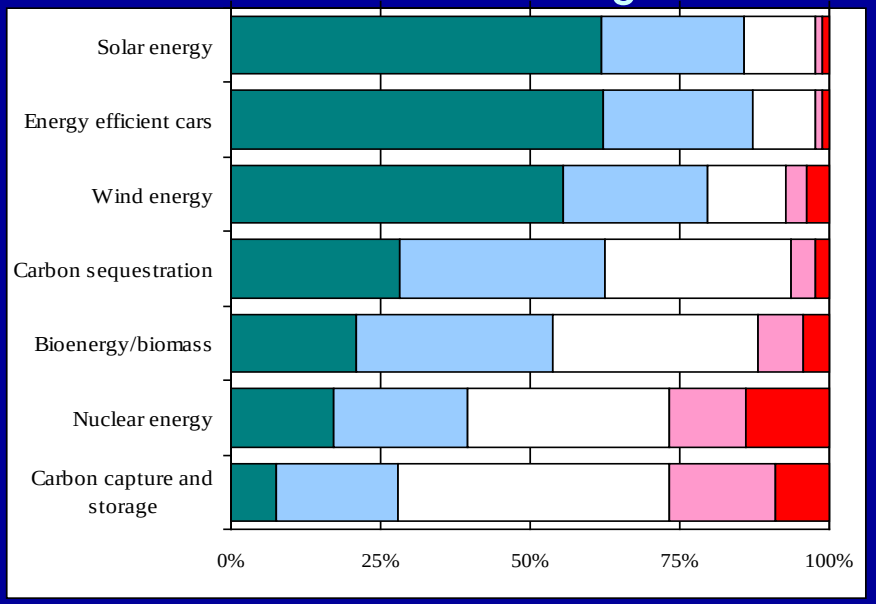
Definitely use | Probably use | Not sure | Probably not use | Definitely not use

Preferred Energy Technology to Address Global Warming

US 06



UK 06



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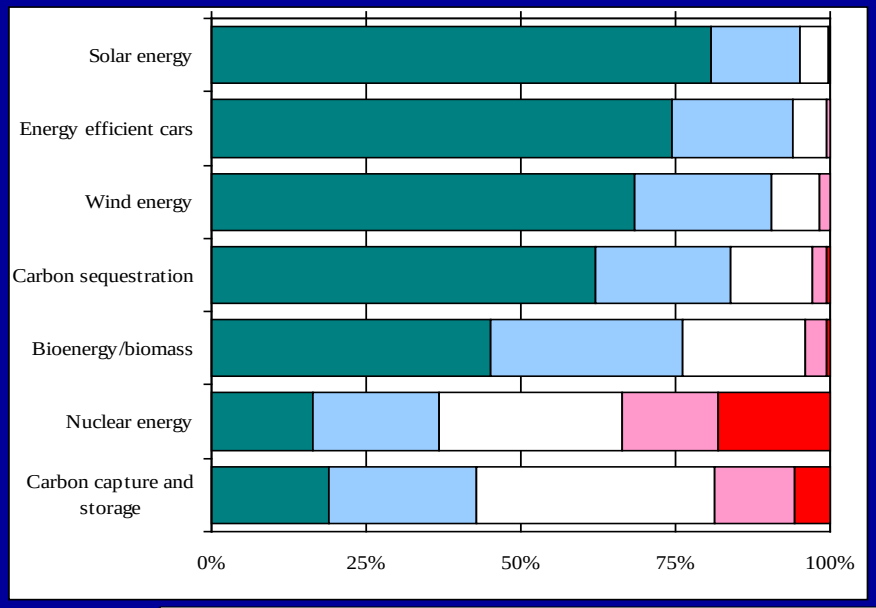
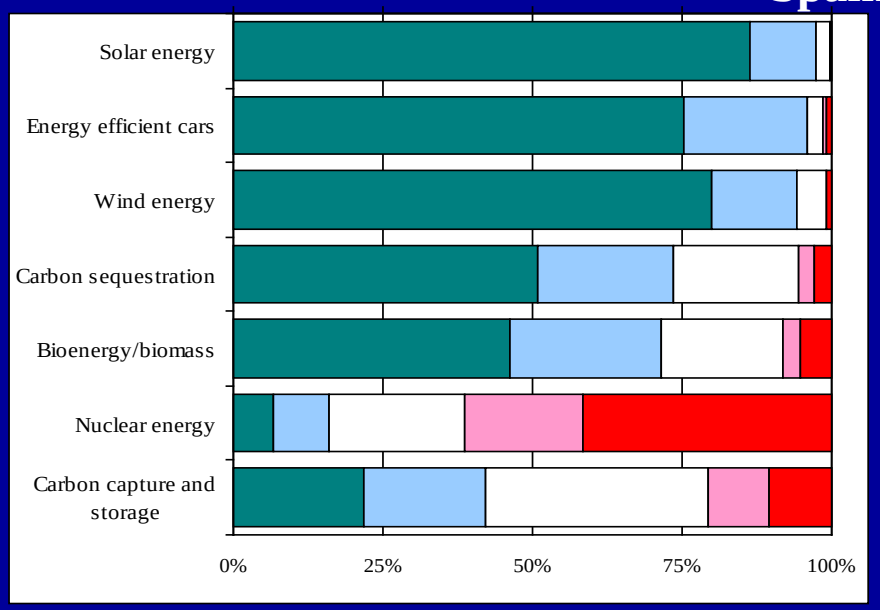
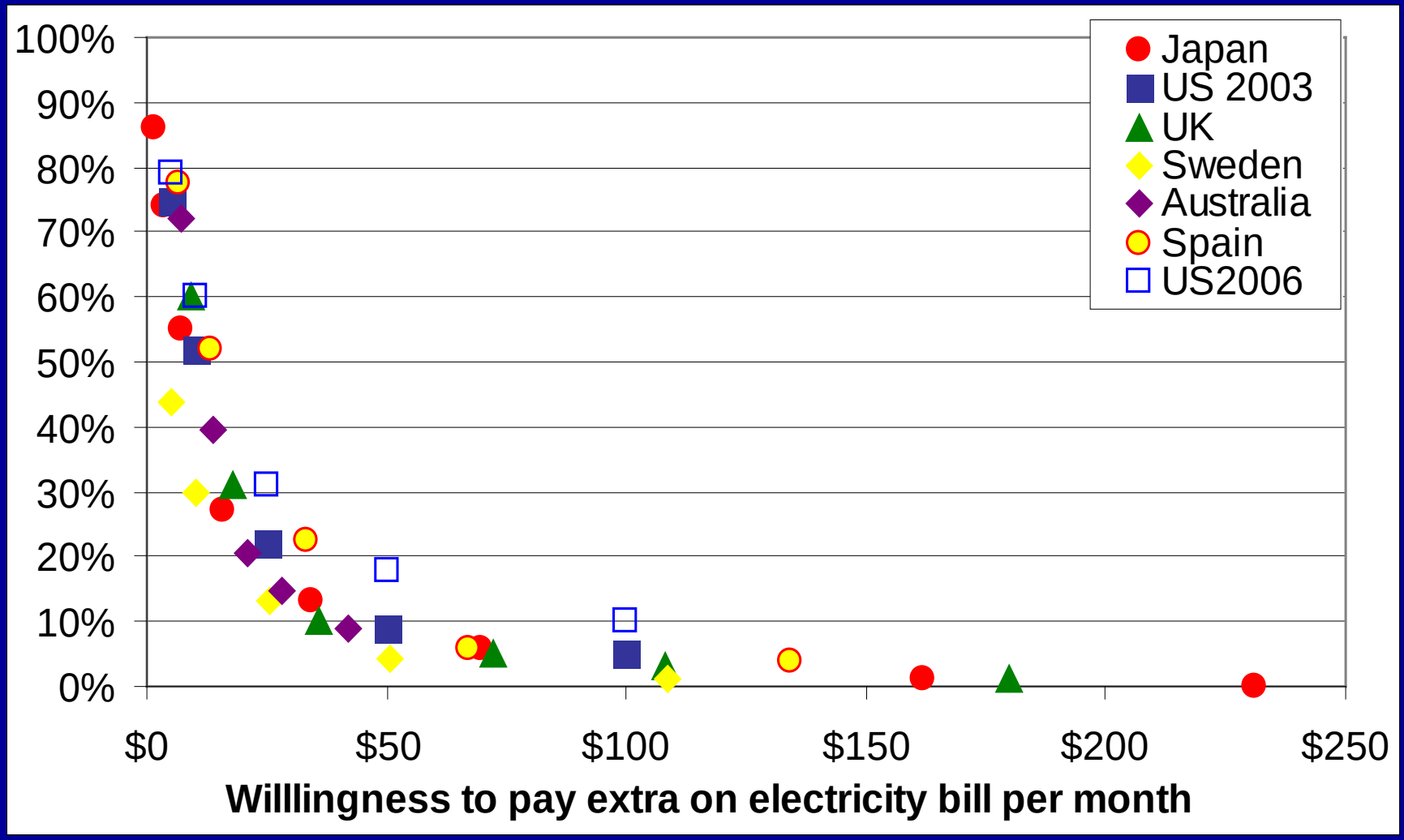


Spain



Definitely use | Probably use | Not sure | Probably not use | Definitely not use

WTP to Solve Global Warming



So What's Wrong with Opportunism?

- Complete absence of useful time series (only exception is MIT series of surveys)
- No sense of learning or shifts in opinion and inability to tie to events
- Dangers of inference drawn from snapshots and possible correlation with exogenous events

Reasons for Lack of Support?

- Classic public goods provision problem –No clear champion for conducting regular public surveys
- More recent focus on specific sites implies that a general representative sample is less relevant
- Concern over seeming lack of focus on CCS-specific questions
- Early evidence of almost complete lack of awareness may have discouraged interest in further surveys

Is this a bad thing?

- No. Clearly too little attention has hitherto been paid to communications, local siting, etc and relatively too much was being paid to general surveys of the public
- Yes. CCS still remains a high-level policy topic and so monitoring public opinion in a consistent manner over time provides useful input for decision makers and other key stakeholders

When and why are pseudo opinions on CCS unstable?

Dancker Daamen (Leiden University)
Marjolein de Best-Waldhober (ECN, Policy Studies)
Claudia Lambrichs (Leiden University)

Q1:
Do you know of large, modern coal fired power plants where CO2 is captured and stored underground?

-no, never heard of	**68**%
-a little	28%
-yes	4%

Q2:
What is your overall evaluation of this technology (expressed as a grade between 1 and 10)?

"No opinion"	**27**%
gives a grade	73%

Depending on specific CCS technology between 40% and 56% of respondents combined "no, never heard of" at Q1 with a grade at Q2
(= **pseudo-opinion**).

After 8 to 12 minutes Q2 was asked again:

-Overall evaluations (expressed as grades) showed to be highly unstable in our first survey and less unstable in our second survey

First Survey:
-Data collection in December 2004 (N=327)
-Filler task (11.7 minutes) between first grade and second grade related to CO2 issues (e.g. MC questions). Info not diagnostic for CCS technology opinions

Technology	Mean 1st grade	Mean 2nd grade	Mean absolute diff. 1st and 2nd grade	Correlation 1st and 2nd grade
IGCC with CCS	5.72	6.22	1.3	0.36
SOFC with CCS	6.08	6.38	1.1	0.35
Hydrogen production via coal gasification with CCS	5.83	6.37	1.3	0.48
Hydrogen production via steam reforming with CCS	6.23	6.50	1.2	0.34
ECBM	5.61	6.45	1.3	0.39
Small scale reforming based on membrane technology with CCS	6.11	6.22	1.5	0.32

-Absolute difference 1st and 2nd grade on average more than 1.2 scale point
-The first grades explain merely 10-23 % of the variance of the second grades

Second survey:

-Data collection in November 2005 (N=300)

-Filler task (8.3 minutes) between first grade and second grade unrelated to CO2 issues (Need for Cognition scale, Need for closure scale)

Technology	Mean 1st grade	Mean 2nd grade	Mean absolute diff 1st and 2nd grade	Correlation 1st and 2nd grade
IGCC with CCS	5.59	5.62	0.5	0.88
SOFC with CCS	6.12	6.08	0.5	0.85
Hydrogen production via coal gasification with CCS	5.73	5.58	0.7	0.82
Hydrogen production via steam reforming with CCS	6.16	6.01	0.5	0.85
ECBM	5.58	5.63	0.7	0.78
Small scale reforming based on membrane technology with CCS	6.26	6.10	0.6	0.77

-Absolute difference 1st and 2nd grade is on average 0.6 scale point

-The first grades explain 59-77 % of the variance of the second grades

When and why are pseudo opinions on CCS unstable?

When?

In Survey 1
Not in Survey 2

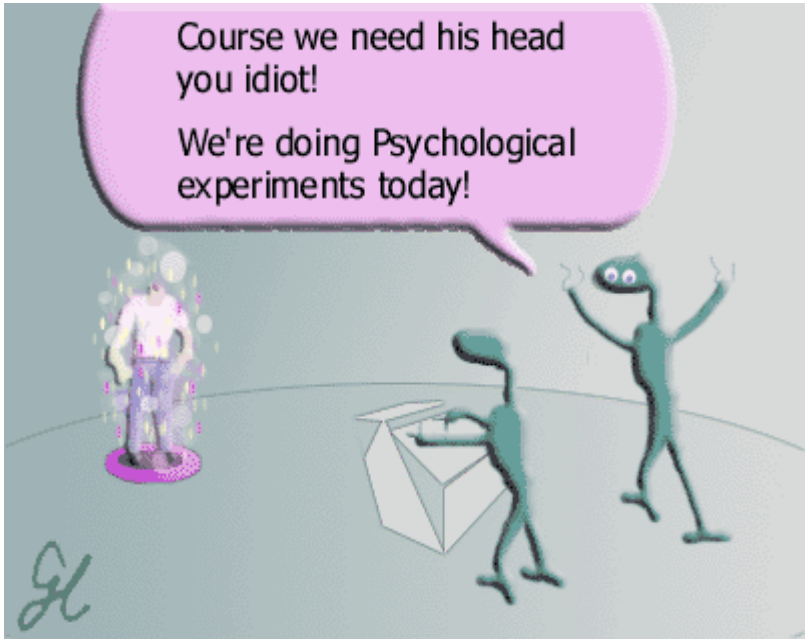
Why?

Because of differences between Survey 1 and Survey 2?

Differences between the two surveys which may explain the different stability of the grades

	Survey 1	Survey 2	Explanation
Mean interval between 1st and 2nd grade	11.7 minutes	8.3 minutes	shorter interval → easier to remember grade
Filler task between 1st and 2nd grade	Related (knowledge questions on CO2 issues)	Unrelated (personality scales: NfCog and NfClos.)	related task → interferes more with memory
Technologies second time preceded by information/description	yes	no	1. Description provides an alibi to change evaluation 2. Conversational logic dictates that the second question is not identical to the first. Description helps to interpret second question differently

Let’s experiment!



Survey experiment with eight conditions

		Fillertask (12 minutes fixed)			
		Related		Unrelated	
Judgment at T2	Overall <u>evaluation</u> (grade)	**T1 T2** t1 info + t1 t2 info + t2 t3 info + t3 t4 t4 t5 t5 t6 t6	**T1 T2** t6 info + t6 t5 info + t5 t4 info + t4 t3 t3 t3 t2 t1 t1	**T1 T2** t1 info+t1 t2 info+t2 t3 info+t3 t4 t4 t5 t5 t6 t6	**T1 T2** t6 info + t6 t5 info + t5 t4 info + t4 t3 t3 t2 t2 t1 t1
	<u>Recall</u> of overall evaluation at T1	**T1 T2** t1 info + t1 t2 info + t2 t3 info + t3 t4 t4 t5 t5 t6 t6	**T1 T2** t6 info + t6 t5 info + t5 t4 info + t4 t3 t3 t2 t2 t1 t1	**T1 T2** t1 info+t1 t2 info+t2 t3 info+t3 t4 t4 t5 t5 t6 t6	**T1 T2** t6 info + t6 t5 info + t5 t4 info + t4 t3 t3 t2 t2 t1 t1

Hypotheses

H1 Stability will be lower when filler task is related

H2 Stability will be lower when technologies are preceded by descriptions at T2

H3 Stability will be lower when filler task is related and technologies are preceded by descriptions at T2 (simple replication of Survey 1)

Results

-Replication of percentages pseudo opinions (40% - 58%)

-Replication of horrible scores on MC test (hardly any knowledge on CO2 and CCS issues)

-no support for H1: equal stability (r=0.80) when task is related or unrelated

-no support H2: equal stability (r=0.80) when technologies are or are not preceded by descriptions at T2

-no support H3: equal stability (r=0.80) when filler task is related and technologies are preceded by descriptions at T2 (no replication of results in Survey 1) GRRRRR!!!

Hypothese

H4 Stability will be lower when at T2 the judgment is opinion (again) instead of recall

Result

Support for H4:
Stability was significantly lower when at T2 the judgment is *opinion* instead of **recall**

-Absolute difference 1st and 2nd grade is on average *0.8* / **0.6** scale point
-The first grades explain *34-52 %* / **58-71%** of the variance of the second grades

However, only a main effect, no significant interaction with other factors (e.g., no less stability gain in conditions with unrelated filler task compared to conditions with related filler task)

Experiment:
Datacollection November 2008, N=

Technology	Mean 1st grade	Mean 2nd grade	Mean absolute diff 1st and 2nd grade	Correlation 1st and 2nd grade
IGCC with CCS	5.89 / 6.12	6.15 / 5.88	0.88 / 0.50	0.59 / 0.84
SOFC with CCS	6.04 / 6.28	6.25 / 6.10	0.73 / 0.62	0.58 / 0.81
Hydrogen production via coal gasification with CCS			1.00 / 0.70	
Hydrogen production via steam reforming with CCS	6.06 / 6.30	6.30 / 5.99	0.79 / 0.52	0.69 / 0.79
ECBM	5.81 / 5.95	6.21 / 5.79	1.00 / 0.64	0.67 / 0.76
Small scale reforming based on membrane technology with CCS	6.12 / 6.50	6.23 / 6.01	0.75 / 0.65	0.72 / 0.79

-Absolute difference 1st and 2nd grade is on average 0.8 / 0.6 scale point
-The first grades explain 34-52 % / 58-71% of the variance of the second grades

Conclusions
When and why are uninformed opinions on CCS unstable?

When?
In Survey 1
Not in Survey 2
Not in any of the 8 conditions of our experiment

Why?
Beats me!

We excluded some explanations:
It is not because of
- less knowledge of CO2 issues
- an unrelated (instead of related) filler task between first and second grade
- an description preceding the technologies at T2

Recall is better than opinion again

However: Don't jump to the conclusion that pseudo opinions are stable!
R= 0.70 or 0.80 indicates only moderate stability within 12 minutes

Next presentation by Marjolein : after a week uninformed opinions are highly unstable!!

Expert title	**Lay title**
Integrated Gasification Gas Combined Cycles with CCS for all kinds if end use *(IGCC with CCS)*	**Large modern coal fired power stations (for private and commercial use) with CO2 capture and storage**

Description of the technology:

In these plants, coal is converted into electricity. The CO2 released in this process is captured and stored under the floor of the Dutch part of the North Sea. About 20 of these large plants would be needed to ensure an annual 20 percent reduction of CO2 released into the air. These 20 plants would generate nearly all the electricity the Netherlands will need in the future. The electricity would be supplied to homes, businesses and organizations. All the plants would be built in the industrial zones near Amsterdam, Delfzijl, IJmuiden and Terneuzen,, and in the Rijnmond region. Realization of this technology is envisaged in the near future, i.e. from 2010 onwards. The technical know-how for this is largely available.

Quality of informed and uninformed opinions:

Stability over time and influence of vivid disaster information

Marjolein de Best-Waldhober

Dancker Daamen

Stability of uninformed opinions

- Earlier research into the stability of “pseudo-opinions” or uninformed opinions shows low or moderate stability -> useless as predictor
- Argument to inform respondents
- Argument to use Information-Choice Questionnaire

Information-Choice Questionnaire

- Policy problem
- Information on policy problem and on consequences of policy options
- Decision aid

Large plants where natural gas is converted to hydrogen and where CO2 is stored underground

Safety in daily life

Experts think that the transportation of hydrogen via pipelines and the use of hydrogen in houses can be made as safe as the current transportation and use of natural gas. The costs of the technical safety measures will probably be higher though. Accidents as asphyxiation, fire or explosion will not be more frequent than currently.

Do you think this consequence is unimportant, a disadvantage or an advantage?

- Unimportant
- Disadvantage
- Advantage

How much of a disadvantage do you think this is?

Very small disadvantage	1	2	3	4	5	6	7	8	9	Very big disadvantage

Better quality of opinion after ICQ?

- Elaboration Likelihood Model (Petty & Cacioppo): Central route leads to stronger opinion, i.e.,

  -better prediction

  -more stable over time

  -more resistant against counterarguments

- Neijens and Price: Quality of opinion is both:
  - stability (over time)
  - and consistency (between overall opinion and opinion on aspects and consequences)

Evidence for better quality of opinion after ICQ

ICQ produces more consistent opinion:

Overall evaluation of CCS option is based more on evaluation of consequences of CCS option after ICQ

ICQ seems to produce more resistant opinion:

FROM THE DIRECTOR OF INDEPENDENCE DAY

A ROLAND EMMERICH FILM

THE DAY AFTER TOMORROW

Hypotheses

- Opinions are more stable over time after an ICQ than after a traditional questionnaire

- Opinions are more resistant against vivid information on (alleged) risks after an ICQ than after a traditional questionnaire

Design

Day 1	Information Lake Nyos	Day 6-8
TQ (no expert-info)	Lake Nyos info	TQ (no expert-info)
TQ (no expert-info)	Lake Nyos info	ICQ (expert-info)
ICQ (expert-info)	No Lake Nyos info	TQ (no expert-info)
ICQ (exert-info)	No Lake Nyos info	ICQ (no expert-info)

ICQ

- Background information on current energy use and climate change
- Explanation ICQ procedure
- Policy problem
- Three options: Biomass, CCS, nuclear
- Information on consequences of options
- Consequence evaluations, overall evaluations, choice, acceptance
- Questions about environmental issues

Large plants where natural gas is converted to hydrogen and where CO2 is stored underground

Safety in daily life

Experts think that the transportation of hydrogen via pipelines and the use of hydrogen in houses can be made as safe as the current transportation and use of natural gas. The costs of the technical safety measures will probably be higher though. Accidents as asphyxiation, fire or explosion will not be more frequent than currently.

Do you think this consequence is unimportant, a disadvantage or an advantage?

- Unimportant
- Disadvantage
- Advantage

Traditional Questionnaire: The same procedure as for the ICQ, but without any information on energy options

1. overall evaluation of option

2. evaluation consequences

What do you think, of the effect that using this option could have on safety in daily life?

Do you think this consequence is unimportant, a disadvantage or an advantage?

Unimportant
Disadvantage
Advantage

Lake Nyos information

- Within second e-mail: two addresses for websites about Lake Nyos
- Summary about events at Lake Nyos

“ I could not speak. I became unconscious. I could not open my mouth because then I smelled something terrible. I heard my daughter snoring in a terrible way, very abnormal…when crossing to my daughter’s bed, I collapsed and fell…….”

Survivor, awoken by a loud noise at midnight

November 2007

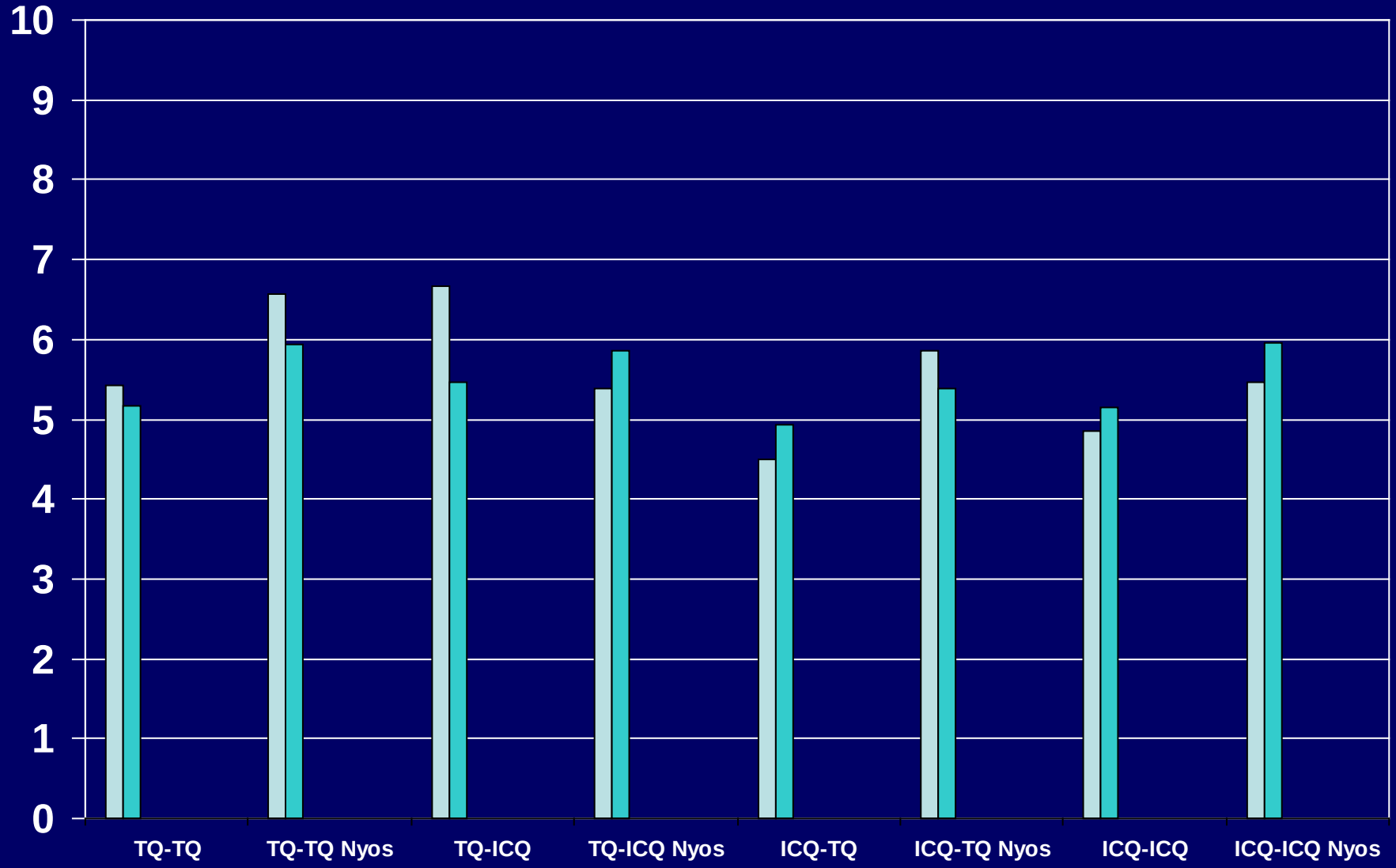
TNS-NIPO program, not respondents

All kinds of Leiden University students

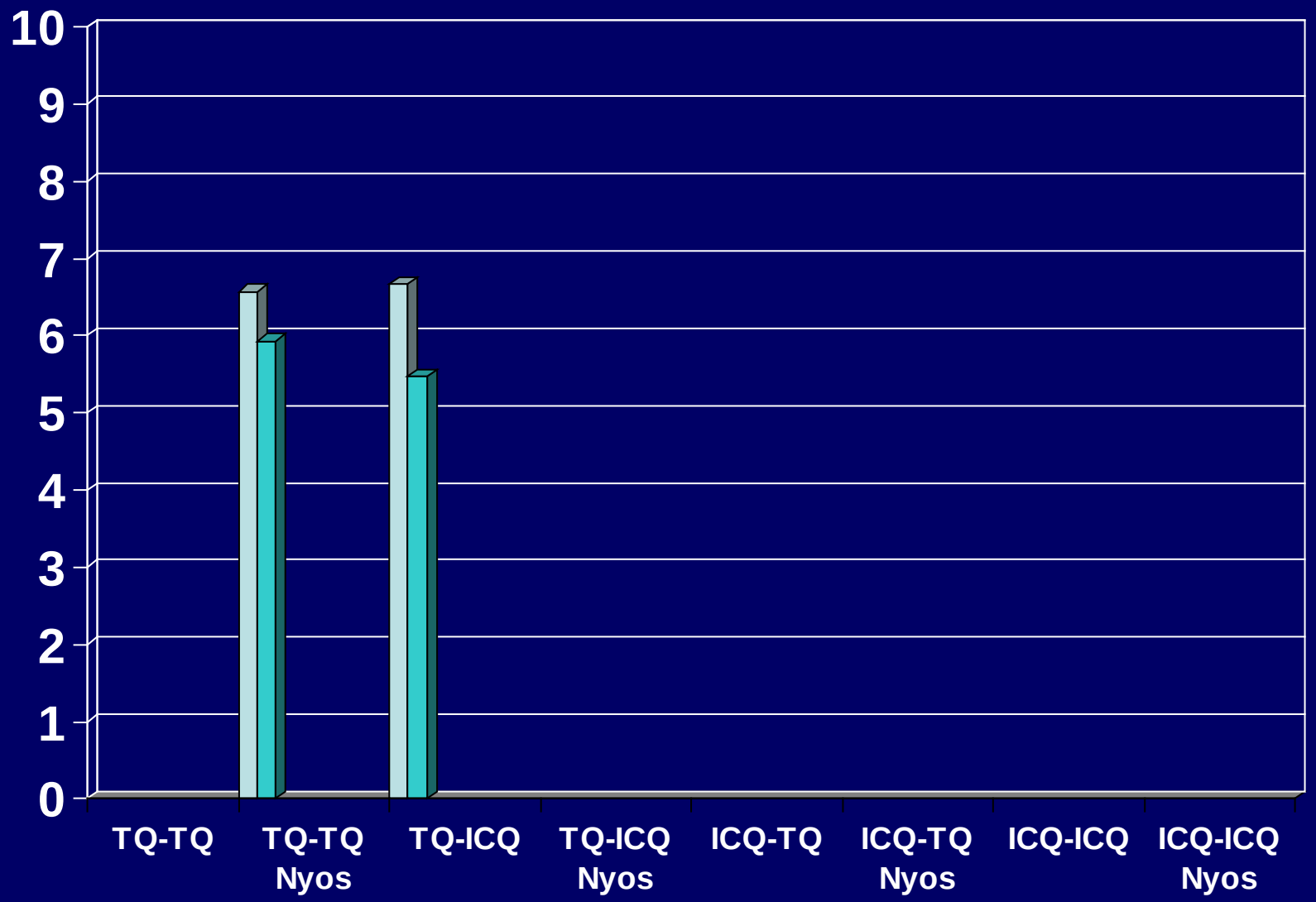
107 respondents

Digitally via home computer

Effect Lake Nyos information: Repeated measures ANOVA



Effect Lake Nyos information: Repeated measures ANOVA



Stability of opinion over time

	Correlation 1st grade – 2nd grade	Absolute difference 1st grade – 2nd grade	Self-observed strength of opinion (1 = very unsure, 5= very sure)
TQ-TQ	r = .37	1,26	2,73
TQ-ICQ	r = .07	1,52	3,64
ICQ-TQ	r = .79	0,78	3,26
ICQ-ICQ	r = .76	0,85	3,88

Discussion

- People value good information
- People are willing to change their opinion based on new (better) information
- The ICQ leads to opinions of higher quality: -more consistent
  -more resistant
  -more stable

Remaining questions

- Information Lake Nyos had no effect on emotions, would other information have a stronger effect?
- Other remaining questions?

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The Stability of Public Preferences for CCS Before and After Group Discussion

Presentation for the IEA GHG SRN

November 2, 2009

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Co-authors: Wändi Bruine de Bruin and M. Granger Morgan

Public Perceptions of CCS

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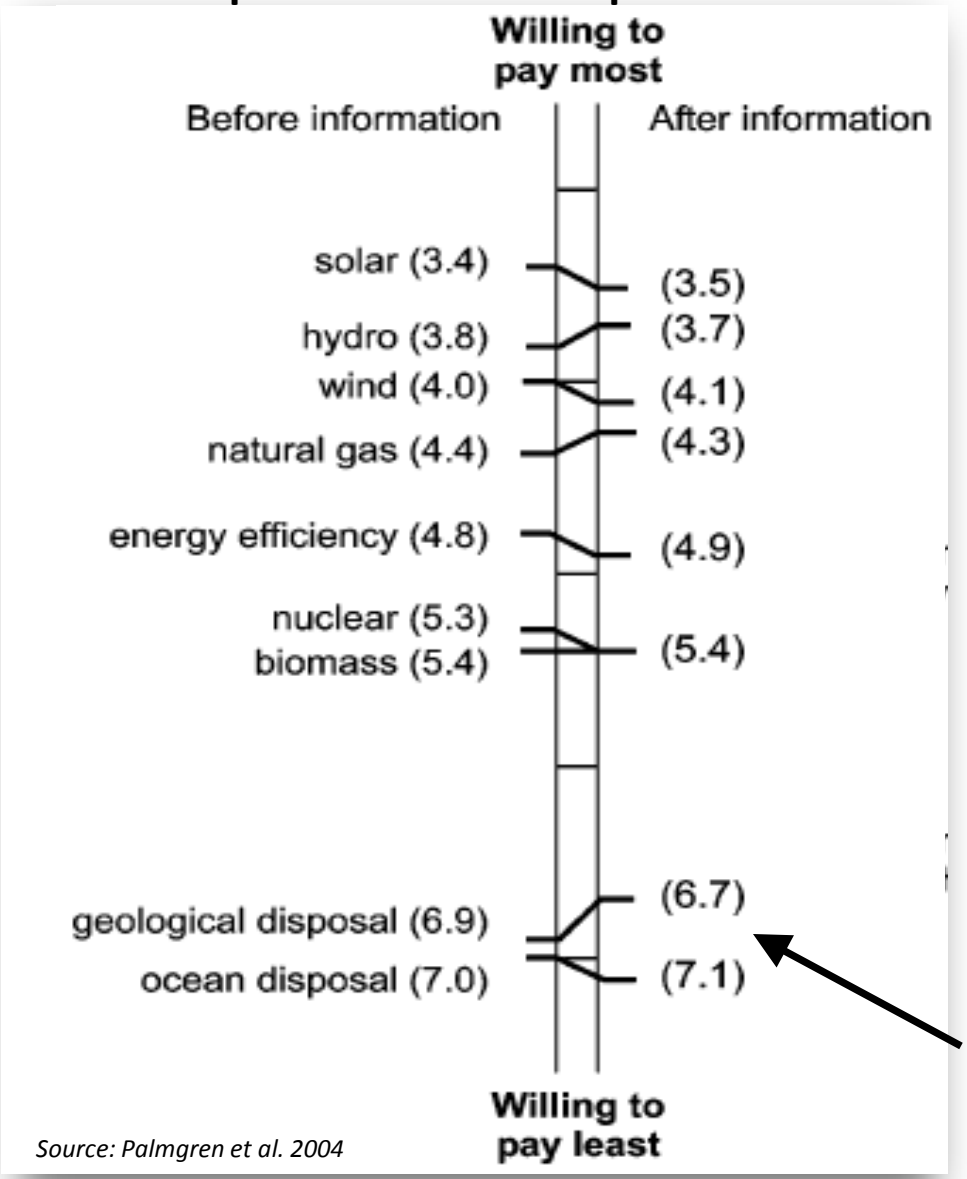
Respondents' ranks of portfolios



Source: Palmgren et al. 2004

CCS perceptions studies have found:

- Low level of awareness and understanding of CCS
- Negative to slightly positive opinions of CCS
- People want to talk about CCS *in comparison* to other low-carbon technologies, and as part of a low-carbon energy portfolio.

Palmgren et al. (2004) asked survey respondents to rank energy portfolios with a 50% reduction in CO_2 emissions.

CCS portfolios ranked as the least favorable

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Eliciting Informed Public Preferences

In this study, participants provided rankings
before and after a "group workshop"

Materials Addressed Limitations in Palmgren et al. (2004)

Limitation	Resolution
Little information about costs and benefits of other options	Developed multi-attribute information materials on costs, risks and benefits of 10 technologies and 7 portfolios
Unrealistic renewable-heavy portfolios	Realistic portfolios
No advanced technologies	"Advanced" (IGCC) and "traditional" (PC) coal options

- Rankings were more informed and decision-relevant
- Iteratively refined materials based on input from
  - Experts, to ensure technical accuracy
  - Lay people, to ensure their understanding
- Resulting materials were written at grade level 6-8

Materials: Technology Sheets

Advanced Nuclear Plants

How it Works: Nuclear plants use uranium that has been slightly [illegible] plant, the ura steam. The s called a "turb electricity. Ac than existing accident virtu

Wind Power

How it Works: Modern wind machines are much

in Somerset, PA

Advanced Coal Plants

Option 2: CO

How it Works: Th in *"Advanced Coa* additional equipm before it escapes liquid. A pipeline t permanently in ro (about 2,500 feet) diagram to the rig stay trapped in th few decades, the thousands of yea

Availat	
Reliabi	
Limits	
Noise	
Land u ecolog	
Safety	
Lifespa	
Curren	

*More

Cost *	It is ch
CO_2 released *	Advan
Other Pollution/ Waste *	• The • If CO beca • Addi
Availability	• Ther to m • Ther CO_2
Reliability	Captur
Limits of use	Advan
Noise	There
Land use and ecology	The C format
Safety	• Unlik is lo a val the l • Ther slow • The wher or th • Pum eartl • Afte Leak to pl • Once and mon
Lifespan	There
Current Use	The U

*More cost and pollut

Traditional Coal Plants

Option 1: CO_2 is released into air

The Armstrong traditional coal plant in Pennsylvania
Source: www.industcards.com/st-coal-use-pa.htm

How it Works: Traditional coal plants burn coal to make steam. The steam is used as fuel in a type of engine, called a "turbine". This turbine runs a generator to make electricity.

When coal is burned, CO_2 is released by the plant. In **Option 1**, this CO_2 escapes into the air because no equipment is added to capture the CO_2.

MORE INFORMATION (ABOUT TRADITIONAL COAL PLANTS)	
Cost *	*Traditional coal plants* make cheaper electricity than advanced coal plants. Yet, it is more expensive to add CO_2 capture equipment to *traditional coal plants*. *
CO_2 released *	Traditional coal plants release CO_2 to the air. *
Other Pollution/ Waste *	• While these plants are much cleaner than in the past, they still release CO_2, nitrogen oxides, sulfur dioxide, mercury and particulates to the air. These pollutants can cause people to have many different health problems. * • Traditional coal plants produce a lot of ash that contain hazardous chemicals. Some ash can be recycled, for example, to make concrete. The leftover solid waste is usually put in a landfill near the plant. • Traditional coal plants use a lot of water to cool the plant's equipment. The water comes from wells, lakes, rivers or oceans. Some of it will evaporate after use. The rest is returned to its source. Since it is hot, the water may disturb plants and animals living in the water source.
Availability	Experts say that the U.S. has enough coal to meet its needs for at least 100 years.
Reliability	Coal can provide steady and dependable electricity.
Limits of use	Traditional coal plants release a lot of CO_2. They cannot make all of the electricity that is needed in PA if we want to reduce CO_2. Other types of plants must also be built.
Noise	These plants are about as loud as average street traffic.
Land use and ecology	Coal mining near the surface disturbs the land, plants and animals. It also disrupts and pollutes streams. Underground mining can cause acidic water to leak into streams. If the mine collapses, it can also cause the ground to sink or shift.
Safety	These plants are quite safe for operators. Coal mining is dangerous for the miners.
Lifespan	The lifetime of any plant is uncertain. But, a new traditional coal plant built today would likely make electricity for at least 50 years.
Current Use	There are more than 1,000 of these plants working in the U.S. today.

** More cost and pollution information is available in "Cost Comparison" and "Pollution Comparison" sheets in Envelope #3.*

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Lifespan	The lifetime of any plant is uncertain. But, a new traditional coal plant built today would likely make electricity for at least 50 years.
Current Use	There are more than 1,000 of these plants working in the U.S. today.

Materials: Comparison Sheets

Types of Pollution

CO_2 (Carbon Dioxide) – Coal and natural gas plants release CO_2 into the air. The CO_2 can contribute to climate change. This may lead to a hotter, dryer climate, more intense storms, more floods and droughts, and rising sea levels. The change in climate can have an effect on crops, plants and animals.

Nitrogen Oxides – Coal, natural gas and biomass plants … oxides into the air. The nitrogen oxides can cause smog … can also contribute to the creation of particulates (see the … box below). The smog can make your eyes, nose, and thr… also cause lung problems, especially in young children. T… turn lakes and rivers acidic. It can also damage trees, and… statues and paint on buildings.

Sulfur Dioxide – Coal and biomass plants release sulfur… air. The sulfur dioxide can contribute to the creation of pa… the 'Particulates' box below). It also can cause breathing … especially in people with asthma. Breathing it for long pe… can lead to lung problems and worsen heart disease. It als… rain. This can turn lakes and rivers acidic. It can also we… statues and paint on buildings.

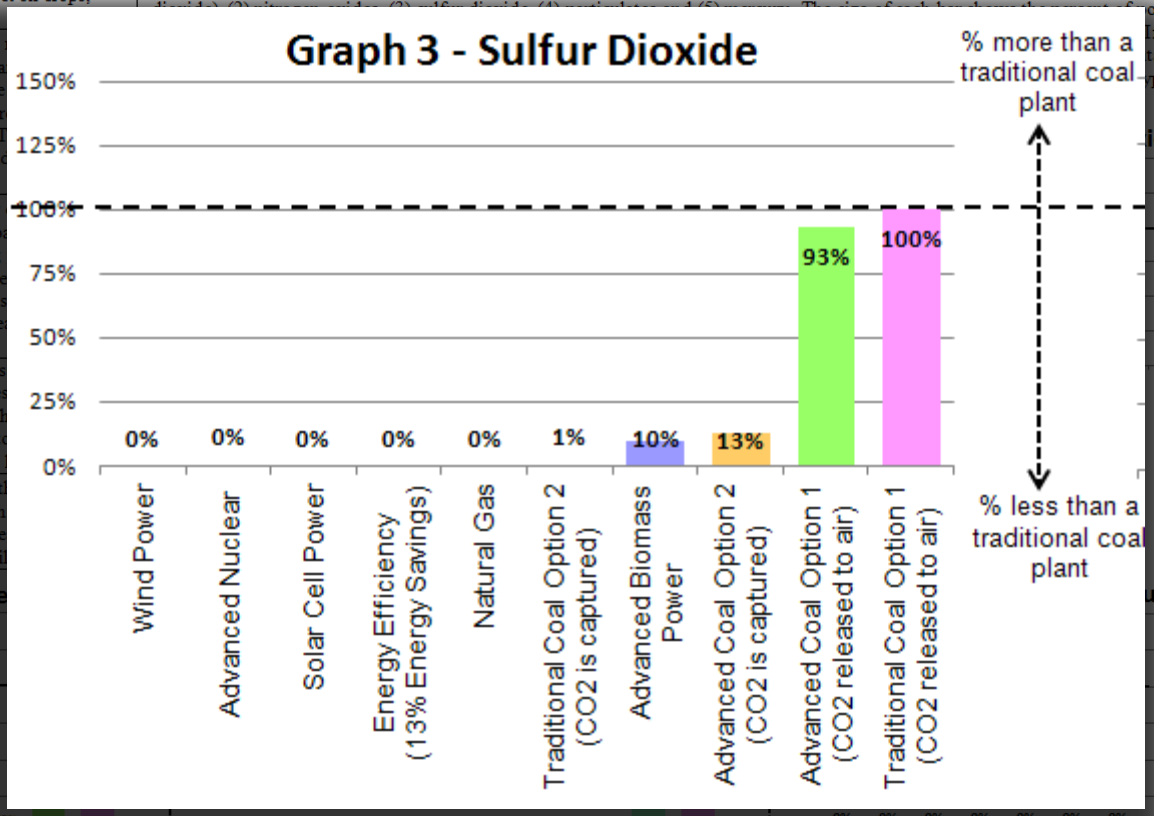
Particulates – Traditional coal plants release particulates… Nitrogen oxides and sulfur dioxide also make particulates… small particles. When they get in the air, it looks hazy. Th… can pass through your nose and throat. They get deep into… That can lead to breathing problems and worsen heart or l…

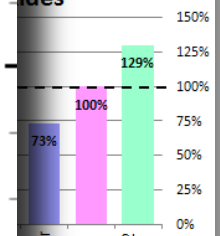
Mercury – Traditional coal plants release mercury into t… the mercury ends up in water, where it can get inside fish… too much fish with mercury, that can harm their brain, he… lungs, and immune system. This is especially true for chil…

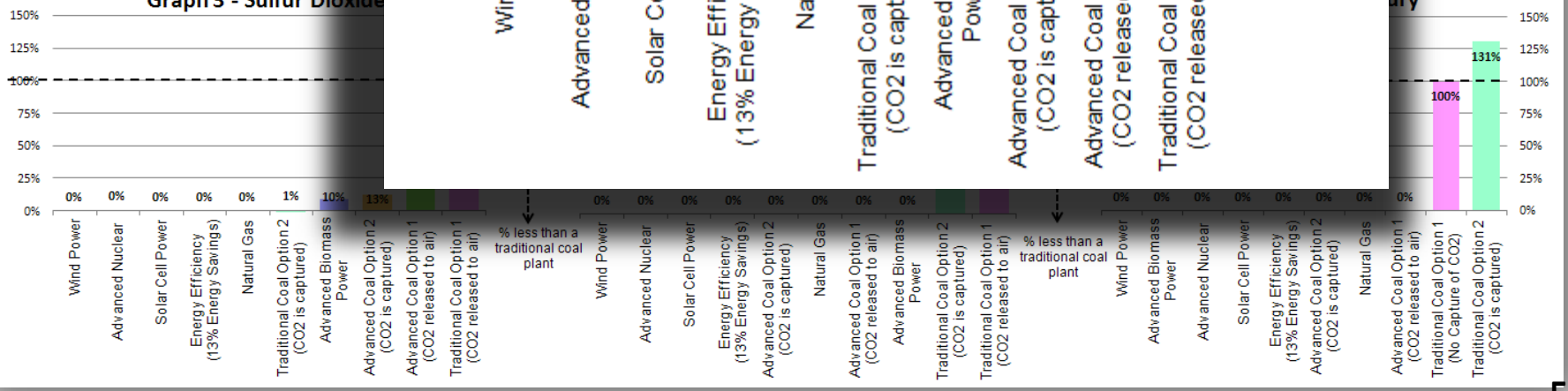
Pollution Comparison

Five types of pollution are shown on this sheet. Each is described in the table to the left. Read the table, "*Types of Pollution*" to learn more.

The graphs below compare traditional coal plants with other power plant types. The graphs show these 5 types of pollution: (1) CO_2 (carbon … ollution put out by … If a power plant type … tage greater than … pe puts out (almost)







Materials: Comparison Sheets

Cost Comparison

The graph below on the left shows the estimated cost of electricity from each power plant type. The graph below on the right zooms in on types that cost less than $0.25 per kilowatt-hour. A kilowatt-hour is a measure of electricity use. One kilowatt-hour can power a 100-watt light bulb for 10 hours. The average PA household uses about 700 kilowatt-hours each month. Your house may use more if it has electric heating or electric water heating, if it is very large or if it uses lots of air conditioning.

The numbers on the right side of each graph are the cost of electricity in dollars per kilowatt-hour. The numbers on the left side are the monthly bill for an average PA household if their electricity had the cost shown on the right. The numbers on the right are multiplied by 700 kilowatt-hours to get the monthly bill numbers on the left. Let's say that electricity costs $0.20 per kilowatt-hour. Then, the monthly bill would then be $140.

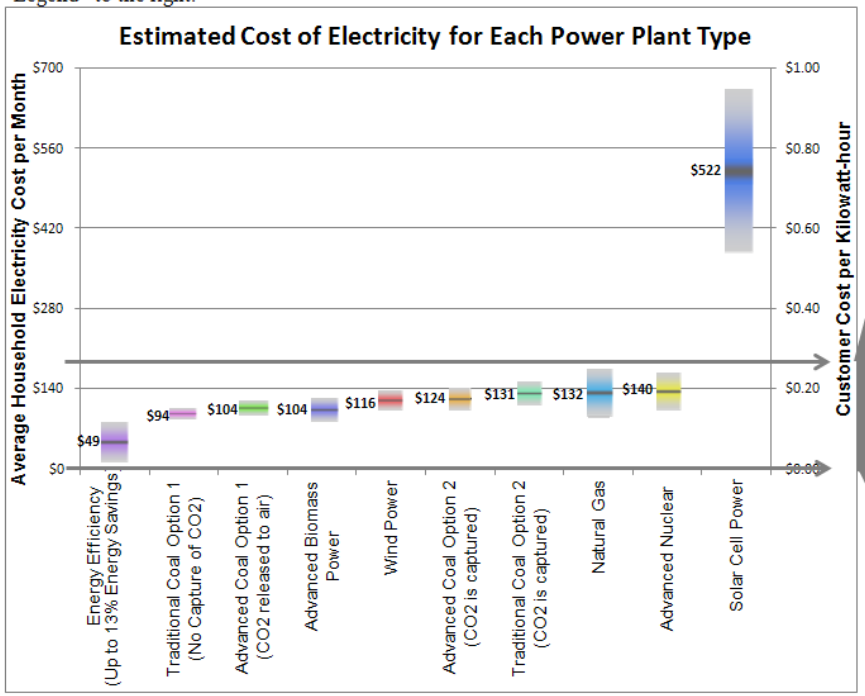
Since experts are not certain about future electricity costs, each bar shows a range. The gray center of the bar (and the dollar value just to its left) show the most likely monthly electric bill. The longer the shaded bar, the more uncertain experts are about the costs. This is also explained in the box titled "Legend" to the right.

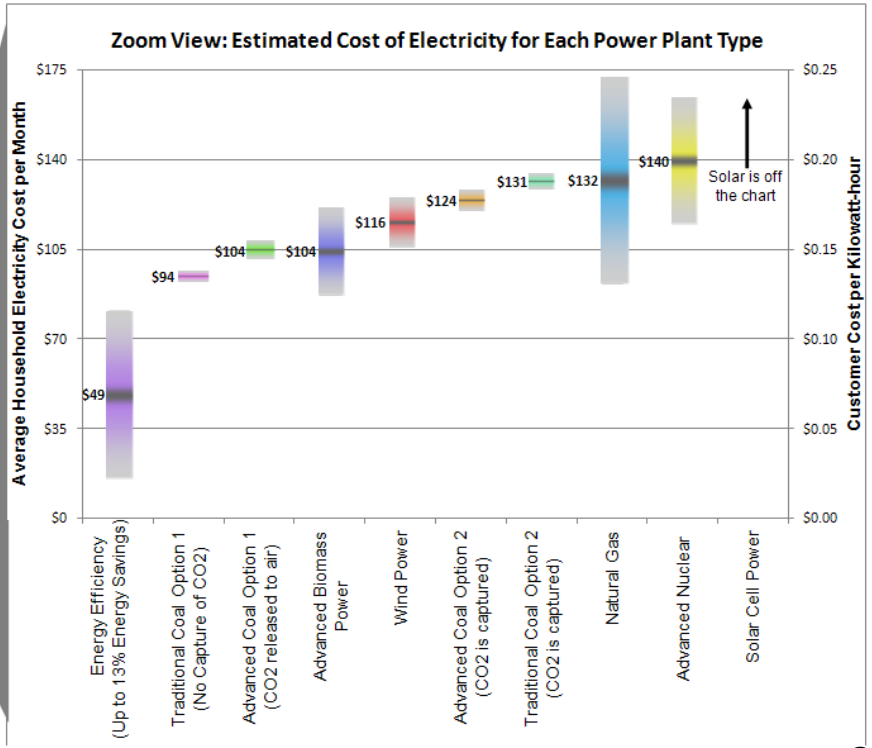
Legend

This shows the monthly electric bill for an average PA household. It is the cost per kilowatt-hour for that power plant type times 700 kilowatt-hours.

$140

The shaded bar shows the range of possible electricity costs from each power plant type.





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Low-Carbon Portfolios

All release 70% less CO_2 than a portfolio of 100% PC plants

Our Seven Low-Carbon Portfolios

A: PC with CCS mix	**B: IGCC with CCS mix**	**C: Nuclear mix**	**G: NGCC & Wind mix**
81% PC with CCS 9% PC Plants	83% IGCC with CCS 17% IGCC Plants	70% Nuclear 30% PC Plants	66% NGCC Plants 34% Wind Power

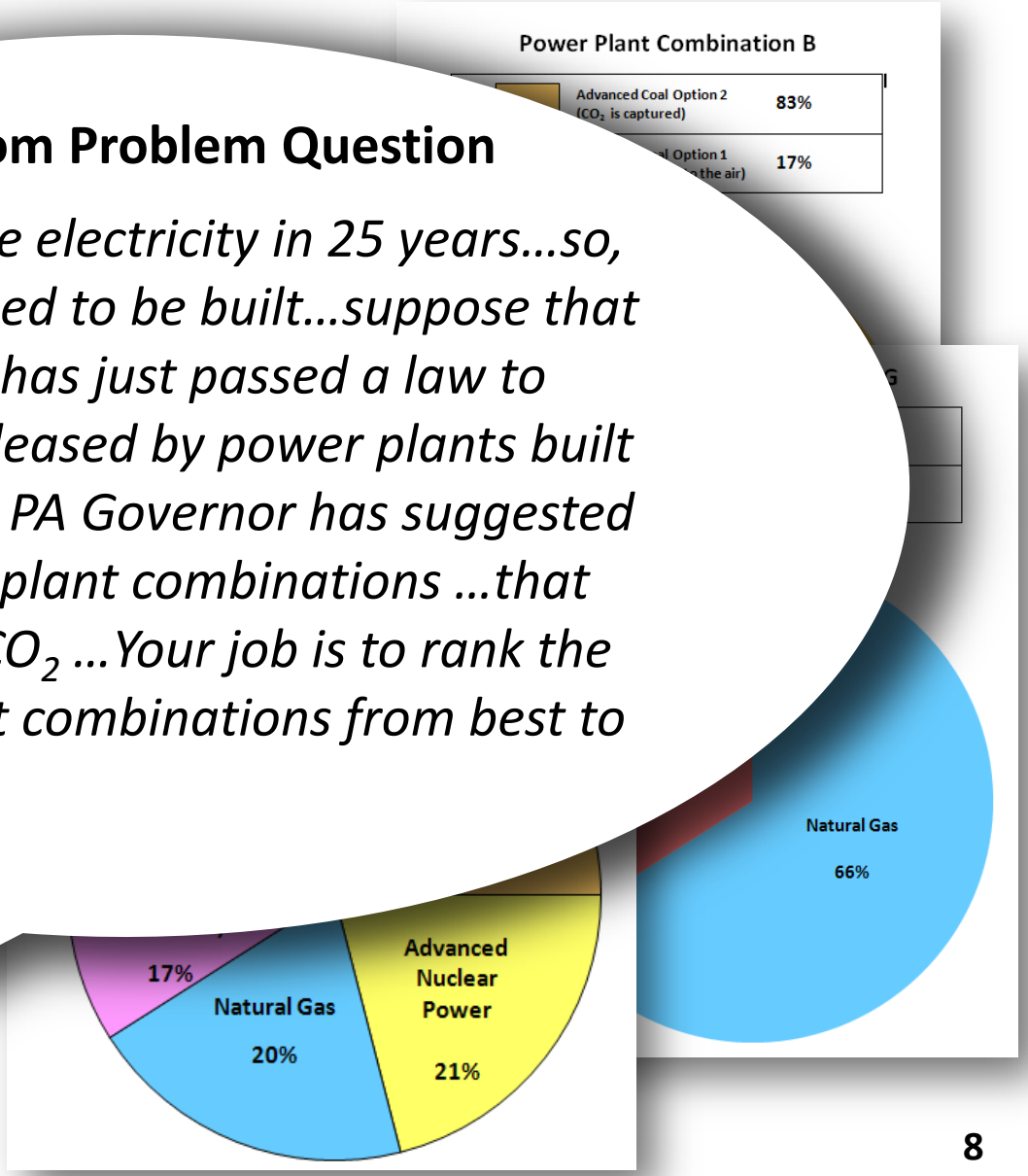
D: EPRI *limited* portfolio, no nuclear or CCS	**E: EPRI *semi-limited* portfolio, with CCS, no Nuclear**	**F: EPRI *full* portfolio, with CCS and Nuclear**
66% NGCC Plants 13% Efficiency 10% Wind Power 6% BIGCC Plants 5% PV Solar	48% NGCC Plants 20% IGCC with CCS 13% Wind Power 13% Efficiency 5% PC Plants 1% PV Solar	25% IGCC with CCS 21% Nuclear 20% NGCC Plants 17% PC Plants 10% Wind Power 7% Efficiency

Low-Carbon Portfolios

- Pie charts act as
- Technolo
  inclu
- *Por*
  Po
  sh
- A *P*
  provi
  context fo
  exercise.

Excerpt from Problem Question

"PA will need more electricity in 25 years…so, new plants will need to be built…suppose that the U.S. Congress has just passed a law to reduce the CO_2 released by power plants built in the future…The PA Governor has suggested seven new power plant combinations …that release 70% less CO_2 …Your job is to rank the seven power plant combinations from best to worst."



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Group Workshop Procedure

Step 1: "Homework Assignment" (*pre-discussion*)	
Received: Technology-related information	Provided: ***Pre-discussion* technology rankings**

Experimenter explanation of "homework" materials & new portfolio materials

Step 2: Working Independently (*pre-discussion*)	
Received: Portfolio-related information	Provided: ***Pre-discussion* portfolio rankings**

***Group discussion**: Participants agree upon a group portfolio ranking*

Step 3: Working Independently (*post-discussion*)	
Received: No new information.	Provided: ***Post-discussion* portfolio and technology rankings**

Participants provided rankings before and after a group workshop

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Participants

8 Workshops:

- Held at local community organizations
- Including 4-9 participants each
- Lasting 2-3 hours
- Carefully scripted following Risk Ranking procedures
- Paid $95 (to keep or donate to organization)

54 Participants:

- Ages 18 to 73 years old (m=37.5)
- 35% Males, 65% Females
- 67% White, 34% African-American or other minority
- All had HS diploma, 63% at least a Bachelor's degree

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Did participants understand the materials?

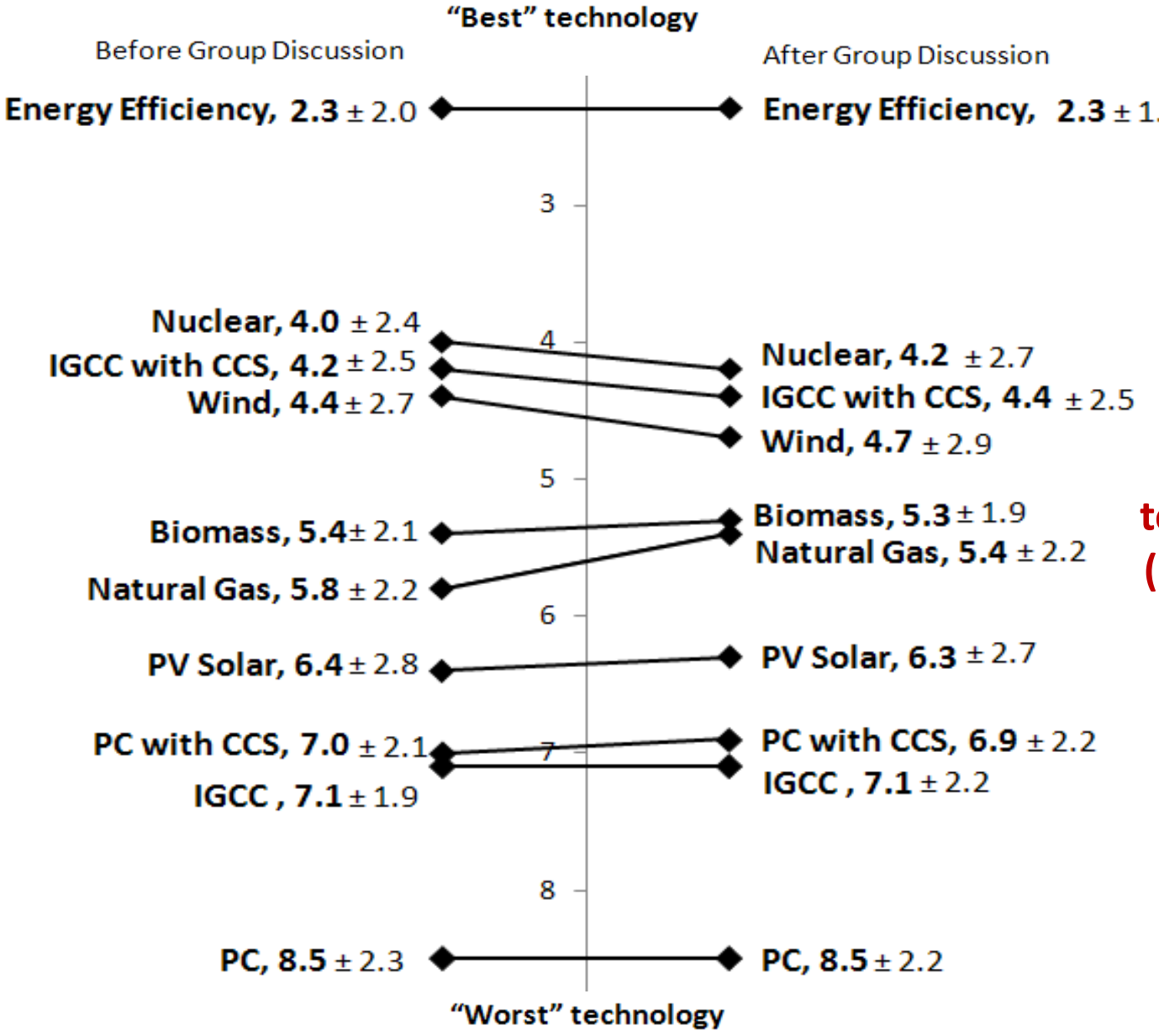
15 True/False questions

- Average score 91% correct (range 60-100%)
- Most difficult: *Problem Question:* 87% correct
  Pollution Comparison: 87% correct

- **Comprehension ratings**
  - Hardest rated materials were still all significantly above the scale midpoint (from 1 "very hard" to 7 "very easy")
  - Most difficult *pre-explanation*:
    Cost Comparison (m=5.23, t=5.53, p<0.001)**
    Pollution Comparison (m=5.43, t=7.42, p<0.001)*
    Problem Question (m=5.74, t=8.17, p<0.001)

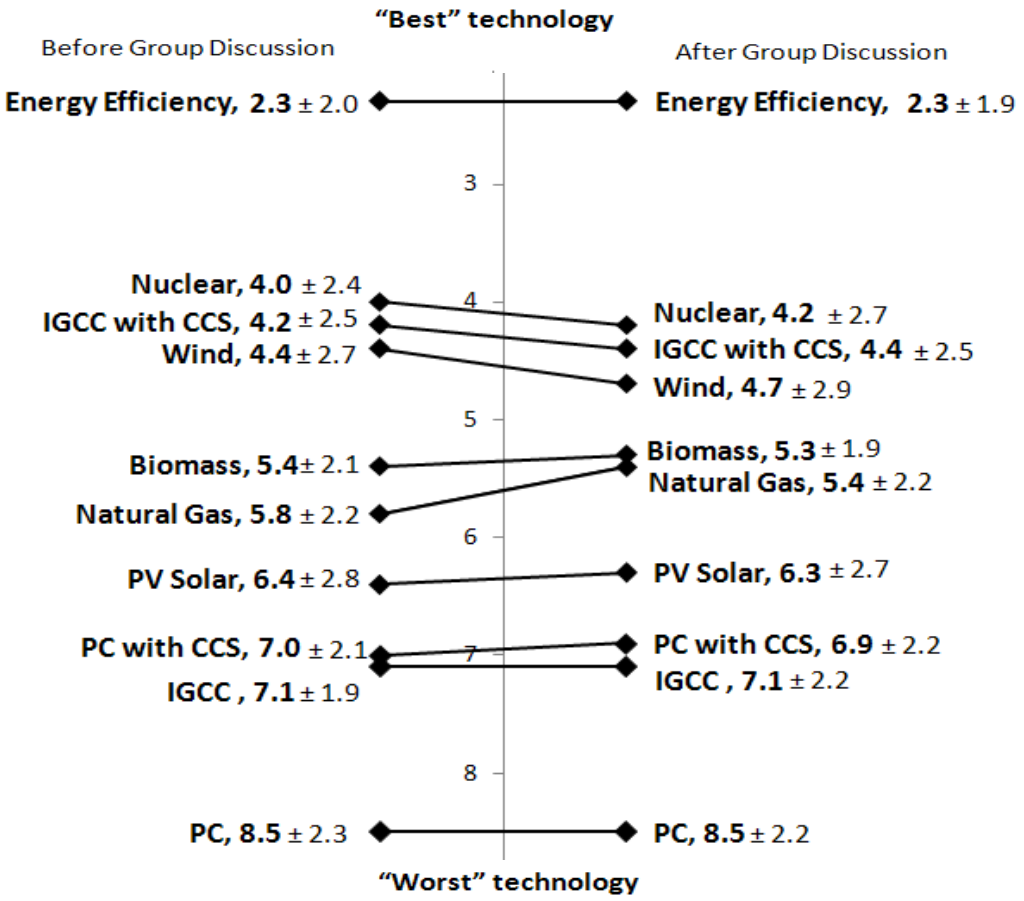
Note: Materials rated as significantly easier *post-explanation* and *post-discussion* are noted as such: ** for p<0.01 and * for p<0.05.

Results – Technology Rankings



Mean participant technology rankings (SD), from 1 (best) to 10 (worst)

Technology Rankings: Consistency and Stability



Mean participant technology rankings (SD), from 1 (best) to 10 (worst)

High Level of Consistency:

Kendall's coefficient of concordance shows **significant agreement between participants' technology rank-orders**

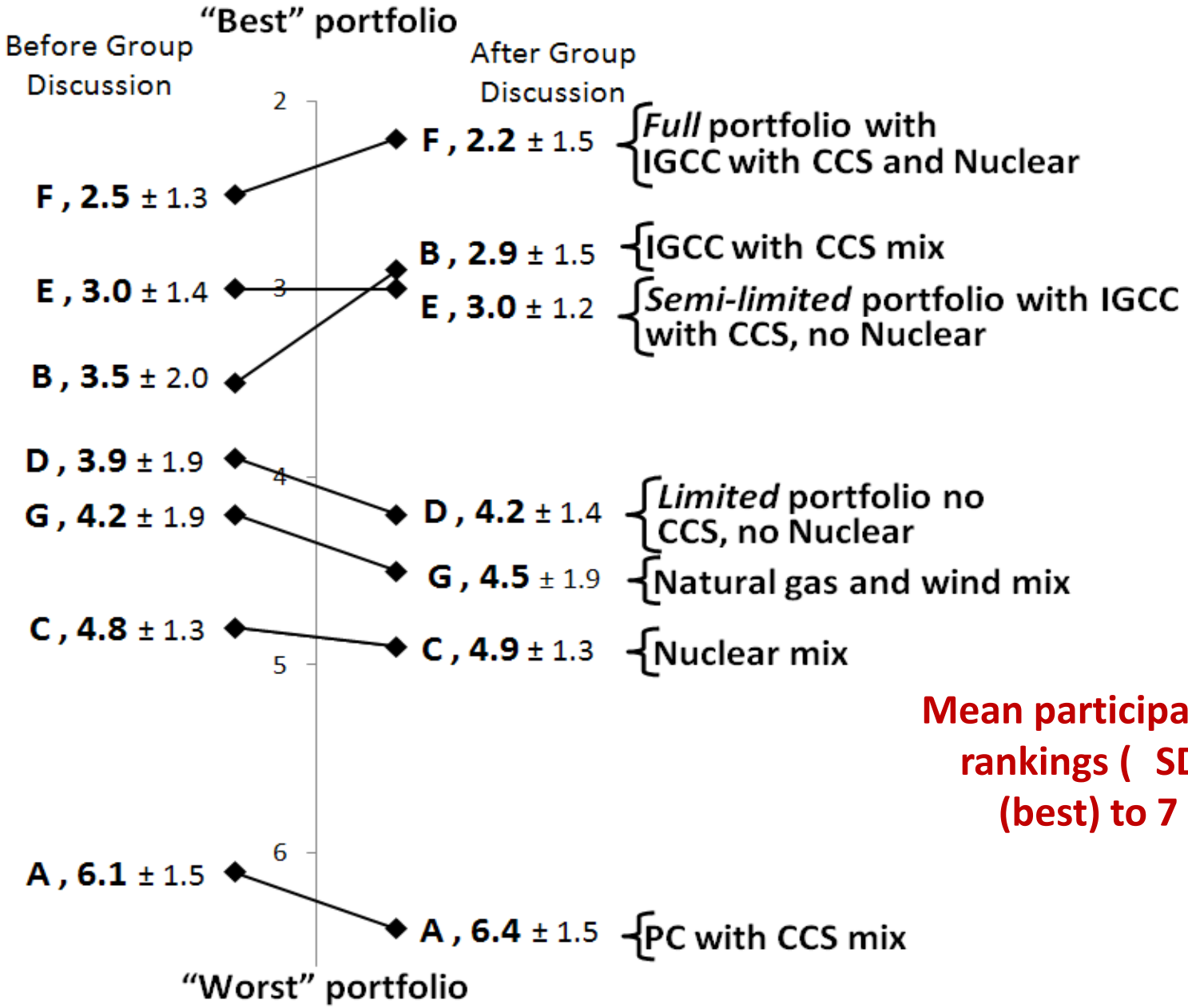
(*W*=0.36, *p*<0.001 for *pre-discussion* rankings, *W*=0.*34*, p<0.001 for *post-discussion* rankings)

High Level of Stability:

Wilcoxon paired-rank tests show, **for each technology, no significant difference between participants' *pre-* and *post-discussion* rankings**

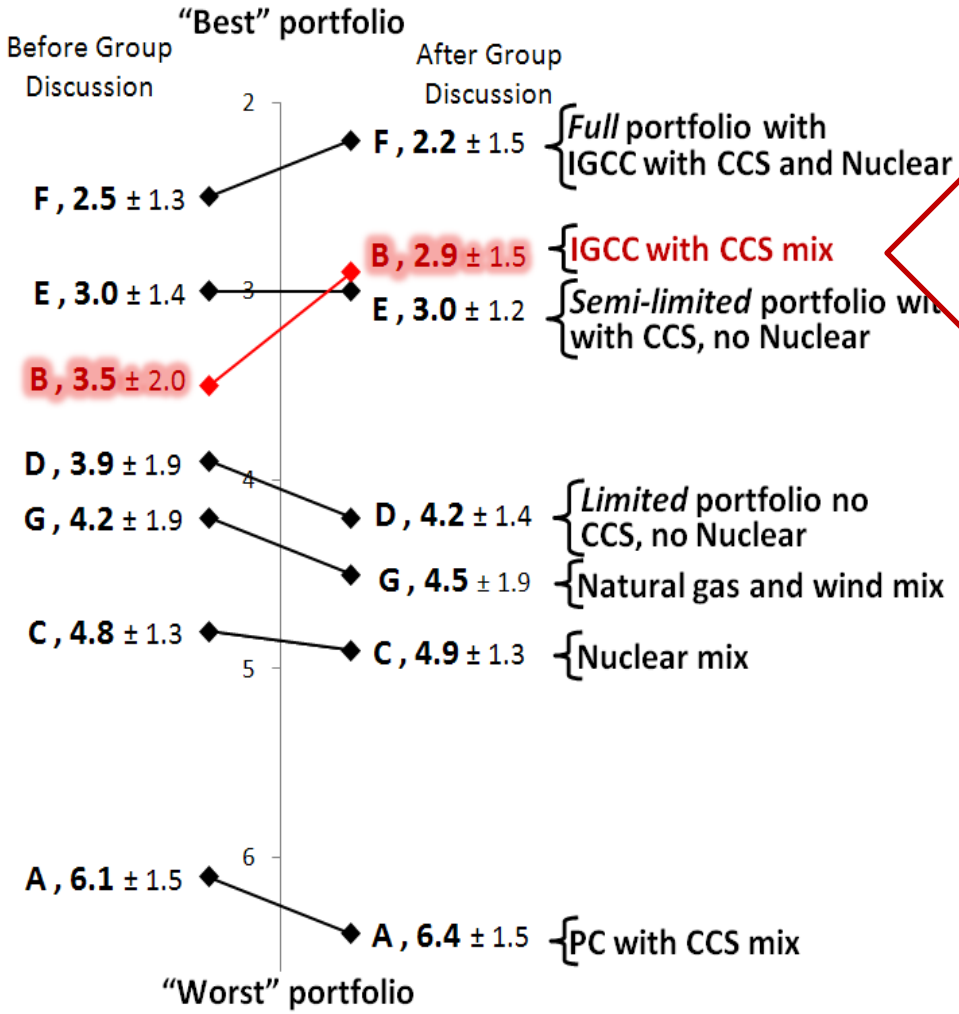
(*p*>0.10 for all)

Results – Portfolio Rankings



Mean participant portfolio rankings (SD), from 1 (best) to 7 (worst)

Portfolio Rankings: Consistency and Stability



Mean participant portfolio rankings (SD), from 1 (best) to 7 (worst)

High Level of Consistency:

Kendall's coefficient of concordance

een

rs

Wilcoxon paired-ranked test show significant difference

z=-2.21, p=0.03

kings,

W=0.45, p<0.001 for *post-discussion* rankings)

High Level of Stability:

Wilcoxon paired-rank tests show, ***for all but one portfolio*, no significant difference between participants' *pre-* and *post-discussion* rankings**

(p>0.10 for all but Portfolio B)

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Group Dynamics and Influence

- Participants agreed* with the statements that they thought they had:
  - Influenced the group discussion
    - Compared to the scale midpoint (m=5.00, t=4.49, p<0.001)
  - Were influenced by the group discussion
    - Compared to the scale midpoint (m=5.09, t=5.16, p<0.001)

** On a scale from 1 (completely disagree) to 7 (completely agree)*

- Participants' perceptions of how much they were influenced by the group discussion are correlated** to the mean absolute difference between their *pre-* and *post-discussion* rankings
  - Spearman ρ=0.34, p=0.01 for technologies
  - Spearman ρ=0.26, p=0.06 for portfolios ** (only marginally correlated)

Discussion of Results

- Participants:
  - understood the materials → were *well-informed*
  - seemed accepting of CCS, but only when added to IGCC (the "advanced" coal)
  - showed a high degree of stability between rankings before and after group discussion
    - Only exception: Ranking for IGCC with CCS mix significantly improved after group discussion
  - showed a high degree of consistency between their overall rank-orders
- Results suggest that:
  - CCS opinions held by well-informed participants are relatively stable before and after a group discussion
  - Members of the general public who study *these materials* may find CCS more acceptable than the alternatives

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CDMC Climate Decision Making Center
Carnegie Mellon University
Funded by the National Science Foundation (NSF)

Contact Email: Lauren@cmu.edu

More materials can be found at: http://sds.hss.cmu.edu/risk/fleishman/LowCarbonPortfolioMaterials.html

"…an arrogant approach such as the one adopted in the past by the industries responsible for nuclear power and genetically modified crops, could create a level of public distrust that makes the widespread implementation of geological carbon sequestration difficult, if not impossible." (Palmgren et al. 2004)

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Back Up Slides

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Viewpoints on CCS

- Mean participant CCS ratings were slightly favorable
  - Compared to the scale midpoint (m=4.72, t=3.22, p<0.01)
  - Scale from 1 “completely oppose [CCS]” to 7 “completely favor [CCS]”

- Participants’ CCS favorability were not significantly correlated to their rankings of CCS-inclusive technologies or portfolio
  - Spearman rank-order correlations had p>0.01 for all

Materials – Portfolio Cost Comparison

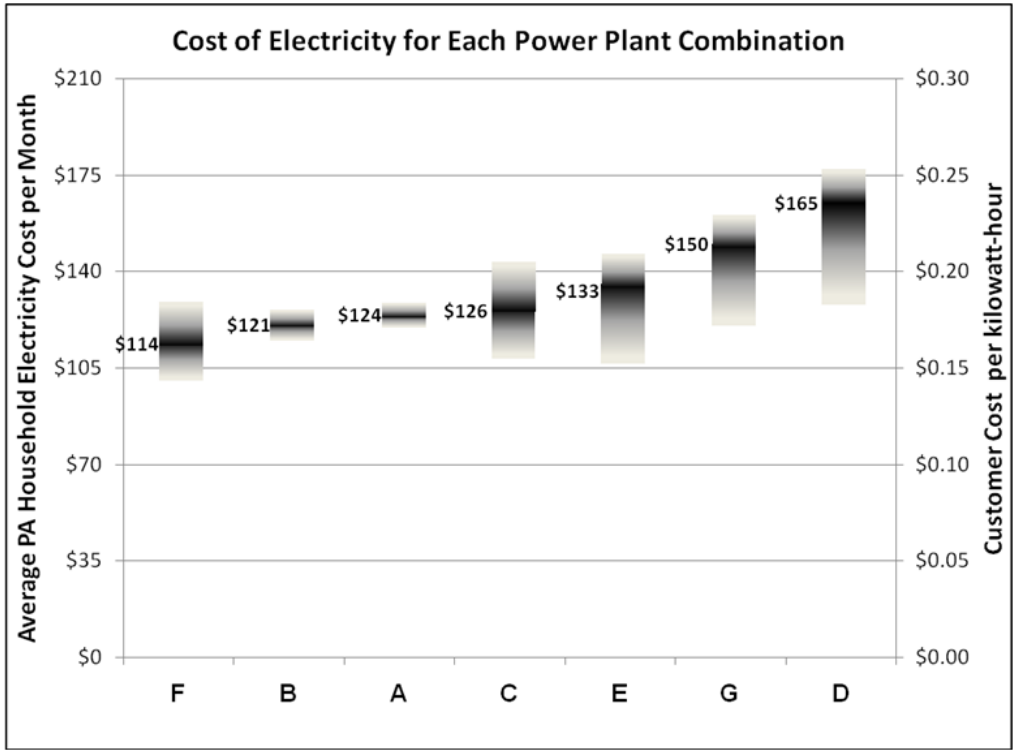
Cost Comparison for Combinations

The graph below shows the estimated cost of electricity from each power plant combination.

The numbers on the right side of the graph are the cost of electricity in dollars per kilowatt-hour. A kilowatt-hour is a measure of electricity use. One kilowatt-hour can power a 100-watt light bulb for 10 hours. The average PA household uses about 700 kilowatt-hours each month. Your house may use more if it has electric heating, is very large or uses lots of air conditioning.

The numbers on the left side of the graph are the monthly bill for an average PA household if their electricity had the cost shown on the right of the graph. The numbers on the right are multiplied by 700 kilowatt-hours to get the monthly bill numbers on the left. Let's say that electricity costs $0.20 per kilowatt-hour. The monthly bill would then be $140.

Since experts are not certain about future electricity costs, each bar shows a range. The darker center of the bar (and the dollar value to its left) show the most likely monthly electric bill for that power plant combination. The longer the shaded bar, the more uncertain experts are about the costs. This is also explained in the legend below.



Legend

This shows the monthly electric bill for an average PA household for each power plant combination.

$140

It is the cost per kilowatt-hour for that power plant combination times 700 kilowatt-hours.

The shaded bar shows the range of possible electricity costs for each power plant combination.

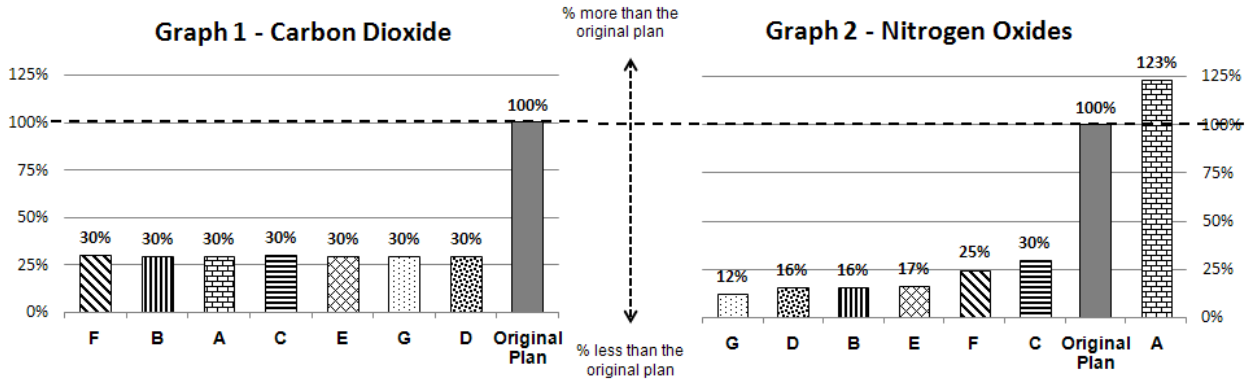
Materials – Portfolio Pollution Comparison

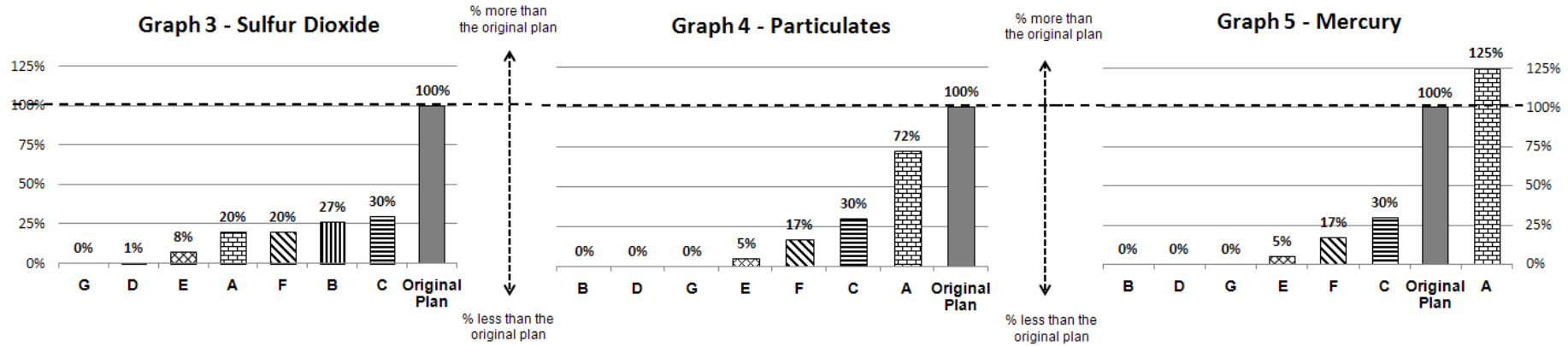
Types of Pollution
CO_2 (Carbon Dioxide) – Coal and natural gas plants release CO_2 into the air. The CO_2 can contribute to climate change. This may lead to more hurricanes, tornadoes, floods and droughts, and rising sea levels. The change in weather can harm crops, plants and animals.
Nitrogen Oxides – Coal, natural gas and biomass plants release nitrogen oxides into the air. The nitrogen oxides can cause smog and acid rain. The smog can make your eyes, nose, and throat hurt. It can also cause lung problems, especially in young children. The acid rain can turn lakes and rivers acidic. It can also wear out trees, statues and paint on buildings.
Sulfur Dioxide – Coal and biomass plants release sulfur dioxide into the air. The sulfur dioxide can cause breathing problems, especially in people with asthma. Breathing it for long periods of time can lead to lung problems and worsen heart disease. It also causes acid rain. This can turn lakes and rivers acidic. It can also wear out trees, statues and paint on buildings.
Particulates – Traditional coal plants release particulates into the air. Particulates are a mix of very small dust and droplets. They can make the air look hazy. They can pass through your nose and throat. They get deep into your lungs and heart. That can lead to breathing problems and worsen heart or lung disease.
Mercury – Traditional coal plants release mercury into the air. The mercury will settle in water and get inside fish. If people eat too much fish with mercury, it can harm their brain, heart, kidneys, lungs, and immune system. If birds or animals eat fish with mercury, they can die or have reproduction and growth problems.

Pollution Comparison for Combinations

Five types of pollution are shown on this sheet. Each is described in the table to the left. Read the table, "*Types of Pollution*" to learn more.

The graphs below compare the seven power plant combinations to the "original plan" of building all traditional coal plants. The graphs look at these types of pollution: (1) CO_2 (carbon dioxide), (2) nitrogen oxides, (3) sulfur dioxide, (4) particulates and (5) mercury. The size of each bar shows the percent of pollution put out by that combination relative to the "original plan". The pollution from the "original plan" is always shown as 100%. If a power plant combination pollutes less the "original plan", the graph will show a percentage that is less than 100%. If it pollutes more, a percentage greater than 100% is shown. So, the smaller the percentage, the less pollution put out by that combination. A graph shows 0% if a power plant combination puts out (almost) no pollution. Overall, shorter bars on the graph are better than longer ones.





Energy Portfolios

Portfolio	Portfolio Make Up	Absolute Cost	Normalized Value Relative to the Base Case					
			Cost	CO_2	NO_X	SO_X	PM	Hg
Base Case	100% PC Plants	$94	1.00	1.00	1.00	1.00	1.00	1.00
A: PC with CCS mix	81% PC *with* CCS 19% PC Plants	$124	1.32	0.30	1.23	0.20	0.72	1.25
B: IGCC with CCS mix	83% IGCC *with* CCS 17% IGCC Plants	$121	1.29	0.30	0.16	0.27	0.00	0.00
C: Nuclear mix	70% Advanced Nuclear 30% PC Plants	$126	1.34	0.30	0.30	0.30	0.30	0.30
D: EPRI *limited* portfolio, with no Nuclear or CCS	66% NGCC Plants 13% Energy Efficiency 10% Wind Power 6% BIGCC Plants 5% PV Solar Power	$165	1.76	0.30	0.16	0.01	0.00	0.00
E: EPRI *semi-limited* portfolio, with CCS, but no Nuclear	48% NGCC Plants 33% IGCC *with* CCS 13% Wind Power 13% Energy Efficiency 5% PC Plants 1% PV Solar Power	$133	1.41	0.30	0.17	0.08	0.05	0.05
F: EPRI *full* portfolio, with CCS and nuclear	25% IGCC *with* CCS 21% Advanced Nuclear 20% NGCC Plants 17% PC Plants 10% Wind Power 7% Energy Efficiency	$114	1.21	0.30	0.25	0.20	0.17	0.17
G: NGCC and Wind mix	66% NGCC Plants 34% Wind Power	$150	1.60	0.30	0.12	0.00	0.00	0.00

Tyndall Centre
for Climate Change Research

The influence of the print media on public perceptions of carbon capture and storage

Sarah Mander, Clair Gough and Ruth Wood

Presentation outline

- Project outline
- Methods
- A CCS communication system
- Emergent frames
- Public engagement with CCS in the press
- Observations

UKCCSC

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Project motivation

- There is low public awareness of CCS and limited understanding of the technology (Reiner et al 2006)
- Media is one route through which people will learn about the technology (Allen et al, 2000)
- CCS reporting could influence people's perceptions of the technology
- Public perceptions of CCS could hinder deployment of the technology……

"potential showstopper"

"possibly the overriding issue" (EAC,2008)

Project Aims

- Who's communicating to UK newspapers about CCS?
- What messages are they looking to communicate
- How successful are they in getting their messages published?
- Are messages getting through to newspaper readers?
- What are the implications?

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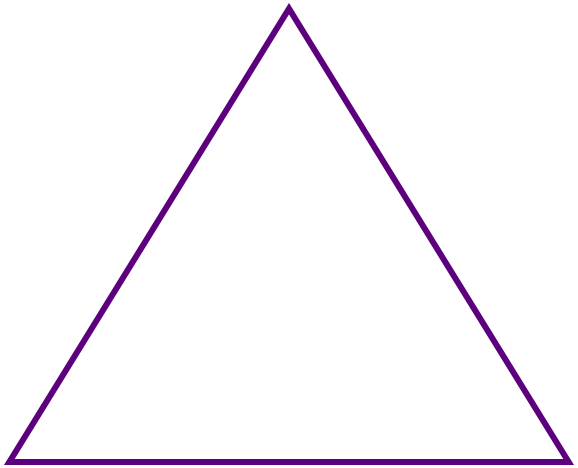
Project outline

22 interviews with key actors from CCS communication system: policy, utilities, environmental NGOs, experts and journalists

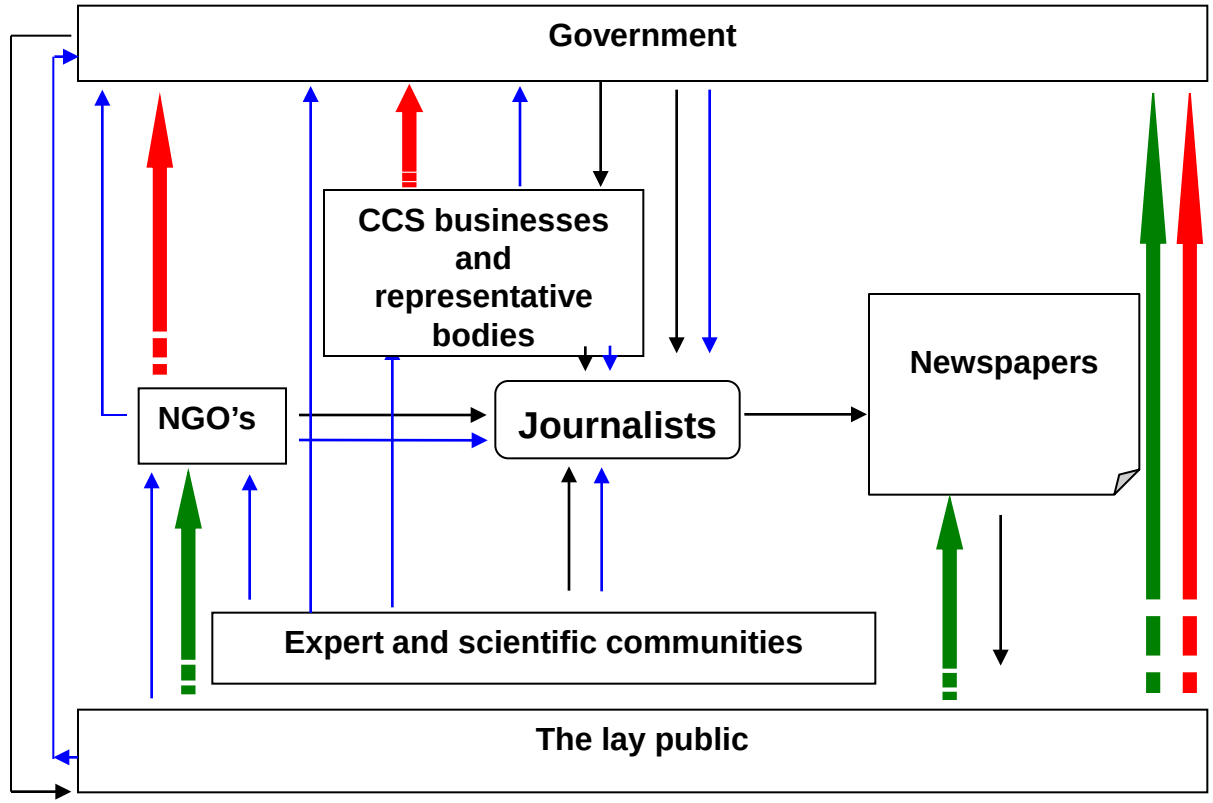
+ analysis of relevant press releases



Content analysis of 3 years of CCS articles in UK newspapers

25 interviews with regular newspaper readers

CCS communication system



Cf.Murdock et al in Pigeon et al 2001)

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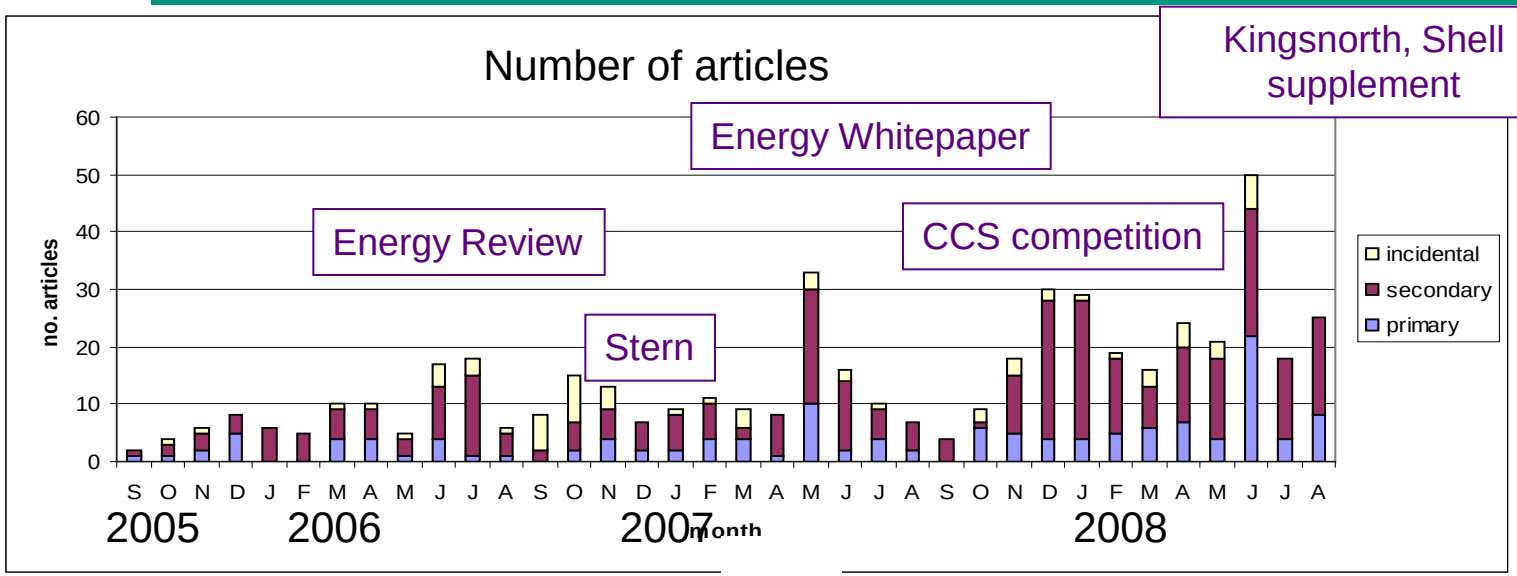
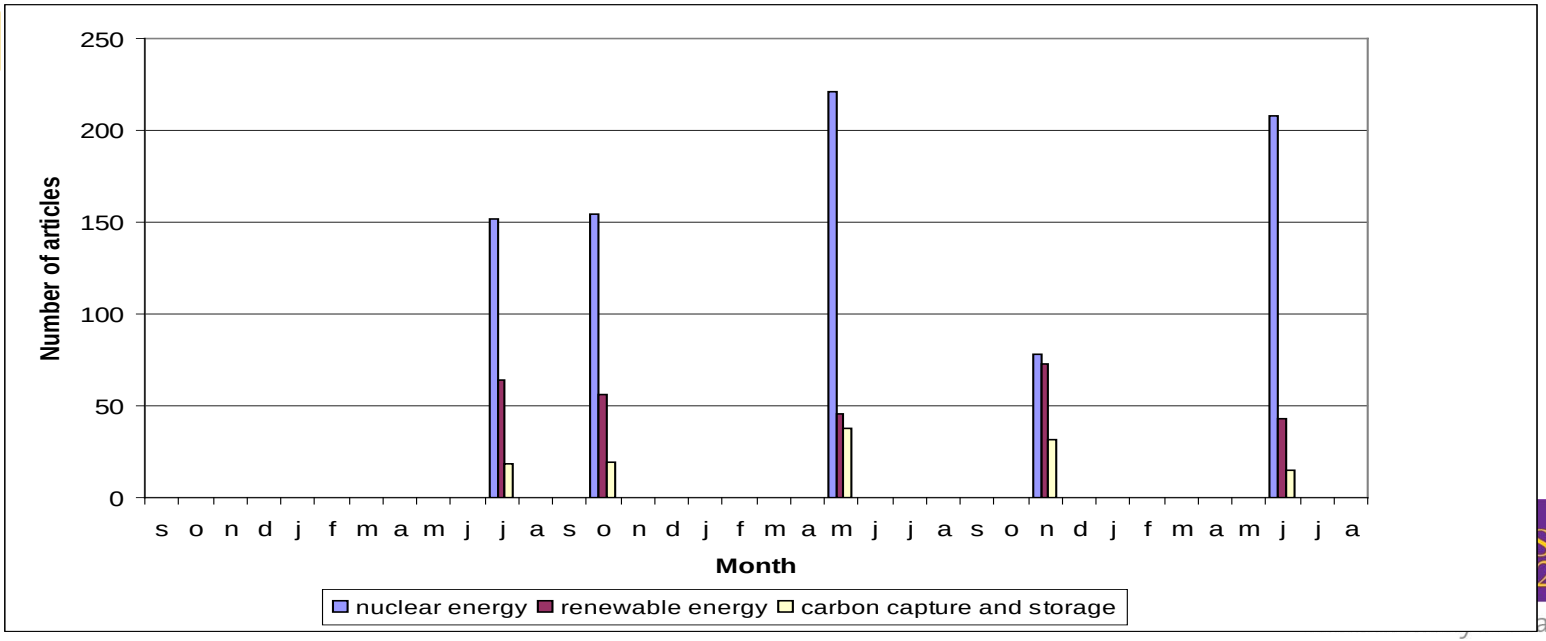
How visible is CCS in the press?





What messages are being given?

- Status of CCS technology development
- Likelihood of leakage from storage sites
- Cost and funding of CCS
- Role of CCS in the UK (& global) future electricity generation mix

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Non Governmental Organisations

Joint statement on coal and carbon capture and storage

Technology Status & Cost:

"Proposals to build new coal fired power stations that are 'capture ready' are a dangerous distraction"

"CCS technology has not yet been proven at scale on an integrated power plant and it may prove not to be technically or economically feasible"

Joint Statement June 2008

GREENPEACE WWF RSPB Friends of the Earth

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Non Governmental Organisations

Role in Future Electricity Generation

"(CCS) has the potential to produce a much bigger cut in CO_2 emissions, and much more quickly, than renewable sources of energy do.

Environmentalists may feel ambivalent about CCS and clean coal are a 'trojan horse' to push through the construction of coal plants.

But given that fossil fuels will power electricity generation for the foreseeable future, carbon-capture technology has a vital role to play in reducing emissions"

Friends of the Earth Sunday Times 4.02.07

Leakage:

We have no convincing evidence that carbon dioxide would not leak back into the atmosphere or the sea.

And unfortunately, the more time and money we spend on CCS, the more likely it is that we will succeed in prolonging our dependency on fossil fuels.

The trouble is it will take decades to come up with evidence for its safety or lack of safety.

Greenpeace, Guardian, 25.06.08

Role in Future Electricity Generation

Greenpeace, Observer 27.07.08

Industry

Role in Future Electricity Generation:

“Main issue is twofold: CCS is important for climate change and we need to start building projects and that requires a funding structure from government”

Lord Oxburgh, Financial Times 09.11.07

“Carbon capture is the only technology for managing climate change that we cannot do without”

Andrew Hanson Centrica, Guardian 25 June 2008.”

(Interview Industry Body 1)

Industry

Role in Future Electricity Generation (Global):

Technology Status

Saturation (Global):

Leakage:

"The technology to deploy carbon capture and storage (is) already there, now it needs to be rolled out on a global scale"

"We have pumped millions of tonnes of CO2 into deep underground fields. We do not see signs of any of it escaping"

"The coal industry is doing everything it can to find ways to make coal cleaner."

Statoil Guardian 25.06.08

Shell Rep, Guardian 15.02.07

UK Rep, Guardian 15.02.07

“Expert” / Scientific Communities

Role in Future Electricity Generation: Technology Status

“Generating power from zero carbon coal and gas is one of the most urgent challenges we face.”

“From an engineering point of view we can say it will not leak. Nature tells us carbon storage is valid now”

“To protect the climate, you have to ensure that no one releases CO_2 by burning coal or other fossil fuels for centuries ahead.”

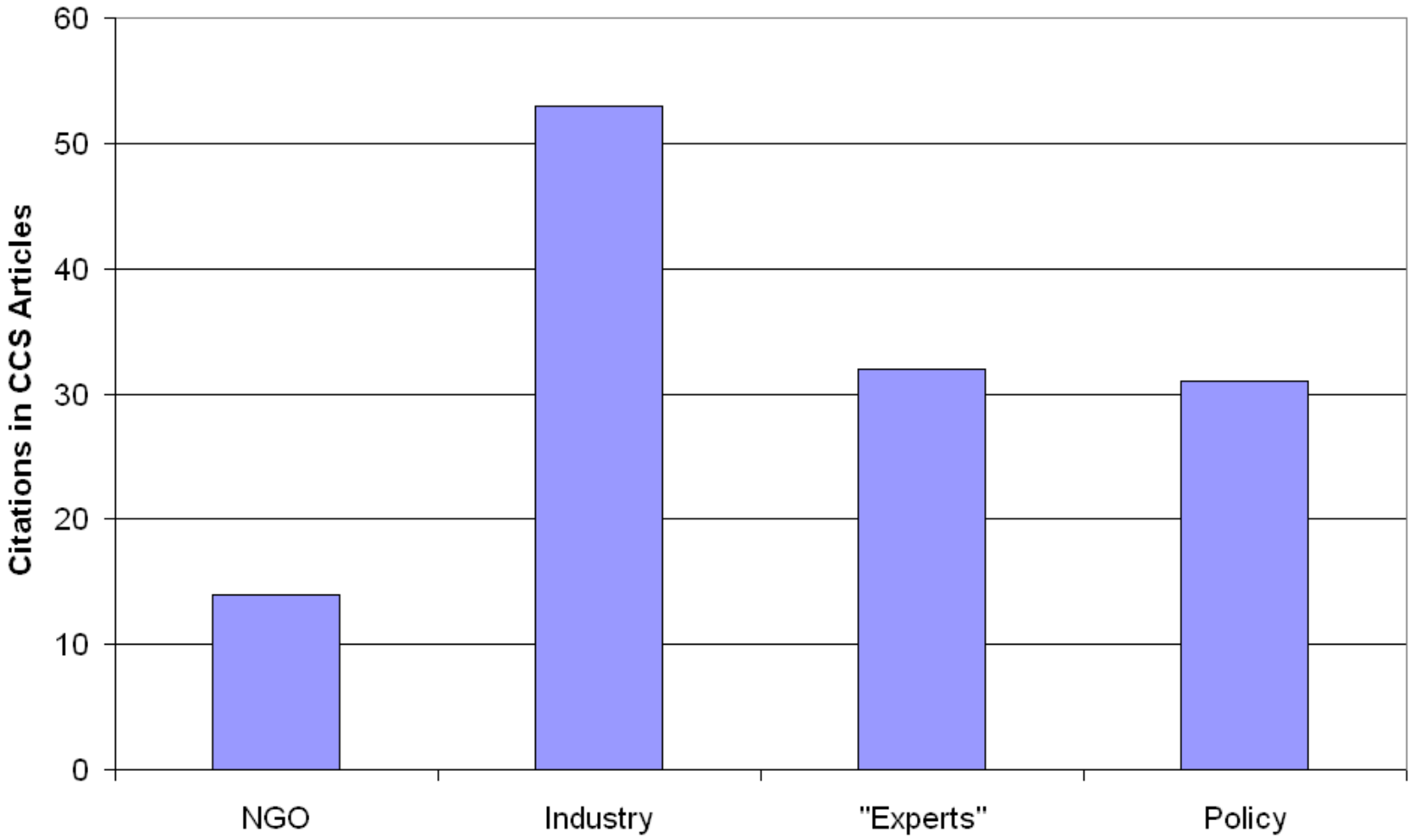
Jon Gibbins, Imperial, Guardian 13 June 2008

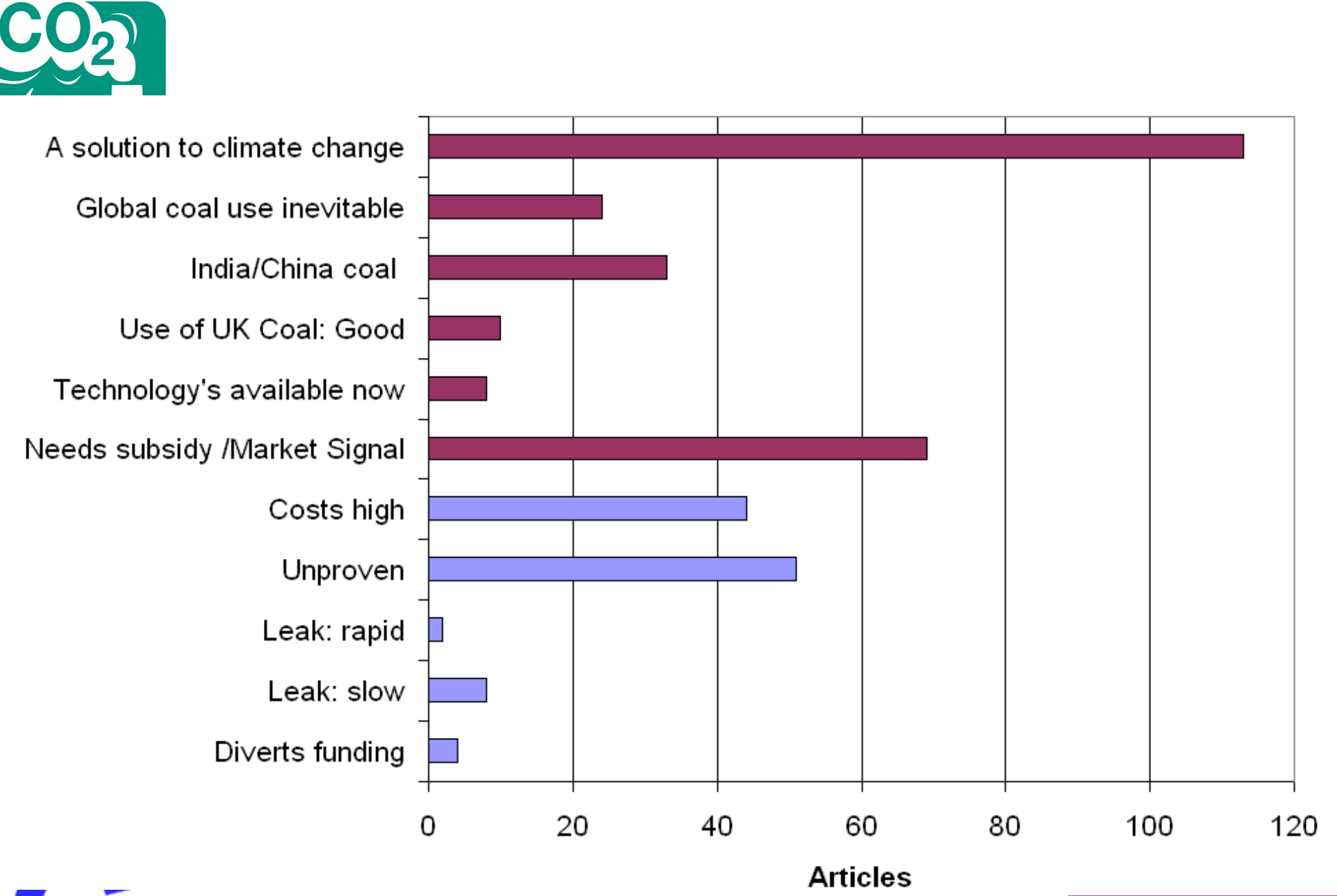
“These fields have existed for millions of years and do not leak. Nature tells us carbon storage is valid now”

Jon Gibbins, Imperial, Guardian 13 June 2008

John Loughead, UKERC, Guardian 13 June 2008

Citations in CCS Articles




A solution to climate change
Global coal use inevitable
India/China coal
Use of UK Coal: Good
Technology's available now
Needs subsidy /Market Signal
Costs high
Unproven
Leak: rapid
Leak: slow
Diverts funding
0
20
40
60
80
100
120
Articles

Emergent Frames

Stage of development of the technology	Technology's there to be exploited	Unproven
Costs	Costs are likely to be competitive, given a carbon price and right market structure	Costs are uncertain; likely to be high; detract funding from renewables
Leakage	Unlikely. Any leakage likely to have minimal impact compared to that of climate change	Long term storage not proven; catastrophic leakage
Role of CCS within UK / Global electricity generation	Buys time to enable transition to alternative energy sources, an alternative baseload to nuclear	Not a long term solution, perpetuates reliance on fossil fuels detracts attention from promotion of energy efficiency / RE

Newspapers, a good source of info?

How many articles explain CCS?

- 3 (7) basic definitions
- 1 (7) detailed (FT)

- Differing levels of detail and information provided in the different papers
  - The Mirror: 6 key messages
  - The Guardian: 23 key messages (no definition!)
  - Mail; Times; FT; Telegraph; Independent: 11 key messages

Would you read an article about CCS?

- Do people read articles?
  - 9 out of 25 chose to read the CCS article in their regular paper
  - Highest number: Independent climate change supplement
  - Lowest number: 0 Guardian article in Financial pages

    "Its under financial, I thought boring. I just, I didn't even spot the heading actually."
  - Requires an interest in energy or climate change

    "I am interested in anything that will help to minimize the impact of human contribution to global warming."

    "Energy? I only care about how much it costs me"

CCS, a familiar technology?

- Less awareness of CCS compared to other low carbon electricity technologies
  - 8 out of 25 were familiar with CCS
  - 25 out of 25 were familiar nuclear and renewables
- CCS recognised as a technology to mitigate climate change
- Limited understanding of the technology
- A range of preliminary opinions concerning CCS

  “Essential for fighting climate change”

  “The coal industry trying to keep itself in business”

What do people understand?

- Articles prompt more questions than they answer

- People questioned the motivations of politicians, academics, NGO's and industry

What impact do articles have?

- Few people without a view of CCS would make a judgement on the basis of one article, particularly given information gaps
- Roughly a third would read articles on CCS again
- No-one would campaign as a result of reading about CCS

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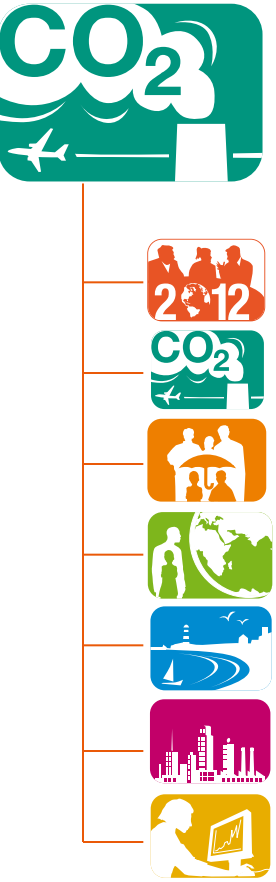
Observations

- Reporting of CCS dominated by coal and its role in the UK's energy mix (75/133). What comes first CCS or new coal?
- Little examination of the technology itself beyond proven or not.
- Minimal discussion of wider applications
- Audience target – opinion formers not public; focus of communications on policy debate rather than what the technology is and does
- Only academics stated desire to inform public about the technology

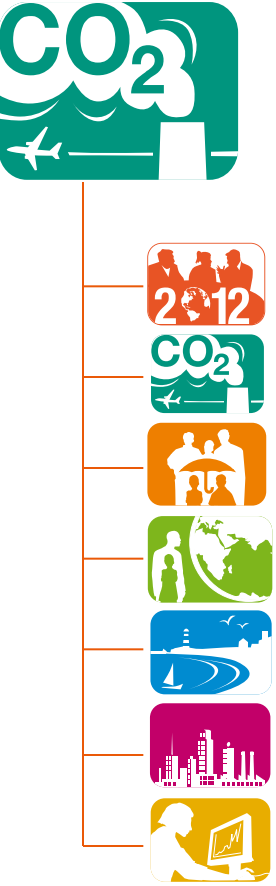
Observations

- Public perceptions are as yet unformed, therefore fluid
- Those interviewed look to the media for information on issues of global and national importance
- Those interviewed considered the media to be a useful way for Government, NGO's and others to communicate with them about policy, new science and technology
- Newspaper articles on CCS, raise more issues than they answer, and in most cases are not read e.g. little information on risk of leakage
- Suggests at present newspapers articles are not doing a good job of informing people about CCS



Thank you

contact:
s.mander@manchester.ac.uk



Thanks for listening….

Any questions?

Please contact:

s.mander@manchester.ac.uk

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Social aspects of carbon capture, transport and storage: Total's Lacq project

Minh Ha-Duong
CIRED

IEA GHG Social Research Network - First Network Meeting
Nogent sur Marne, France, November 2-3, 2009

Outline

A) Reinventing Lacq after a 50yr industrial history

B) From press release to permit in 27 months

C) A questionnaire survey in Jurançon

A - Reinventing Lacq, after a 50 year industrial history

- 1951: natural gas discovered at -3 550 m
- 1957: plant opens at 1 million m³ /day
- 1982: peaks at 33 million m³/day
- Today: < 10 million m³/day
- 2013-17: not the end

- 16 % H_2S, 10 % CO_2
- High Temp. & Pressure

B - 27 months from press to permit

- **Total** press conference (Feb. 8Th 2007)
- ~40 key local actors meeting (Jun-Sep/07)
- Concertation: Web, paper, 3 public meetings (Nov. 07, help from **C&S Conseil)**
- **CLIS:** Local information and surveillance commission meetings (April 08 - present)
- Administrative public survey (July - Sep 2008)
- Authorization (May 13th, 2009)

The project on Total's website

See online

http://www.total.com/fr/responsabilite-societale-envi

Total's concertation

Nov. 2007: 3 public meetings (~300 persons, 3h)

National level experts, real participation

Experience from Cretace 4000 concertation

Topics: risks, transparency, control, economic interest, the platform's future.

Outcome: Climate change information day, CLIS

The CLIS (local information and surveillance commission)

- Legal institution, mandatory in some cases
- Composition: 4 State / 9 locally elected / 2 unions / 4 associations / 5 experts / 4 Total
- Installed 4/2008, met 7 times since
- Hears Total, can order additional investigations
- Reports and documents are made public at http://www.pyrenees-atlantiques.pref.gouv.fr/sections/actions_de_l_etat

The public survey

- 21/7/2008 – 22/9/2008 (64 days), 4 cities
- Double feature: Capture, Transport & storage
- Very weak participation (capture), contrasted (Transport and Storage) with 90% at Jurançon
- Favorable

Other actors

- ENGOs

  SEPANSO Béarn (federation affiliated to France Nature Environment)

  Côteaux du Jurançon (local opposition)

- Research institutes (science comitee)

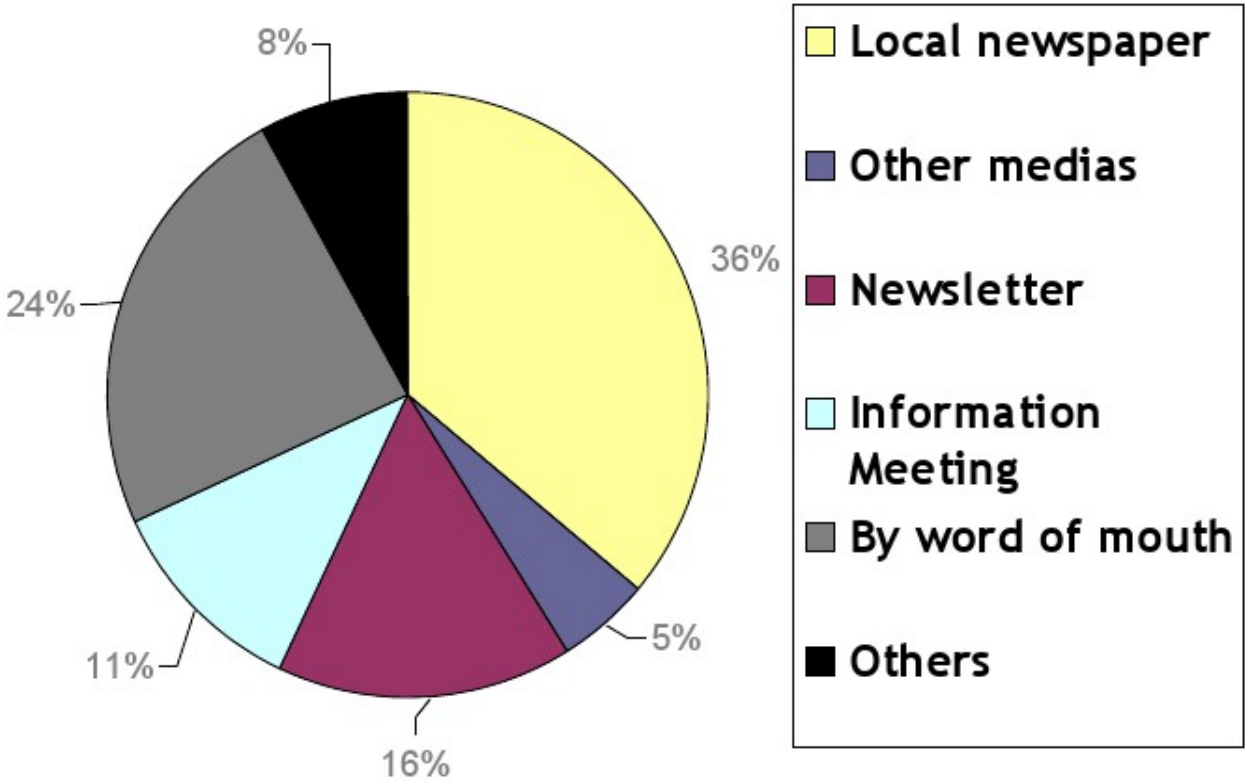
  BRGM, **IFP**, **INERIS**, **CIRED**/CNRS

  APESA (expertise, questionnaires)

C - Questionnaire survey

- Oct. 2008 in Jurançon city (7087 hab.)
- 167 returned (153 useable) on 1206 mailed
- 89 questions !
- Michèle Gaultier (APESA) with contributions from Ana Sofia Campos (CIRED/INERIS) within the SOCECO2 project

How have you been informed of the project ?



- - Avez-vous consulté le site Internet de Total ou d'autres sites Internet : OUI 10% NON 90%
- - Selon vous, l'information dont vous disposez concernant le projet pilote est:
- Tout à fait suffisante: 12%
- Plutôt suffisante: 19%
- Plutôt insuffisante: 23%
- Insuffisante: 32%
- Sans opinion: 14%

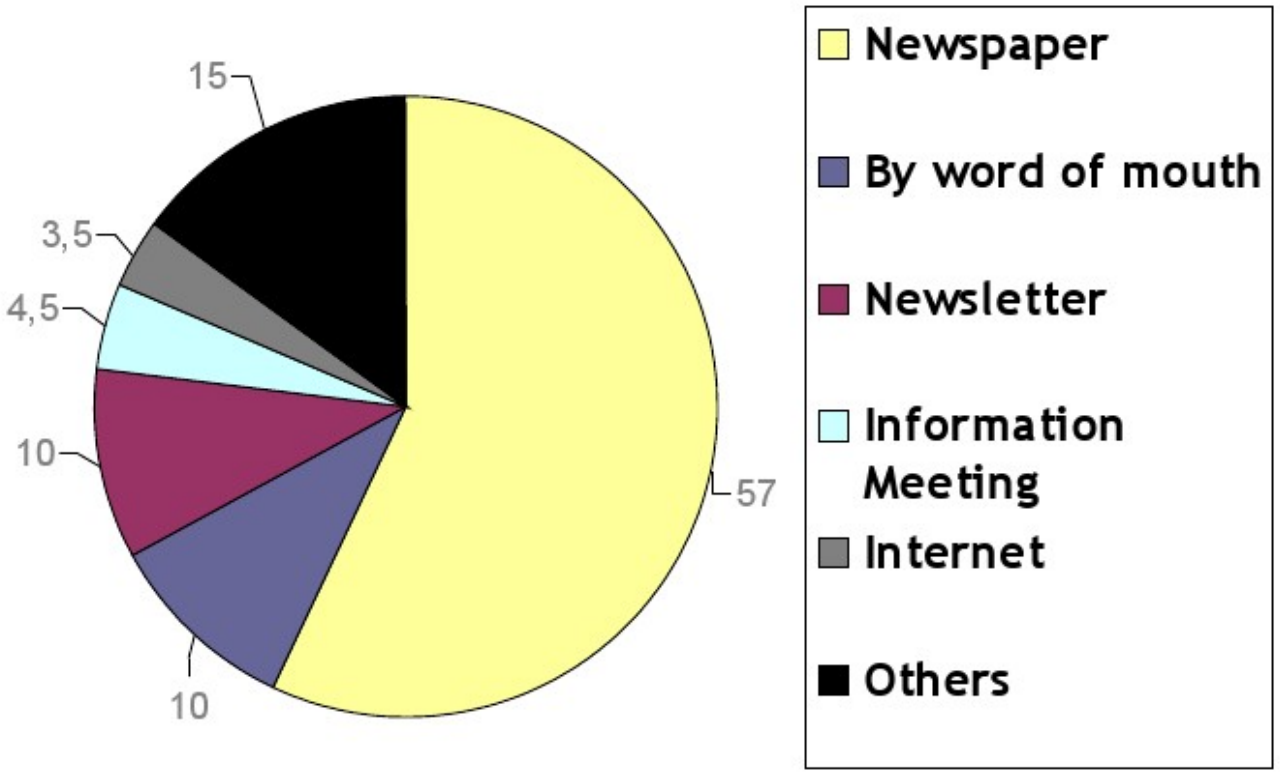
Do you think that the pilot project can bring something to the region regarding:

- - Retombées économiques : 29
- - Emploi : 27
- - Attractivité industrielle : 23
- - Intérêt scientifique : 65
- - Autres : 11

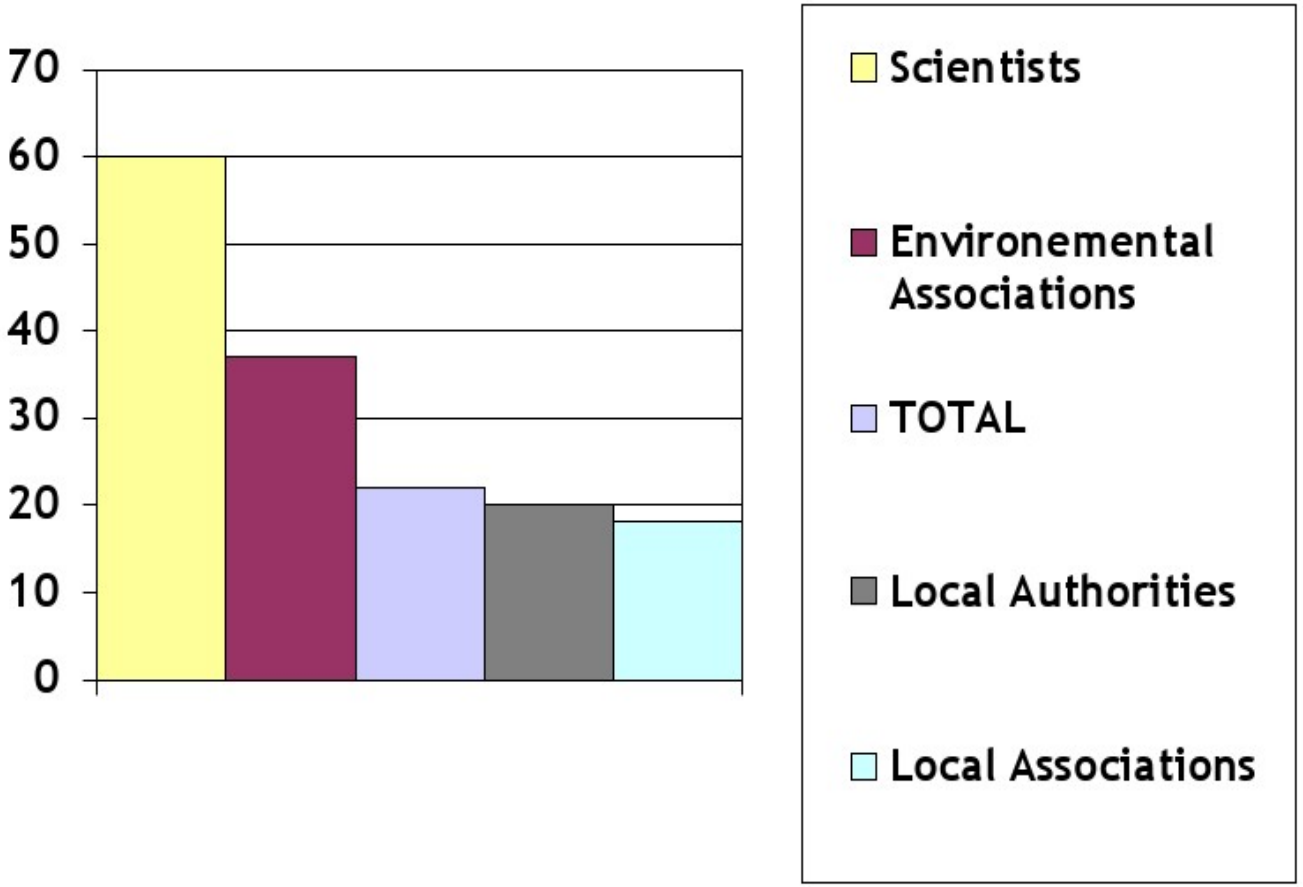
Do you know that Total organized a concertation ?

- -Savez vous que Total a organisé une concertation ?: OUI 40%
- - Y avez-vous assisté ? : NON 87%
- - Avez-vous eu connaissance des comptes rendus et du bilan de la concertation ? : NON 93%

Par quelle source avez-vous été informé de la concertation organisée par TOTAL?



Which sources can bring you additional information ?



PUBLIC SURVEY

- - Did you participate to the public survey
  - YES 9% NO 91%

- - Do you think a public survey is useful for a better consideration of neighbours interest
  - YES 70% WITHOUT OPINION 21 % NO 9%

LOCAL COMMISSION OF INFORMATION

- - Did you know that a local commission has been organized
  - YES 33% NO 67%

- - Have you been informed of the results of the meetings of the local commission
  - YES 10% NO 90%

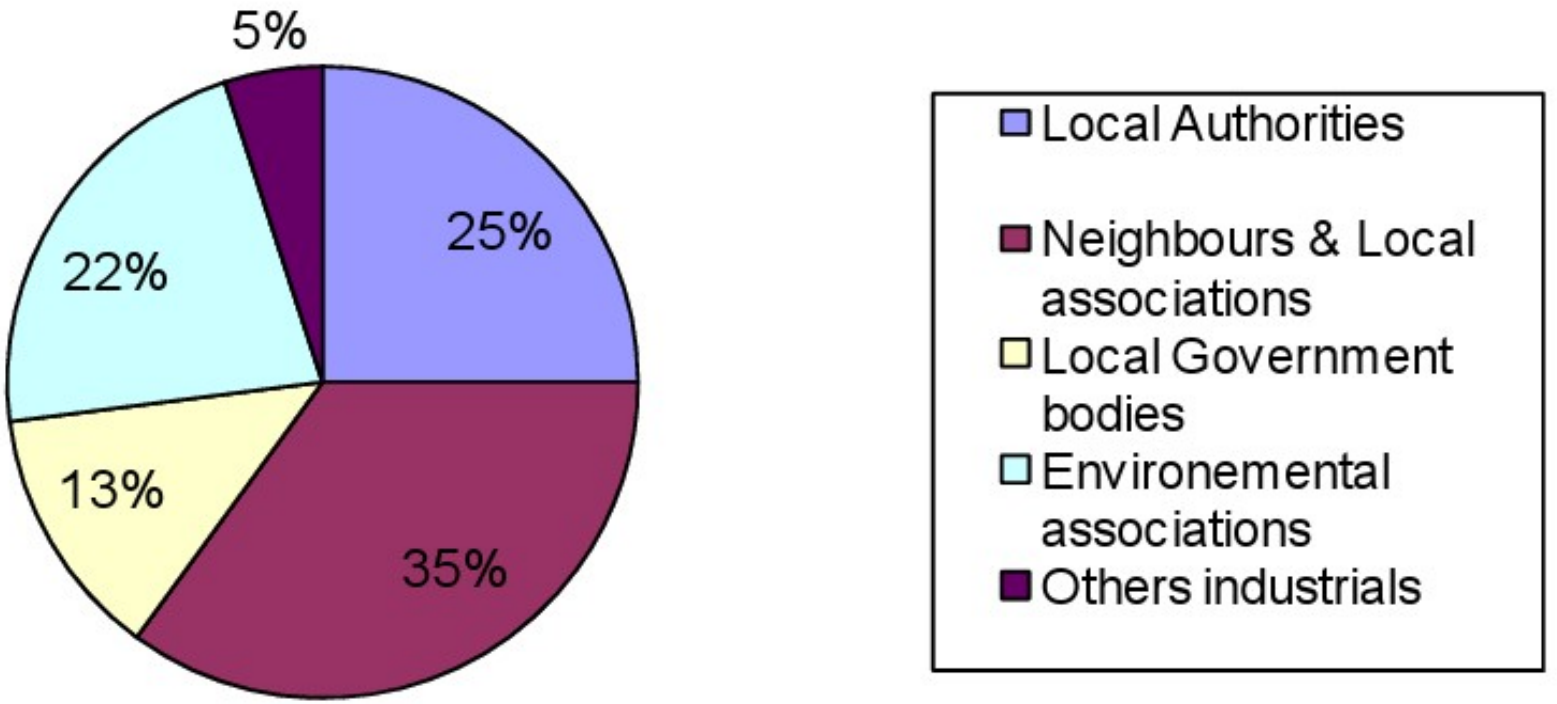
The existing plant of gas extraction

- - Do you think that the operator has good mastery of the industrial risk of this plant
- YES 40% NO 18% DOES NOT KNOW 40%

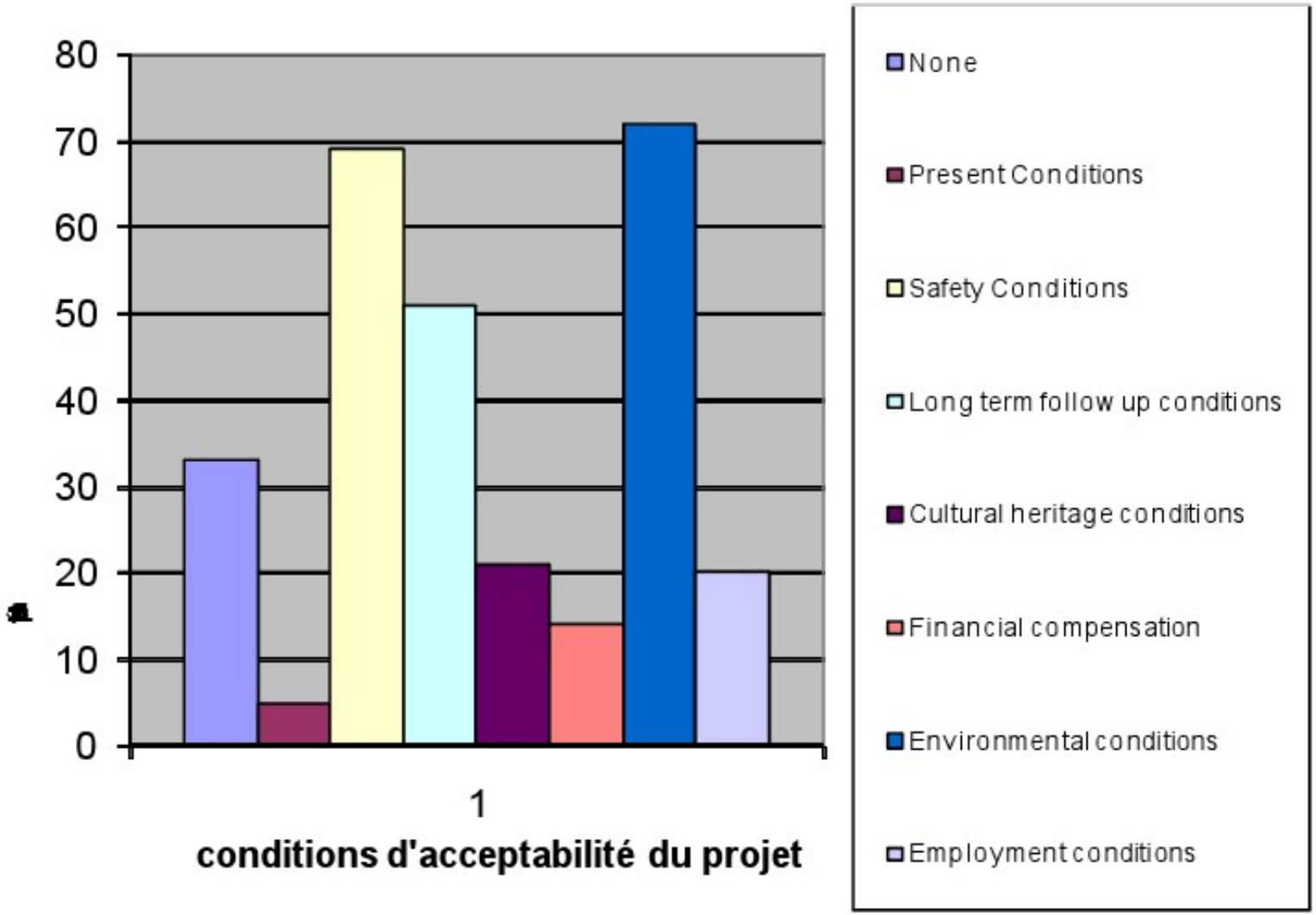
- - Did you suffer from nuisance because of this plant
- YES 31% NO 69%

- For you, is it still necessary to negociate on the implementation conditions for the pilot?
- YES 51% NO 15% WITHOUT OPINION 34%

Who should participate to the discussions around the pilot implementation?



Under which conditions could you agree with this pilot project?



Conclusion

- Favorable social and technical conditions, but technically constrained, not much to negociate
- Pro-active concertation works, but people always want more
- For NGOs, October 2007's « Grenelle de l'environnement » was only the beginning

ECN

Energy research Centre of the Netherlands

Participation and communication near CO_2 capture and storage operations

Findings from case studies in the Nearco2 project

Nearco2 Project Overview

Main purpose is to develop effective strategies for:

- objective communication to stakeholders and the public about risks and advantages of CO2 capture and storage
- involving stakeholders and the public in local decision-making on CCS projects

Main research question:

- Which mechanisms influence public attitudes through the CCS lifecycle? (From the policy stage to planning application and eventually deployment).

Timing and Organization:

- April 1st 2009 – March 31st 2011
- EU project (FP7), 6 Partners, coordinated by ECN

Case Studies: Research Questions

- Which stakeholders were engaged? How?
- Which stakeholders were not engaged? Why not?
- Which concerns were raised by stakeholders?
- Which information and communication materials were used?
- How was the project presented in the media?
- What do stakeholders think of the engagement process and its outcomes?
- How did all of the above affect project outcomes?

Case Studies: Method

Comparison between several CCS cases:

- Barendrecht, the Netherlands
- Ketzin, Germany (CO2SINK)
- Beeskow, Germany
- Lacq, France
- Belchatow, Poland

Additional comparison of CCS cases with non-CCS cases:

1 Wind case in the Netherlands, 2 pipeline cases and

2 biomass cases in the UK, one gas-fired power plant in Spain

Case Studies: Method

Data collection method

- Existing data/data already collected for other projects
- Information obtained through the internet
- Existing “offline” literature such as press articles
- Available project communication materials
- Interviews with key actors

Data collection topic list

- Project features
- National and local project context
- Stakeholder relations
- Information/communication process and materials used
- Media coverage

Public Protest: Barendrecht, the Netherlands

Public Protest: Beeskow, Germany

Public Protest: Ketzin, Germany

Ketzin (CO2SINK)	Beeskow	Barendrecht
Successful	Triggered protest	Triggered protest
Small scale R&D	Exploration for commercial storage	Permitting procedure for commercial storage
Injection in progress	Awaiting exploration permit	IEA finished, awaiting ministerial decision
Funded and managed by GFZ (research institute) and public sector	Funded and managed by Vattenfall (private sector)	Funded and managed by Shell (private sector), partly funded by Dutch government (30 mln)
Rural area, no people living above storage site	Rural area, people are living above storage site	Urban area, densely populated residential areas above both storage sites
History of local industrial development/gas storage, renewable energy sources (biomass, wind)	Strong local appreciation for nature, rural area, no significant industry	History of major infrastructural changes, heavily industrialized area

Ketzin	Beeskow	Barendrecht
No public consultation procedure required	Sufficient to inform and hear authorities affected	IEA procedure to which everybody can submit a view which has to be answered
Communication from research team: Information meetings for local politics and public, project updates, excursions to site	Communication from project developer: Meeting with local politicians, press conference, direct mail to residents, information campaign directed at organizations, information meeting, information center, telephone line, website	Communication from project developer: Meeting with local politicians, two information meetings for the public, website, information center (shared with other stakeholders except municipality)
Information deemed sufficient, reliable	Information deemed insufficient, unreliable	Information deemed insufficient, unreliable
Political support at time of development	Local public and political opposition	Local public and political opposition
Local elections took place recently. In Beeskow a new mayor was elected		Local elections will be held in March 2010
National government does not yet have a clear view on CCS as part of the emission reduction portfolio and has no national communication strategy on CCS		Dutch government created a Taskforce CCS that aims to promote CCS as third strategy after energy savings and renewable energy

Concerns raised

- Safety (Leakage? High pressure?)
- Monitoring
- Property value
- Effective solution?
- Competition with other renewables?
- Beeskow: Tourism may suffer
- Barendrecht: Why here, where so many people live and where we are already surrounded by potential disasters?

Dialogue with Project Developer

- Both Shell and Vattenfall make strong claims about safety
- Shell: “We have done this before, we have experience, our research shows it is safe”
- Public and political response: You can’t claim previous experience because this is new and different, and since this is new you can’t guarantee us 100% safety either

Media Coverage

Lake Nyos, Cameroon 1986

“We are not guinea pigs!”

Dynamics of Public Protest

Similar development across case studies in development of public communication and public involvement:

- Project developer(s) start informing people, but are a low trusted source
- Some members of local public raise concerns to project developer and to local authorities
- Concerns are not being taken seriously (or so it is perceived). Often deemed “emotional” or “irrational”
- Some community members and/or members of local political parties take the lead in organizing public protest
- A process of arguing and counterarguing leads to polarization between proponents and opponents
- Trench war

Barendrecht:
Additional Location Research

- Answers remaining questions of opponents (municipality)
- Results available since Thursday October 29th
- Decision Minister expected within 2 weeks from now
- Press release on Ministerial website:

  “TNO concludes that of the 12 selected locations, only Barendrecht and the P06-Zuid gas field on the North Sea don’t have geotechnical disadvantages. An independent second opinion by Det Norske Veritas confirms the results of this research”

Barendrecht:
Responses in the Dutch media

- Several websites (VARA, Energieraad):
  “CCS in Barendrecht is safe”
- Newspaper NRC/NRC.Next:
  “No extra risks CCS Barendrecht”
- Press release on Municipal website:
  “Several locations suitable for CO2”
- Newspaper Trouw:
  “North Sea only alternative to Barendrecht for CCS”

Association “CO2 is no”

Official since
Monday October 26th

250 members

Poll - blij metactiegtroep?

Barendrechters die zich zorgen maken over de ondergrondse opslag van CO2 kunnen zich nu aansluiten bij de Stichting CO2isNee.

Bent u blij met de nieuwe stichting?

- Ja, hoe meer verzet tegen het CO2-plan, hoe beter het is.
- Nee, want de actiegroep loopt de gemeente voor de voeten bij het tegenhouden van het plan.
- Het maakt niet uit, want de politici in Den Haag zijn toch op de hand van Shell

Stem

“Cootje does not want to die”

Questions and thoughts

- How many people are in favor, against, or just do not care?
- What information need do these groups have (if any)?
- What if Shell/Vattenfall would admit there are uncertainties and let the public think along about how to deal with them?
- Should we present CCS as a strategy in context of global warming and versus other strategies?

Or…

- Frame it as a local project that people can be proud of: Barendrecht is a unique location for learning about CCS, there are economic benefits to the Netherlands, the project puts the town or city on the world map (in a positive way) and may thus stimulate local economy…

Thank you

Case study report available early in 2010

http://www.communicationnearco2.eu

How to get Valid assesments of awareness, knowledge, and opinions of people living near planned CCS activities before during and after implementation?

problem presentation

one suggestion

invitation to come up with solutions

Dancker Daamen (Leiden University)

Direct questions on environmental annoyance (e.g. odour, noise) result in too high estimates of percentages “annoyed” people.

To what extent are you annoyed by the noise made by neighbours

Not at all 1 2 3 4 5 6 7 very annoyed

Dosis-response relations are very weak or non-existent
(Dosis in Decibel, response on scale from 1 to 7)

Unobtrusive survey provides better results

To what extent are you satisfied with your living conditions?

Not at all 1 2 3 4 5 6 7 very satisfied

What adds to your satisfaction with your living conditions?

……..

……..

What detracts from your satisfaction?

……..

……..

Please, tick box if this detracts from your satisfaction with your living conditions

0 distance workplace home
0 noise from neighbours
0 etc.
0 etc.
0 etc.

If respondent mentions noise from neighbours at open question or cued
then ask:

To what extent are you annoyed by noise made by neighbours

Not at all 1 2 3 4 5 6 7 very annoyed

Dosis-response relations are stronger in such indirect, unobtrusive surveys

Educated guesses:

- In communities where CCS projects are planned in the far future, there is not yet much awareness among residents.

- This situation resembles weak environmental annoyance

-Direct questions will result in too high estimates of the percentage of residents who are concerned

Did you hear about a that Company X wants to store CO2 deep under XYZ?

To what extent are you concerned by the planned CO2 storage project?

Not at all 1 2 3 4 5 6 7 very much

- Ironically, these questions may cause people to start worrying about the project (this project must be at least a bit risky, otherwise they would not interview us, residents)

By the way, I guess the same goes for information meetings in an early stage (this project must be risky, otherwise they would not organize this information meeting for residents)

What do you think?

Is this a serious gap?

Suggestion

Do an unobtrusive survey like in annoyance research

To what extent are you satisfied with your living conditions?

Not at all 1 2 3 4 5 6 7 very satisfied

What adds to your satisfaction with your living conditions?

……..

……..

What detracts from your satisfaction?

……..

……..

Please, tick box if this detracts from your satisfaction with your living conditions

0 distance workplace home
0 noise from neighbours
0 etc.
0 etc.
0 the planned CO2 storage project
0 etc.

If respondent mentions spontaneously the planned CO2 storage project
at open question or cued at the closed question,
then ask:

To what extent are you concerned about the planned CO2 storage project

Not at all 1 2 3 4 5 6 7 very concerned

Etc.

You may ask indirect questions also on awareness, opinions, intentions re. the project, media coverage, interventions etc.

Some questions

-Ethical?

Some questions (continued)

-Will this disguise hold if you repeat your unobtrusive survey several times?

- Who gets access to the results of the unobtrusive surveys at what stage?

Do you have other suggestions for a solution?

What Do we Know? What do we Need to Know?

Judith Bradbury

IEA GHG Social Network Meeting
Paris, November 2 and 3, 2009

Focus Group Research

- Focus group protocol drawn up collaboratively by research teams from three partnerships
- Built on previously published surveys
- Focused on seven broad topics:
  - 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

Value of Focus Groups In Research

- Especially valuable in an emerging area such as sequestration:
  - Avoid eliciting pseudo opinions when knowledge levels are low
  - Allow for the emergence of dimensions important to participants
  - Enable researchers to identify fruitful directions for future research
- More feasible to implement in government programs
- Though not representative, can provide useful insights into the perspectives of community stakeholders

Key Finding: Predominance of Social Concerns

- Among all groups, most strongly expressed concerns were:
  - trust in authority
  - concern about the fairness of implementation procedures

Key Finding: Predominance of Social Concerns

- Slight variation in emphasis:

  - West: sense of community empowerment (ability to mitigate risks and ensure just procedures)
  - Southwest: issues of trust and fairness, especially in relation to DOE and oil/gas companies
  - Midwest: underlying distrust of government and private sector to protect public or environment of greater concern than risks of technology per se

- In all cases, opinions backed up by specific examples of breakdown in trust

Management Questions from the Public

- What is the **benefit** to our community? How does the proposed project fit into or **improve** our way of life?
- How can we **have a say** in what happens? Who is in charge? Will the process be **fair** and will anyone **listen** to us?
- What will happen if something goes wrong? Can we **trust** the project developers and the government to take care of problems—what have our previous **relationships** with these entities shown us?

How Do Research Findings Compare with CCS Test Experience?

- Technical issues (leakage, earthquakes, impact on water) frequently raised—but often in the context of underlying social factors
- Differences in policy viewpoints on whether:
  - climate change is occurring
  - climate change or associated regulations will affect one personally
  - "green" solutions alone will solve the climate change problem
  - CCS will result in continued reliance on coal
  - research is a valuable use of taxpayer dollars

How Do CCS Research Findings Compare with Experience?

- What is the economic and social benefit to our community?

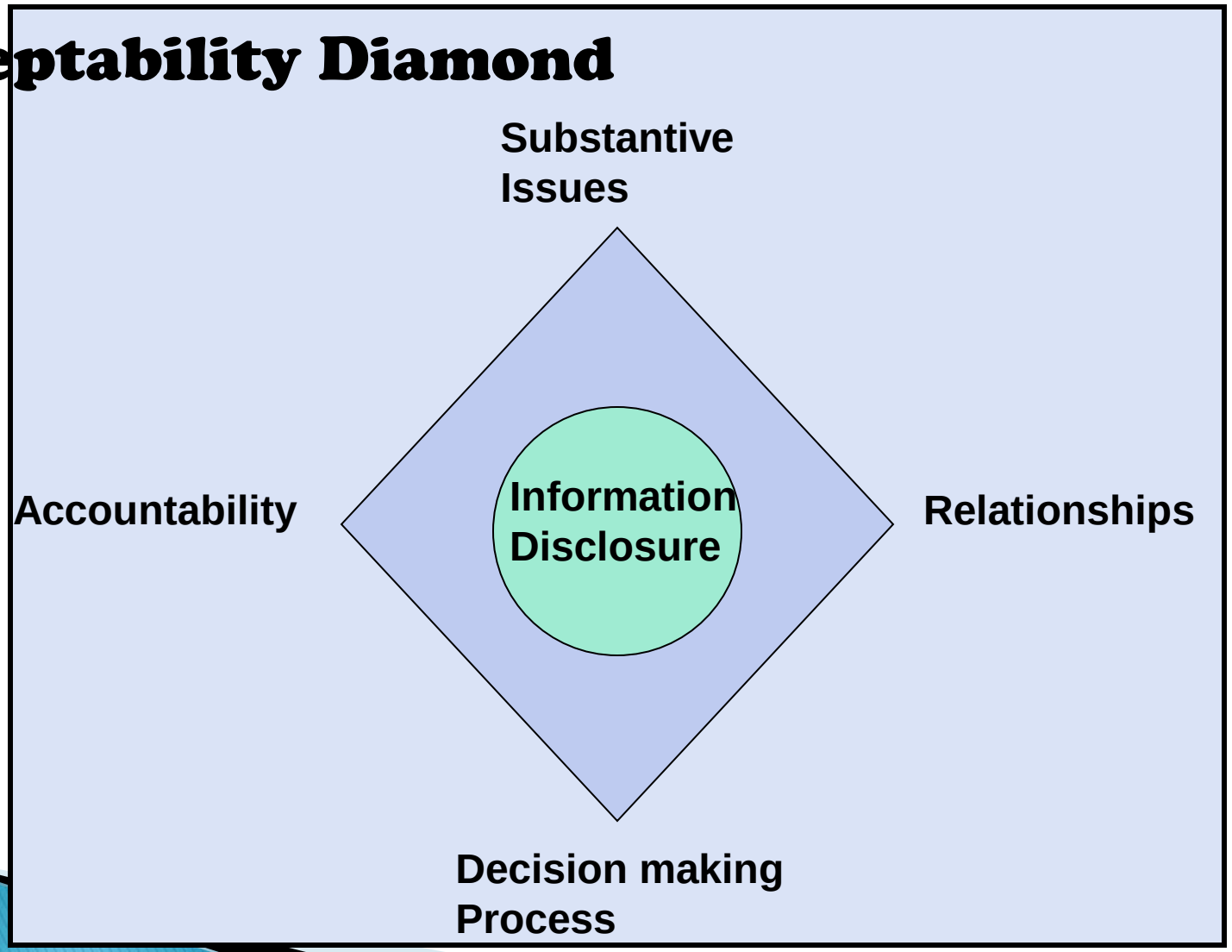
  - how does this technology fit in with our current and desired way of life?

  - what is the benefit vs. risk?
- What has been our previous relationship with the host site? Why should we trust them/you?
- How will you address process issues (fairness, ability to have a say)
- What happens if something goes wrong?

How Do These Findings Compare With Other Research?

Chemical Demilitarization Research

Acceptability Diamond



Interpretation

- Domination of technical risk issues may be misplaced. Rather, social processes are key
- Public perceptions of the risk of technology do not occur in a vacuum. People evaluate new technology through a 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 essential to successful deployment
- But, *management* of these risks is the critical factor

So What are the Research Questions?

- Should we focus on the broader social context
  - link to other policy positions?
  - social factors that affect perspectives on risk/benefit rather than the technical risks?
  - social relationships at the proposed host site?

- Is a social characterization needed? How? When?
- How can we address “what if” concerns?

So What are the Research Questions?

- What is the most effective way to communicate (in the broadest sense) with various stakeholders?
- What is the impact of the social media on a complex policy issue?
- How can we facilitate the use of our social science knowledge by decision makers and policy makers?
- Does an activist, vocal group speak for the community?
- What is the role of the social scientist in an applied setting?

Research Gaps

- Preliminary discussion showed strong differences and interest in both descriptive (normative / theoretical) and prescriptive (applied) research
- Strong focus on the issues, processes, implications and reactions to siting
- Suggested research questions:
  - How should we consider the broader social context
  - What is the link to other policy positions?
  - What social factors affect perspectives on risk/benefit; how does this impact perspectives on the technical risks?
  - What are the social relationships at the proposed host site?

Research Gaps

- Research questions; continued:
  - Is a social characterization needed? How? When?
  - How can we address “what if” concerns?
  - What is the most effective way to communicate (in the broadest sense) with various stakeholders?
  - What is the impact of the social media on a complex policy issue?
  - How can we facilitate the use of our social science knowledge by decision makers and policy makers?
  - Does an activist, vocal group speak for the community?
  - What is the role of the social scientist in an applied setting?
- Unresolved questions:
  - Research priorities?
  - Ethical implications?
  - How to promote role and understanding of value of social science research?

Social Science Research Gaps

- What do we know?
- What do we think would be interesting to study?
  - Unanswered questions
  - Potential to inform policy
  - Potential to inform project developers
  - Potential to motivate and support radical socio-technical change
- Who else do we need to involve?

IEA Greenhouse Gas R&D Programme

IEA Greenhouse Gas R&D Programme

1st Social Research Network Meeting

Hosts : CIRED

Paris 2-3 November 2009

1st Social Research Meeting Agenda

1. Setting Aims, Objectives and Scope
2. Current Research
3. Measuring Public Awareness on CCS
4. Strength of Opinion – How These Move or Not
5. Application into Real World
6. Synthesis – Identification of Gaps
7. Meeting Conclusions and Recommendations

+ Posters

Objectives and Scope

- **Objectives:**
- **Ensure high quality social science research**
- Elevate reputation and acceptance of social science research to help people understand the value of it.
- Consistency of our research
- What are the gaps in the work we are doing
- Develop better appreciation of social processes
- Engaging alternative theoretical approaches and raising awareness of alternatives.

Objectives and Scope

- **Objectives:**
- **Promoting a learning environment**
- Learning from one another
- Exchange of ideas
- Preventing overlap - ongoing research projects
- **Building capacity within the social research network**
- Promoting student and researcher exchange

Objectives and Scope

- **Objectives:**
- **Translate studies into tools or applied lessons**
- Apply insights to actual CCS projects
- Interact with technical experts
- Technical communication challenges
- Communicate results to policy makers
- Brokering between social science and technical perspectives
- Helping to ensure application is grounded in theory
- Importance of language/trust
- **Create a database of social science research – clearing house of tools**
- Building objective information

Current Research

- Concerns about constraints on openness and academic freedom driven by need for institutional approval, government and industry sensitivity on ‘live’ projects
- Concern over quality of information sources available to the public
- Time burden of engagement for researchers and tensions with other pressures desire not to be seen as advocates, peer-reviewed articles versus immediacy
- Different agendas are inevitable so need to make agendas more explicit and clearly state starting assumptions and goals of individual research projects.

Measuring Public Awareness on CCS

- Public surveys for national population are still useful to provide implication for policy making, especially for setting baseline of public opinion and periodical assessment of public attitude toward GHG mitigation technologies, although it is costly to do well.
- Focus groups and interviews for local public provide insights of local perspectives on the issues as well as they work as a part of outreach program.
- Focus group vs ICQ: group discussion in focus groups might interfere each participant make clear opinion on the projects or help them understand the projects from different views? Meanwhile ICQ would help participants keep thinking over the issues for a long time and reach relatively stable opinion?

Strength of Opinion – How These Move or Not

- Uninformed opinions are sometimes highly unstable, sometimes moderately unstable. Why, we don't know yet
- Informed opinions are stable and resistant to vivid information on alleged risks of CCS
- It helps people to judge CCS in the context of portfolios with info on all dimensions. Portfolio preferences are quite stable.

Application into Real World

- Project experiences beneficial to understand firsthand public perceptions
  - The focus is on projects that have failed or presented challenges, should also incorporate perspectives from projects that are on-track – what works?
- Public opinions and actions are fluid for CCS currently
  - Focus on understanding turning points and catalysts – what causes shift from neutral to opposition?
- Media can raise more questions that it answers
  - Focus on who using media, what messages delivered, do readers use information to make decisions – value of cultivating knowledge in media?
- Framing CCS as global or local
  - Focus on context may change depending on community – what impact does this focus have on public perceptions? (projects perceived as positive solution to climate change to be proud of)

Synthesis – Identification of Gaps

- Preliminary discussion showed strong differences and interest in both descriptive vs prescriptive research and theoretical vs applied
- Strong focus on the issues, processes, implications and reactions to siting
- Suggested research questions:
  - How should we consider the broader social context
  - What is the link to other policy positions?
  - What social factors affect perspectives on risk/benefit; how does this impact perspectives on the technical risks?
  - What are the social relationships at the proposed host site?
  - How do we know the validity of the opinion?

Synthesis – Identification of Gaps

- Research questions; continued:
  - Is a social characterization needed? How? When?
  - How can we address “what if things go wrong” concerns?
  - What is the most effective way to communicate (in the broadest sense) with various stakeholders, and determine who they are ?
  - What is the impact of the social media on a complex policy issue?
  - How can we facilitate the use of our social science knowledge by decision makers and policy makers?
  - Does an activist, vocal group speak for the community?
  - What is the role of the social scientist in an applied setting?
- Unresolved questions:
  - Research priorities?
  - Ethical implications?
  - How to promote role and understanding of value of social science research?

Meeting Conclusions

- Need to bridge basic and applied research?
- Challenge of getting social science research used by decision-makers
- Can’t start too early in public engagement ?

Meeting Recommendations

- Develop research agenda
- Within network peer review and pre-review
- Deepen international comparative research
- Greater evaluation of alternative methodologies
- Expand exchange of researchers
- Learning to apply other social science experience to CCS
- Increased theoretical basis
- Clearing house
- Bridge basic and applied research
- Share best practices

- Promote

IEA Greenhouse Gas R&D Programme

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Chaire d'Enseignement et de Recherche sur le captage, le transport et le stockage du CO2

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