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Internet-based public debate of CCS: lessons from online focus groups in Poland and Spain

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Abstract:
This paper makes three contributions to the developing literature on public opinion and understanding of CCS. The first is a discussion of online focus groups as a deliberative method in experimental and perhaps consultative contexts. The second is the role of anchoring and associative reasoning in the development of public opinion of CCS, illustrated through the coincidental timing of the investigation with the Fukushima nuclear accident. The third is a discussion of managing public-facing energy messaging in an age of public access to online information. Two multi-day, online focus groups or "dialogue boards" were held, one in Poland and one in Spain, with participants drawn from regions with active CCS development potential. The nature of the groups led to participants being subject to wider social influence through discussion of the topic off-line. They were also able to research and present evidence on the topic to the group, deepening debate and allowing the emergence of 'experts'. The study illustrates and affirms the importance of trust in message source, the difficulties of challenging pre-existing concerns and opinion and the challenge potentially posed by access to conflicting online information.

Keywords: Carbon Capture and Storage (CCS); perception; risk

Running title: Public energy messaging

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1. Introduction

CCS is seen by many energy analysts as an important, even if temporary, technological solution to the problem of urgently reducing carbon emissions from large fossil fuel combustion plants (IPCC, 2005; Stern, 2007). The technology essentially involves capturing CO_2 emissions at the combustion source, compressing it for transport and transporting it (usually via pipelines) to a suitable geological storage site such as saline aquifers or depleted natural gas reservoirs. However, CCS is also controversial and whether or not CCS will actually or necessarily be used to provide development and implementation time for renewable energy is the focus of considerable debate. With some exceptions such as Bellona, environmental NGOs are generally at best ambivalent about this aspect of the case for CCS. Hence Greenpeace (2008) argue that there is a risk that CCS may further entrench fossil technology lock-in, with CCS used as an excuse for energy companies to continue relying on fossil fuels by allowing promises on capturing emissions without a reliable timeline for their replacement (the terms “fig-leaves”, “greenwash” and “Trojan Horse” are often mentioned by opponents to describe CCS: see Corry and Riesch, 2012). In addition to these concerns, recurrent themes in public opinion studies include a focus on the risks perceived to accompany CCS, such as possible CO_2 leakage from the reservoir (e.g. Oltra et al., 2010; Upham and Thomas, 2011).

Moreover, a decade of studies internationally have consistently shown that for the public

CCS is not a widely known or understood technology (Curry et al., 2004; EC 2011; Gough et al., 2001, 2002; Ha Duong et al., 2009; Huijts et al., 2007; Itaoka et al., 2004; Miller et al., 2007; Reiner et al., 2006; Shackley et al., 2005). Even when self-knowledge of CCS has been judged by respondents to be good, factual cross-checks have shown that people over-estimate their own knowledge of CCS, though the extent of this varies across countries (Curry et al., 2007; de Best-Waldhober and Daamen, 2006; Reiner et al., 2006). Given a limited level of information provision, research respondents also typically prefer renewable energy over CCS (e.g. Oltra et al., 2010; Reiner et al., 2006; Shackley et al., 2005; Upham and Roberts, 2011; see also Itaoka et al. 2004).

Provision of information about CCS is known to influence opinion, often (though not always) negatively (Brunsting et al., 2011a, 2011b; L'Orange et al., 2011; Wallquist et al., 2011; Oltra et al., 2012). In the focus groups of Upham and Roberts (2011), for example, the concerns about CCS that emerged in the focus group discussions were not allayed by the provision of further information. In fact provision of additional information about CCS led to an increase in approval of nuclear power relative to CCS (ibid). Wallquist et al. (2011), using an online experimental survey, have shown that information on CCS can both increase and decrease risk perception and perceived benefit on CCS, depending on the content given. Indeed most studies of public opinion of CCS have tended to be conducted under the condition of CCS being an initially unfamiliar technology. As de Best-Waldhober et al. (2006, 2009) argue this leaves them vulnerable to recording "pseudo-opinions", in the sense of inaccurately reflecting opinion that might be developed under better-informed and more considered conditions. However, the highly

controlled conditions of an information choice questionnaire as used by de Best-Waldhober et al. (2006, 2009) would be unusual, even if perhaps democratically valuable.

A more realistic set of conditions for attitude formation might be those that enabled discussion with family or friends, influence by opinion formers through various media and arrival at more or less stable conclusions. Action-research activities in social site characterisation and community engagement for CCS projects have allowed for exploring public attitudes towards CCS developments in naturalistic settings. By means of tools like focus groups, large group processes (LGP), focus conferences and information meetings, recent studies have gathered socio economic information, while at the same time informing the local public, building trust, assisting public opinion forming and raising public awareness (Wade and Greenberg, 2009, 2011; Ashworth et al., 2012 and Brunsting et al., 2012). Focus groups comprise mostly 2-3 hours with 8-15 participants, LGPs comprise 1 day with 90-115 participants and focus conferences span two weekends with 10-25 participants leading to a positioning paper. The results of the LGPs in Australia and Canada resulted in a positive change in attitude toward CCS, while in The Netherlands and in Scotland there was a negative change in attitude (Ashworth et al., 2012). At the same time in the Dutch LGP it also appears that the attitudes toward CCS became more polarised after the LGP: before the LGP most participants had a neutral attitude, while after the LGP, people tended to be more positive or negative toward CCS with fewer respondents being unsure (Brunsting et al., 2011c).

With the above in mind, this paper discusses the results and implications of two online

focus groups or “dialogue boards” held with respondents to a large-scale survey on perceptions of Carbon Capture and Storage (CCS) technology in general and local projects specifically, in Spain and Poland. The survey results are available separately (Reiner et al., 2011). This is the first attempt to explore the application of online focus groups in the research on the public opinions of CO_2 storage sites. The exercise combined elements of research and public engagement, and in this sense explores the use of online dialogue boards as both a social research tool as well as investigating their potential as a public engagement mechanism. The latter has, to our knowledge, not been undertaken before in the context of CCS. Furthermore, we have been able to use the online focus groups to explore whether having participated in a social science survey on risk perceptions surrounding CCS affected participants' views of the technology, which again has to our knowledge is novel.

The online focus groups investigated participant perceptions of the risks and benefits of CCS and the perceived roles of industry and state actors, as well as the effects of the survey itself on opinion formation. The research design was intentionally such that participants had some level of knowledge of the technology as a result of participating in the survey, which provided information on CCS (see Reiner et al. 2011). This allowed for reflection and discussion outside of the focus group, as well as the opportunity to seek additional information, adding an extra dimension of realism relative to the more common, closed focus group design, in which participants have only each other to discuss with for a short period of time.

The dialogue board study drew on participants in an opinion survey conducted in five European countries (the Netherlands, the UK, Germany, Spain and Poland), where CCS projects are currently being planned. The survey compared a national sample with residents living nearby the planned projects and the results are reported separately (Reiner et al., 2011). Among other things, the survey investigated respondents' perceptions of the risks of the technology, where they would go for more information and which actors they trust to provide impartial information. Also investigated were the level of trust in the local planning process for energy infrastructure and the extent to which participants thought that local views and opinions are being taken into account sufficiently. A positive correlation between trust and perceived justice in the planning process and more favourable views on the CCS developments was found, as hypothesised (ibid).

The intention of the dialogue boards was to add a qualitative dimension to the survey, including the opportunity for respondents to pose reflective questions through use of a relatively novel discussion process. Poland and Spain were chosen for the study because of the relative similarity of the two planned projects (near the towns of Bełchatów in Poland and Ponferrada in Spain; for more information and brief characterisations of the two sites please see Reiner et al., 2011). The rationale for country selection was not to select for country contrast, but rather to explore the role of the online methodology as a means of deliberative engagement under experimental conditions.

Discussion prompts used as part of the DBs related to: (1) the nature of the risk and

benefit perception in relation to CCS; (2) how and whether participating in the survey had influenced the views of respondents; and (3) the perceived role and trust in politicians, energy companies and the political process with respect to managing CCS adequately. A further theme emerged and became dominant, unexpectedly so. Immediately prior to and through the course of the focus groups, dramatic events unfolded at the Fukushima nuclear power plant in Japan, where one of the most serious civil nuclear accidents in history took place following a major earthquake and tsunami (BBC, 2011). As a result, a physically remote event provided, through what we suggest was a combination of risk amplification through the news media (Kasperson et al., 1988) and analogous reasoning (Sternberg, 1979a, 1979b), linkage of the risks perceived to be posed by both CCS and nuclear power. In the final part of the discussion we consider the implications of such rapid, online access to information for CCS-related messaging.

2. Method

Survey participants from Spain (n=535) and Poland (n=407) were given, at the end of the survey referred to above, the option of participating in an online focus group study. Potential participants were told that the aim was to probe deeper into their opinions on the issues raised by the survey. Of those that indicated that they were willing to participate, 30 respondents per country were selected by the survey firm, reflecting a representative mix of gender and age. These individuals were asked to log onto a specially constructed forum website about a month after the main survey. The dialogue boards took place over two days, the 15th and 16th March 2011, which happened to be the

week after the 11th March earthquake and tsunami in Japan, which in turn caused a nuclear accident at the Fukushima nuclear power plant.

As we discuss below, the latter event was very much in participants' minds and has certainly influenced how they talked in terms of the unpredictable consequences of technology. Participants were asked to log in at least twice a day to answer and to discuss a set list of questions provided to them the day before each discussion. The forums were moderated by native speakers of each language. As the role of the moderator in an online focus group is more passive than in traditional focus groups, the schedule itself played the role of a much needed and useful starting point to gather participants' reasoned initial responses and then generate discussions among them.

The discussions provided qualitative data and were analysed for emerging themes. The themes that emerged were coded and categorised as participants' perceived benefits of CCS, the perceived disadvantages, perceptions of the local projects, perceptions of industry and political actors and of political efficacy, and finally regarding information provision and perceptions of the survey and of the dialogue boards themselves. The online dialogue boards (hereafter DB) were treated methodologically as a variant of the focus group methodology (see Bryman, 2001). There are however differences between traditional "face-to-face" focus groups and online discussion boards. While the methodology to our knowledge is still fairly uncommon in academic research, online focus groups have been used for a number of years in market research (for further discussions see Lang and Hughes, 2004; Oringderff, 2004; Reid and Reid, 2005 and

Turney and Pocknee, 2005).

Turney and Pocknee (2005) argue that online focus groups fulfil most of Krueger's (1994) criteria required of focus groups, and can therefore be considered as a legitimate version of that research methodology. Some of these differences however are:

- Participants in online focus groups do not see each other and can therefore not respond to (or convey) non-verbal cues such as face expressions or hand gestures.
- As participants take part in their own homes, in principle they have more time to consider and think about their responses, which makes completely spontaneous responses less likely than in traditional focus groups. On the other hand, this condition gives less articulate or confident members of the discussion board time to think about and consider their answers and the rather neutral social dynamic makes it more likely that they will actively participate.
- Online focus groups require internet access and at least some basic familiarity with online communication, which not all members of society have. This same feature, though, can also widen the potential pool of participants, for example to those with mobility problems.
- Online focus groups give participants a greater scope for hiding their identity, which may make participants more likely to share opinions particularly on more sensitive topics.
- The format allows participants to introduce new information themselves (i.e. through pasting in a link to a website) and therefore bring their own visual and

text stimuli to the discussion.

- Although dependent on how the focus group is set up, the format can, as in the present case, allow participants to join and leave at their own time, thus introducing a timing element to the discussion (i.e. the direction of a discussion can be changed part-way through by a member joining at a particular point in time).

For present purposes, the benefits of online focus groups were clear, as they allowed recruitment of respondents from those who participated in the survey and who were separated geographically. The online format also gave us the option of regulating what participants saw of each others' answers. Respondents were only able to see other participants' answers to specific questions once they had answered themselves, thus removing one of the traditional features of focus groups, whereby participants tend to influence each others' opinions continually. This influence was less evident in our virtual groups and coupled with the fact that participants had more time to provide reasoned responses and were more anonymous made for a different dynamic in the discussion.

Hence the moderation of the DB consisted, first, in providing participants with an initial list of specific questions to gather participants' views on CCS. After this, participants were able to see each others' answers, opening the opportunity for a real debate. The moderators' role was, then, to add new questions regarding specific comments posed by participants, to open new topics, to ask for clarification for a particular phrase or sentence, or to introduce new information (such as texts or webpages) to stimulate the

discussion. In terms of moderation, and as compared to conventional focus groups, the DB allowed a more strategic and structured introduction of questions to be discussed. The use of structured facilitation and stimulus materials over two and a half days enabled participants' attitudes and understandings to be elicited, as well as generating a process of learning and deliberation.

3. Emergent themes

The first day of the online focus groups involved general questions on the technology and was more lightly moderated to ensure that the discussions progressed in a direction that the participants found interesting. Particular attention was paid to how participants viewed the benefits and risks of CCS, and their attitudes towards industrial and political actors. The second day involved more focussed questions about the survey itself, whether participants had sought additional information independently, whether they discussed the issues with friends or family, and the extent of any opinion change due to reflection and the foregoing factors. More general questions were also posed that contextualised CCS in terms of larger debates on, for example, global warming or energy security.

3.1 Perceived benefits of CCS

3.1.1 Pollution control

Reducing pollution is perceived as one of the main benefits from CCS. While climate change was discussed extensively, for the majority the framing seems still be one of

waste or pollution rather than the more intangible and abstract issues of climate change. In a fairly typical example of this type of response, one participant argued that: "Reducing pollution always brings a better quality of life for us and for the future generations."[i] (Spain). Participants also often referred to cleaner air as beneficial to people's health, with CO_2 seen as polluting the air and thus reducing the quality of air we breathe. CCS was initially framed as an environmental technology linked to the efforts and the need to reduce pollution and climate change. In this sense, it was perceived as a good idea.

3.1.2 Climate Change

In the Spanish group, climate change was not a significant topic at the beginning of the discussion and not much emphasis was given to this issue. When asked specifically if the need to mitigate climate change makes CCS an acceptable technology, some participants considered CCS as a necessary part of the solution. Here, participants established a clear relationship between CCS and the need to reduce CO_2 emissions. Indeed, when the links between the technology and the regional CCS development project and climate change were made explicit, many participants expressed a more positive attitude towards CCS.

However, for others, the need to respond to climate change did not generate a more positive view of CCS. These individuals considered there to be many other mitigation options and CCS was not seen as a good solution, with some stating that CCS could simply and primarily be an excuse for continuing to emit CO_2.

While broadly similar opinions were voiced in both groups, the Polish DB also included a few participants who were sceptical about the reality of climate change or the role that CO_2 from power plants plays in it. In this context, CCS understandably made less sense to these participants. However, even those sceptical about climate change were aware that Poland needs to meet EU emission targets in order to avoid heavy fines, and thus reducing emissions would still financially benefit Poland as a whole, or the individual through lower electricity prices (the counter arguments about the higher costs of CCS and climate change mitigation strategies are discussed below).

3.1.3 Development of technology

Some participants, usually not the more active, stated that the development of CCS could be an opportunity for Spain or Poland in terms of furthering technological advancement in these countries. Linked to this idea, participants discussed whether the project would generate qualified jobs in the R&D sector. This seemed to be an important topic for participants.

> I am in favour of CCS. It is supposed to strengthen the Polish position on the international arena (although I somehow don't believe it) (Poland)[ii]

Other participants argue that the cost is too high, with any potential economic benefit needing to be counterbalanced: that there are many other technologies that could be invested in and that CCS will not generate many jobs.

3.1.4 Energy security

Participants were not accustomed to the term 'energy security' and found the concept confusing, despite, for example, a spontaneous discussion about energy security occurring in the context of Poland's reliance on coal for its energy. In Spain, few participants understood the relationships between CCS and energy security. This may also reflect the concerns that some participants had as regards Spain lacking large coal reserves (i.e. energy security relating to coal would be less relevant in Spain than in Poland). However, when asked explicitly about energy security towards the end of the Polish DB, the participants did not see any obvious connections either, or stated that they did not understand the question.

3.1.5 Energy Transitions

It was argued by some participants in Spain that CCS could help in reducing the problems of climate change while other solutions were sought and implemented (reduced consumption, zero emission appliances, renewable energies, etc). This was an argument used by those more favourable to the technology. This argument however was not made in Poland and negative participants in both Spain and Poland argued that CCS is not a solution to the needed transition, but just hides the problem.

3.2 Disadvantages: perceived risks and costs

3.2.1 Risks to health and environment

How to handle the risks associated with the storage of a CO_2 was the main issue of

discussion in both DBs and tended to dominate discussions over perceived benefits. Even those more positive towards CCS were concerned about safety and the environmental consequences. A fatal leakage (to the residents rather than the project) is a recurrent image for many participants; also prevalent was the idea of CO_2 as a dangerous waste. The unpredictability of the risks were an important aspect in reducing acceptance of the technology, with participants arguing that the technology is still new and underdeveloped, and that it is unclear how the CO_2 will behave in the long term:

> The project assumes that the developer looks after the CCS installation for 20/30/50 years and if it is, so to say, "stable" in all kind of ways, the state takes care of it... However, physical and chemical processes characterize with some level of unpredictability and their impact, in particular on the zone of about 1000 to 1200 meters underground, is not known in case of the long-term storage of CO_2. (Poland)[iii]

However when asked about the risks of CCS compared to other technologies, participants often agreed on the idea that CCS will not bring more risks than other technologies or industries. It was also argued that new technologies are always 'scary' at first.

Risks from CO_2 storage (as opposed to the risks in capture or transport) was a main issue in the discussion and the risks from leakages were spontaneously mentioned by most participants. The idea held by some participants was that CO_2 is a polluting and dangerous gas and that any storage will have some risks. CO_2 storage is then perceived to

generate more risks than benefits, given the possibility of a local accident.

The perception of CO_2 storage risks was based on several often intersecting considerations:

- No personal control over the risk: others are taking the relevant decisions.
- Not natural and perceived as a waste disposal.
- Catastrophic potential: CO_2 storage is perceived as a huge industrial storage with potential consequences 'dreaded'.
- Lack of familiarity and unpredictability; perceived uncertainty about the risks.
- In Poland it was also pointed out that the Bełchatów area had recently experienced some earthquakes, which participants thought would heighten the risks of CO_2 storage.

On the other hand, many participants, when asked about the risks of living close to CO_2 storage, showed a more neutral reaction. These participants tended to argue that the risks will be under control and that other industries (such as petrol stations or other power plants) pose the same level of risk to local communities. The opposite however was also argued (in Poland), where some participants made favourable comparisons with nuclear power, arguing that it is safer than CCS: "Nuclear energy is a good alternative due to its safety and lack of CO_2 emissions" (Poland)[iv]

Safety was thus an important issue for participants. Regarding how the risks would be

managed concretely, two main themes of concern emerged:

a) There is not enough money and commitment to assure the safety of the storage. It was perceived that companies and governments are not going to invest enough money in safety. Also, since the storage is for the very long term, if not permanently, there is no knowing how safety will be monitored and financed in the future. The lack of long-term studies of how things will be in the future is also perceived as a concern more generally.

b) Participants with a more positive attitude towards CCS assume that safety is a priority for CCS projects. However, even then, acceptance was conditional only on credible reassurances on safety:

> If this method is confirmed by tests, and it provides the MAXimum safety, I am in favour of it. (Poland)[v]

3.2.2 Remote events: Fukushima nuclear power plant

Related to the discussions about safety, the DBs took place during the week after the earthquake and tsunami in Japan, and at the time events surrounding the Fukushima nuclear power plant were still unfolding. The power plant withstood the earthquake, however the resulting tsunami overwhelmed it, which for a while seemed to threaten long term regional impact with international ramifications.

Developments with the Fukushima plant were at the time a major world media event and

therefore very fresh in participants' minds. The relevance of this disaster to the safety of CCS, especially in the Bełchatów area which has a recent history of small earthquakes, was seen as clear and was spontaneously and frequently mentioned in both DBs. Fukushima was cited by participants to show that even with strong safety measures CCS can be dangerous:

> In fact, no security can be guaranteed. Even the best technologies and the best researchers cannot guarantee complete security. Nature is unpredictable. We can see what is happening in Japan, such security… and this all for nothing. Nature won. (Poland)[vi]

Fukushima was also used to argue that CO_2 storage can be dangerous even if it is located far from human populations, that we need other solutions and (by the more CCS-positive respondents), that it shows how every technology has some risks. Japan was also seen as a more technologically advanced country than the participants' home countries, and it was argued that if security concerns can happen in Japan, then it will be even more risky in Poland or Spain: "If an advanced country such as Japan is under alert, what can happen here in Spain?" (Spain)[vii]. This is also in keeping with the theme from the Polish DB of general distrust in Polish institutions to manage risks adequately.

3.2.3 Economic costs

There was clear concern expressed by some participants about the costs of CCS projects. The main ideas related to the view that CCS projects are very expensive and that in a

period of economic crisis, uncertain investments must be avoided. Some participants argued that there are many other projects in which governments and companies should invest instead. These participants were not particularly negative about CCS, but nevertheless perceived economic cost as a key limitation. The economic cost was also linked by some participants to the problem of safety. Safety was perceived as costly and CCS advocates could reduce safety to reduce costs (see also the comments on safety and trust in safety management).

> I am not saying I do not trust them to manage storage, but the problem will come when the costs are so high that they will have to reduce costs. Maybe the costs are reduced in safety… (Spain)[viii]

In Poland it was additionally argued that the country is relatively poor (compared to other EU countries) and that CCS would negatively affect tourism in the area. Mostly though, economic worries were related to the energy companies loading the additional costs onto the consumer or taxpayer.

3.2.4 CCS as a non-solution

For some, CCS might contribute to reducing pollution, climate change and environmental problems: hence CCS could at least be part of the solution. CCS was also positively associated with the search for solutions, with acceptance partly being on this basis, i.e. CCS as a bridging technology only. For other participants, CCS was not a solution but rather obscured the real problem, in one participant's words: "putting the dirt under the

carpet". These participants pointed to the existence of other options that they found more environmentally sustainable and less risky, such as reducing the production of CO_2 (less CO_2 intensive behaviours and use of renewable energy) and reutilizing the captured CO_2 rather than storing it away.

> CO_2 storage is not even remotely going to resolve the problem, only the top, like the carpet... but the source is clear... fossil fuels consumption.... (coal, oil,..). It's time to consider alternative and clean energies and not "hide" the wastes of this. (Spain)[ix]

Some participants also saw CCS not as an energy option but as a contamination reduction technology that is not comparable to other, preferred, energy technologies. Not only do other preferred solutions not have the problem of being temporary bridging technologies, but they are also seen as less risky and less expensive.

These preferred solutions included geothermal energy, nuclear energy and windpower and carbon sequestration through forestation. Mostly though it was argued that we should be more conscious of the energy we are using and strive towards producing less waste in everyday life.

3.3 Knowledge of the Polish/Spanish projects

3.3.1 Information

One clear thread that emerged from the discussions was a lack of previous knowledge about the planned local projects (i.e. before the survey), particularly in Spain. Almost none of the Spanish participants had heard about the Ponferrada project in their locality, with only one participant saying that a friend living in the area informed him about it. The Polish participants were slightly more informed, though still most had not heard of the local project before the survey. Those who did were on the whole very dissatisfied with the amount of information they had received and/or the way it was disseminated:

> Yes. I've heard about this project earlier. I found out about a meeting with inhabitants about CCS only after the meeting took place. (Poland)[x]

Some commented that the survey and the discussion board included more new information than they had accessed through other channels. None of the participants had found the website of the Spanish project and the project itself had not generated much local interest. Confronted with the website of the project, however, participants emphasized that the project was (a) of interest, (b) that the website lacked information on the risks (regarding lack of trust, please see below), and (c) that there is relevant information on other projects.

3.3.2 Local benefits and risks

When asked about the local benefits of the Spanish CCS project during the second day, the initial reactions emphasized the potential local economic benefits of the project. Some participants argued that the project will bring new infrastructure and jobs to the area and

these participants showed a very positive attitude towards the project. Following these comments, some participants argued that the potential risks would negate the economic benefits. Yet other participants agreed on the potential risk, but were more ambivalent. In terms of attitudes towards the project, participants seemed to be divided into the more positive ones who emphasized the economic benefits to the community, and the more negative ones who emphasized the potential risks (leakages, explosions) to the community. In Poland, tourism and depopulation of the area were also mentioned as negative side-effects on the local economy. There were also some who were more ambivalent towards the project, arguing that it has both benefits and carries risks.

3.4 Trust / Political efficacy

3.4.1 Companies

Some of participants in the DB were antagonistic towards the companies promoting CCS. These participants tended to consider CCS as a strategy to keep the traditional business model of fossil fuel-based energy supply. This is tied up with suspicions that someone will profit from CCS, which in itself is often seen as a negative because from this perspective money is seen as important than the environment, raising suspicions about the whole undertaking:

> ...do not want to concoct a conspiracy theory here, because there is no evidence for doing so, but it seems logical that someone will earn money on this, someone has yet to build the installation and operate it. It will not be cheap and the money will

> go to the public sector (Poland)[xi]

Another idea that came up in the group discussion was that CCS will bring higher costs of electricity for consumers, i.e. energy companies will need to recoup the higher costs of using CCS with their power plants by adding to the price of their electricity. In Poland, this argument was made most fervently by the climate change sceptics, that is, those who already did not see much need for CCS in the first place.

3.4.2 Policy makers / politicians

When expressed as a problem by participants, lack of trust in policy makers seemed to be based on several factors: politicians were perceived as having the same interests as companies and as being concerned primarily about elections – some also talked about corruption in this context. Since the project was not perceived as a priority for policy makers, it was also felt that safety issues could be neglected. On the other hand, there was also an isolated argument in the Polish DB that the government can be trusted to work in everyone's best interest.

In the Polish DB, a recurring theme was distrust and lack of faith in the state. Poland was perceived as “backward” and “poor”, and there was a lot of cynicism over whether the Polish state or Polish companies would be able to manage such a project competently:

> Knowing the Polish reality I suspect it will not be very safe. We will do it superficially and the consequences can be dire. (Poland)[xii]

3.4.3 Local opinion

Participants tended to express a very low sense of political self-efficacy. Asked about whether they think that local opinion will be taken into account in the design of the project, some participants argued that the local community is rarely heard:

> Local views are rarely taken into account. As in many other situations, there is an appeal to the "general interest" and that's it. (Spain)[xiii]

Some participants stated that decisions are always taken before consulting the community and that this would not be different for CCS. Others argued that only huge protests may prevent unwanted projects. ("Opposition is only taken into account if it is strong and noisy." - Spain[xiv]).

The discussion about public consultation in Poland involved the (general lack of) information about the project, i.e. that information needs to be provided before people can make an informed decision. Also, as referred to above, participants did not generally feel that information about the project had been disseminated well.

There were differing views on the appropriate role of expertise. For example, one Polish participant argued that important decisions on such complex matters should really be left to experts and professionals who understand the issue better:

> [with more information] people would certainly be more informed but not necessarily more supportive of the project. People always have concerns, even in case of wind energy. (Poland)[xv]

Yet another participant, while agreeing that experts will know much better what the issues at stake are, thought that the role of experts should only be to advise:

> I believe that any, even the most complex issue, can be presented so that the layman can understand it. Anyway, I'd prefer to have some input into what is happening around me. I have something to say. Professionals should advise, educate and, yes, have a major impact on the final decision, but they should not be the only ones with the voting rights. (Poland)[xvi]

3.5 Reactions to the study

Asked about their experience with the questionnaire and the DB, participants were generally positive towards their participation in the project, with some finding it particularly interesting, revealing and an opportunity to both learn something new and to express their views and concerns.

> I think it is an interesting topic that affects all of us, that I was completely unaware. Now I can form an idea about it, more or less. (Spain)[xvii]

This positive appreciation particularly related to the DB, which participants found had allowed them to learn about a new technology and project. Indeed the survey and DBs also provoked some to have a closer look at the issue:

> The subject was interesting and I must admit that the discussion forced me to read more about CCS. There could be more such forums on interesting topics. (Poland)[xviii]

Many participants reported that participation in the earlier survey prompted them to discuss the issue with friends, family, colleagues or neighbours. However they also often found that they didn't encounter much interest in the topic when they tried to discuss it. The effect of the prior questionnaire itself was judged to be marginal in influencing participants' opinions on the local projects, though this was mainly due to their self-confessed lack of knowledge:

> I've never heard of this project. The survey changed my opinion to the extent that previously I had no opinion on this subject and now I have one :) (Poland)[xix]

As already discussed above, some participants felt that there was a general lack of good information available. It should be noted that a minority also expressed scepticism of our motives as researchers (i.e. was our motivation actually to promote the project?) This scepticism was also evident in the physical focus groups, despite explicit assurances that the project was not intended to promote CCS (Upham and Roberts, 2011).

4. Discussion

4.1 Social representations of CCS

Our research questions related to participants' perceptions of the risks and benefits of CCS and the specific local projects, as well as perceptions of trust in the political process, the provision of information and participants' experience of the quantitative survey as a means of raising awareness and providing information. This section discusses how the participants viewed the role of politicians, energy industry and social scientists in shaping their opinion of CCS.

Among the possible risks and benefits that might pertain to CCS, the obvious climate change benefits of the technology were little discussed. This does not, however, signify that participants were unconvinced by the need for GHG emissions reduction; on the contrary, the lack of debate rather reflected majority agreement on the need to lower emissions. Claims of other potential benefits such as local employment or energy security were seen as more contentious and thus elicited more argument – indeed associated debate may have shifted both groups towards more negative states than would have otherwise been the case.

Nevertheless, safety was seen as the major issue throughout the DBs. Public acceptance of CCS is clearly contingent on worries about safety being met adequately. This however may prove a problem, as many concerns about safety are conventionally framed in terms

of probability and hence can be difficult to communicate (and in the case of unfamiliar technologies such as CCS, answer). The timing of the DBs is important here, since they were held during the week immediately after the earthquake and subsequent tsunami in Japan. The events that unfolded there are of clear relevance to perceptions of the risks of large-scale energy infrastructure, especially infrastructure which even without natural disasters is often seen by the public as potentially unpredictable and thus risky. Though the Fukushima nuclear plant was built in a country that is known to be prone to earthquakes, the implication of an unpredicted and unpredictable natural disaster taking people unawares with severe consequences, despite risk management strategies, was not lost on participants. Participants were aware that even professional "worst case scenarios" may turn out to be too conservative.

The events in Japan thus provided a ready frame with which participants could articulate fears about unknown or unpredictable risks: the respondents' social representation of the unfamiliar technology of CCS was conceptually anchored to the more well-known energy technology, with which it shares several features such as the unpredictability of the risks or the "waste disposal" element (Moscovici, 2000). The events in Japan then highlighted the nature of technological risks inherent in these conceptually linked large-scale energy infrastructure projects, and the unpredictability of nature posing a possible risk not just to nuclear power but now also to CCS.

With that in mind, participants were understandably nervous and distrusting of official reassurances of safety. This echoes the influential "risk society" literature (Beck, 1992;

Giddens, 1999) which argues that contemporary society is safety and risk conscious and focuses on the more intangible and unpredictable risks of "the unintended consequences of technology", which technological expertise will find hard to address through traditional methods. This was underlined by the fact that Japan was seen in both countries as a technologically advanced and safety conscious country, which made any safety doubts even worse because both Spain and Poland were perceived to lag behind technologically. There was general doubt in Poland even without the discussion of Japan, as to whether the country's institutions or companies would be able to deal competently with CCS (a sentiment which was also apparent in the survey itself, which was held before events in Japan).

In many ways the discussions concerning the economic values of CCS were the most complex, since they were used both as arguments for and against the technology. In Spain, the potential costs of CCS are perceived as a significant drawback by some participants, who question the high investment costs in the context of budgetary restrictions. On the one hand, CCS was seen as bringing new employment to the area, thus re-invigorating it (though it was also argued that any employment would go to trained experts who would need to come from outside, so that CCS would not benefit the local population much). In Poland CCS was also seen as keeping the local coal industry in business, which would be a clear benefit for the community, though this was also contested by participants who argued that the country needed to get away from reliance on coal. On the other hand, a worst case scenario was painted by one Polish participant who thought that CCS would lead to a depopulation of the area by concerned citizens,

and the only remaining people would be those working on the project. Tourism, though not a major part of the local economy was perceived as likely to plummet as well.

It was clear to participants that CCS, when in the form of an add-on to existing coal technology, will introduce costs to the production of energy. This made the extra cost of CCS more intuitive to grasp than any extra costs incurred, for example, by wind power or even nuclear power, relative to unabated fossil fuelled power stations. There were clear concerns about who would have to shoulder those costs, with the view being that this would either be consumers through higher energy prices, or general taxpayers through government (or EU) support of the project. In both cases, participants thought that ultimately they would have to pay for it, and while these concerns were not seen as show-stopping, it was still clear that participants expected clear and well defined benefits and safety assurances if they were to agree to it. Coupled with these concerns it was also often seen that particular people (others) will profit from it (why else would energy companies be keen on this), and that CCS could therefore be readily perceived as industrialists and politicians profiting at the expense of ordinary people.

Regarding knowledge of CCS and participation in the DBs, on the whole participants did not consider themselves knowledgeable about the technology even after participating in the survey; in many cases the survey was the first place they have heard about it. In addition, few participants had previously heard about the CCS projects proposed for their areas. There was therefore a general feeling of frustration about the process of information provision, with participants complaining that there is not enough useful

information available, and that it was an opinion survey that had prompted them to find out more.

4.2 Implications for messaging policy

The experience of using online dialogue boards to explore public opinion of CCS raises a number of issues relating to the role of the internet in relation to CCS messaging and also planning governance. Participation in the exercise was generally perceived as a positive experience and had prompted some participants to discuss CCS with colleagues, neighbours or family, a response echoing findings from other qualitative research exercises that have used focus groups to simultaneously uncover public opinion of CCS while also playing an informational role regarding plans for CCS developments in a locality (Ashworth et al., 2010). Of particular note is that a small number of participants actively sought and shared online information[xx], acting as 'experts' within the groups, while at the same time, as referred to above, there was a generally perceived scarcity of good quality, trustworthy information on CCS.

This begs the question of which agencies (if any) should be involved in the production and dissemination of online information on CCS, while being aware that use of any specific form of information provision, dialogue, consultation or debate cannot be expected to compensate for limited trust – and that trust in key actors was a core issue in all of the groups, particularly the Polish group, in which nearly all the main actors (including government) were considered untrustworthy. Nonetheless some actors are more usually trusted than others (Terwel et al., 2009a, 2009b) and good quality, neutral

and comprehensible information does seem to lead to more stable opinions (de Best-Waldhober et al., 2009), at least in controlled conditions.

The difficulty remains, however, in finding an appropriate response in terms of online information/messaging policy[xxi].

There seems to be no ideal, uncomplicated answer to this question, but as publics can now be assumed to seek and disseminate online information on unfamiliar topics, it is surely incumbent on public agencies with an interest in CCS to produce reliable information that publics will readily find. In the Polish and Spanish cases, this was unavailable. It is worth noting that a self-appointed expert in the Polish group referred their peers to particular sections of http://www.realclimate.org, a website maintained by climate scientists. However it hardly needs to be said that there are many less reliable online sources of information relating to climate change and energy options.

A broader issue is that of the use of the internet as a means of engagement, consultation and/or simple communication of planning proposals, consistent with the minimum consultation required by any signatory to the Aarhus Treaty (UNECE, 1998). Although progress on this has been slow (e.g. re the USA, see Pew, 2009), there is clear potential for at least planning-related information provision. Online consultation and engagement raise many more issues relating to their role in representative democracies, but a variety of arguments can be mobilized in favour of giving deliberative fora a role in informing policy, in which the internet as a technology is used as tool for enriching the democratic process (Coleman and Gotze, 2001). Coleman and Gotze (ibid) provide a useful overview

and discussion of these issues, which we do not need to rehearse here, but the characteristics that they consider indicative of public deliberation at its best could well act as a model for CCS-related deliberation: access to balanced information, an open agenda, time to consider issues expansively, freedom from manipulation or coercion, a rule-based framework for discussion, participation by an inclusive sample of citizens, scope for free interaction between participant, recognition of differences between participants, but rejection of status-based prejudice Coleman and Gotze (2001: 6). This is a long way from our Polish and Spanish participants' experience of the planning system.

4 Conclusions

This paper discusses the results of online focus group studies with participants who had already responded to a detailed survey of CCS opinion that raised their awareness of CCS, informing them that a CCS development would be taking place in their region. The participants had several weeks in which to consider the issues raised by the survey and to gather any new information that they deemed interesting or relevant. In this respect the methodology embodied a number of realistic features relating to opinion formation, including allowance for the passage of time, influence of friends, family and opinion-formers and a reduction of the in-group dynamics of a physical focus group that can drive a narrowing of group opinion.

Most participants were dissatisfied with the information available both about CCS in

general, but particularly about the specific local plans. It was here that the public engagement benefits and wider implications of performing the online discussion boards were clearest, with respondents valuing our information provision and some seeking and sharing online information. While there was no overall feeling of negativity towards CCS and many participants classed themselves as moderately in favour, much discussion was risk-related. There were perceived positives, primarily relating to CCS as a pollution control measure, as well as climate change and economic benefits, but even the otherwise positive participants spent far more time discussing aspects of CCS that worried them, particularly risks, safety and costs. The concurrent Fukushima incident in Japan proved a ready reference frame through which to voice these concerns, though similar concerns were frequently raised by respondents to the survey (Reiner et al., 2011), which was held before the earthquake. Fukushima provided an analogous situation and raised the salience of technological risk, particularly when juxtaposed against the power of 'nature'.

The issue of limited trust in politicians at all levels, as well as energy companies, affirms previous findings on the importance of land use planning and civic engagement cultures (Brunsting et al., 2011b). Issues such as leakage and corresponding safety measures are intimately bound up with issues of trust in political actors and perceptions of democratic possibilities, making such concerns particularly difficult to allay. Moreover the frequently expressed concern over long term and unpredictable risks are also difficult to address, as they relate to questions that CCS experts find themselves difficult to answer with precision. As a result, we too found that risk discourse has a tendency to take over public discussions of CCS (Jaspers, 2009).

Use of online focus groups in this context is a relatively new research tool with a range of potential benefits, some of which were realized in the present study and some of which we suggest should be further explored not just in experimental settings but in the form of deliberative fora, as part of the land use planning process. In this regard the technique has the potential to connect to long-standing debates and practices relating to revitalizing democratic structures more generally.

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[i] Reducir la contaminación siempre es calidad de vida para nosotros y las generaciones posteriores

[ii] Za- ponoć umocni pozycję Polski na arenie międzynarodowej (choć ja jakoś w to nie wierzę).

[iii] Projekt zaklada ze firma budujaca opiekuje sie projektem przez 20/30/50 lat i jezeli jest on ze sie tak wyraze "stabilny" pod kazdym wzgledem to opieke przejmuje panstwo.. z tym ze istnieje nieprzewidywalność procesów fizycznych i chemicznych i ich skutków w szczególności w strefie oddziaływania ok. 1.000 do 1.200 metrów głębokości przy długoterminowym składowaniu CO2.

[iv] Energia atomowa ze względu na bezpieczeństwo i brak emisji gazów w tym CO2

[v] Jeśli stosowanie tej metody będzie potwierdzone badaniami i zapewni nam maxymalne bezpieczeństwo jestem za.

[vi] Tak naprawdę bezpieczeństwa nikt nie może nam zagwarantować, nawet najlepsze technologie i najlepsi naukowcy. Natura jest nieobliczalna. Widzimy co się dzieje w Japonii takie zabezpieczenia, a i tak wszystko na nic. Natura zwyciężyła.

[vii] Si en Japón que es un país avanzado las centrales nucleares están en alerta que puede pasar aquí en España.

[viii] No es que desconfie de que no sean capaces de gestionar el almacenamiento, el problema será cuando los costes sean demasiado elevados y haya que reducir coste. Esos costes posiblemente se puedan reducir en la seguridad porque a corto plazo no se va a ver y los

[ix] Un almacenamiento de CO2 no resuelve ni por asomo el problema, solo lo tapa, como la alfombra...el origen está más que encontrado... el consumo de energías fosiles.... (carbón, petroleo,..). Es hora de plantearse otra alternativa de energia limpia y no de como "esconder" los restos de esta.

[x] Owszem. Słyszałam o tym Projekcie wcześniej. Dowiedziałam się, niestety już po fakcie o spotkaniu mieszkańców Gminy, na terenie której proponuje się realizację tego Projektu ze specjalistami.

[xi] Nie chcę tutaj knuć teorii spiskowej, bo nie ma ku temu żadnych dowodów ale logiczne jest, że ktoś na tym zarobi, ktoś musi przecież to zbudować i obsługiwać. Nie będzie to tanie, a pieniądze pójdą z sektora publicznego.

[xii] Znając Polską rzeczywistość podejrzewam , że będzie to mało bezpieczne.
Zrobimy jak wszystko po łebkach a skutki mogą być opłakane.

[xiii] Las opiniones locales raramente son tenidas en cuenta. Como en otras muchas situaciones, se

apela al "interés general" y punto.

[xiv] Sólo se tiene en cuenta si la oposición es muy rotunda y hace "mucho ruido"

[xv] byliby na pewno doinformowani, ale nie popierali by bardziej , społeczeństwo ma zawsze obawy nawet w sprawach np.elektrowni wiatrowych

[xvi] wierzę, że każdą, nawet najbardziej skomplikowaną kwestię da się przedstawić laikowi tak, aby zrozumiał.

Zresztą wolałabym też mieć jakiś wkład w to, co się dzieje wokół mnie, mieć coś do powiedzenia. Specjaliści powinni doradzać, edukować i owszem, mieć duży wpływ na ostateczną decyzję, ale nie powinni byc jedynyi z prawem głosu.

[xvii] Me parece un tema interesante y que nos afecta a todos, que desconocía por completo. Ahora ya me puedo hacer una idea, más o menos.

[xviii] Ja również dziękuję za zaproszenie do dyskusji i możliwość uczestnictwa. Temat był ciekawy, a przyznam szczerze, że dyskusja zmusiła mnie do poczytania i zgłębienia wiedzy na temat CCSu, mogłoby być więcej takich for dyskusyjnych na ciekawe tematy.

[xix] Nigdy wcześniej nie słyszałam o tym projekcie. Zmienił moją opinię o tyle, że wcześniej nie mialam żadnej opinii na ten temat

[xx] A more common practice was for participants to question other participants about their specific comments, a practice that in our experience was more common in the online format than in face to face focus groups.

[xxi] While also bearing in mind that internet access varies within and between countries: in Europe in 2011, 73% of households had access to the internet and 68% had broadband internet access (Eurostat, 2012); this varied in 2010 from 26% of households in parts of Bulgaria, to 95% or more in parts of the Netherlands (ibid).