



CATO-2 Deliverable WP5.1-D24

Report on findings of regional survey(s)

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1 Executive Summary (restricted)

At the start of CATO-2, the WP5.1 research plans included repeated surveys among residents living near (proposed) onshore CCS activities. The aim of these repeated regional surveys was to monitor local public awareness, knowledge, perceptions, beliefs, and attitudes concerning CCS. However, the need for regional surveys was gone after the decision made by the Dutch government (February 14, 2011) to withdraw its support for (onshore) CO₂ storage. Instead of the repeated regional surveys, WP5.1 researchers thus developed and executed alternative research plans, which were developed after consultations with CATO-2 consortium partners and Executive Board. As a consequence, this deliverable only discusses findings from two regional surveys that were conducted before the Dutch government decided to withdraw its support: a survey conducted in the Northern Netherlands (October 2009) and a survey conducted in Barendrecht (May 2010). In this deliverable, we center our discussion around two primary themes rather than repeating all specifics (e.g., procedure, detailed results) of the surveys. These themes concern (1) CCS-related knowledge and misconceptions, and (2) issues of trust. For all specifics of the surveys we refer to previous deliverables (CATO-2-WP5.1-D02 and CATO-2-WP5.1-D14).

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2 Applicable/Reference documents and Abbreviations

2.1 Applicable Documents

(Applicable Documents, including their version, are the “legal” basis to the work performed)

	Title	Doc nr	Version
AD-01	Toezegging CATO-2b	FES10036GXDU	2010.08.05
AD-02	Besluit wijziging project CATO2b	FES1003AQ1FU	2010.09.21
AD-03	Consortium Agreement	CATO-2-CA	2009.09.07
AD-04	CATO-2 Consortium Agreement	CATO-2-CA	2010.09.09
AD-05	Program Plan 2013b (and annexes)	CATO2-WP0.A-D03	2013.04.01

2.2 Reference Documents

(Reference Documents are referred to in the document)

	Title	Doc nr	Version
RD-01	Report on survey among residents: Results and implications for decision procedure and communication campaign	CATO-2-WP5.1-D02	2010.12.20
RD-02	What do Barendrecht residents know about and think of the CO2 storage plan and about the information and decision-making about this plan? Results of a survey in May 2010 among more than 800 residents.	CATO-2-WP5.1-D14	2011.12.14
RD-03	Targeted Communication to increase Knowledge: Implications from the Knowledge and Beliefs Test	CATO-2-WP5.3-D02b	2011.04.12
RD-04	The Dutch general public's opinion on CCS and energy transition in 2011: Development in awareness, knowledge, beliefs and opinions related to information and media coverage	CATO-2-WP5.3-D04	2012.04.01

2.3 Abbreviations

(this refers to abbreviations used in this document)

SP	Sub program
WP	Work package

3 Report on findings of regional survey(s)

3.1 Introduction

At the start of CATO-2, the WP5.1 research plans included repeated surveys among residents living near (proposed) onshore CCS activities. The aim of these repeated regional surveys was to monitor local public awareness, knowledge, perceptions, beliefs, and attitudes concerning CCS. At that time, the need for repeated regional surveys was evident. First, to monitor local public awareness of (proposed) CCS activities, to assess local perceptions and opinions, and to detect shifts in opinions. Second, to link any shifts in opinions to specific events that have occurred in the course of a project. And third, to monitor how the local public's general and project-specific knowledge about CCS develops, which would help to evaluate and improve the effectiveness of public communications, and to identify important knowledge gaps and misconceptions to resolve in future communications.

Unfortunately, it never came to carrying out repeated surveys because the need for repeated regional surveys was gone after the decision of the Dutch government (February 14, 2011) to withdraw its support for (onshore) CO₂ storage. Therefore, instead of the repeated regional surveys, alternative WP5.1 research plans were developed and executed (these alternative plans were developed after consultations with the CATO-2 consortium partners and Executive Board). In this deliverable, we thus only discuss insights of two regional surveys that were conducted before the Dutch government decided to withdraw its support.

3.2 Two regional surveys

The first survey was conducted in the Northern Netherlands in October 2009. Professional polling firm TNS-NIPO executed the survey and collected data of 458 people living in the three northern Dutch provinces (Drenthe, Friesland, Groningen). The main aims of this survey were to assess CCS-related knowledge and to measure general trust in organizations involved in CCS. Details of the procedure and results of this survey can be found in deliverable CATO-2-WP5.1-D02.¹

The second survey was conducted in Barendrecht in May 2010, about half a year before the proposed local CO₂ storage project was cancelled. Professional interviewers from TNS-NIPO executed the survey by telephone and collected data of 811 Barendrecht residents (including a small

¹ Deliverable CATO-2-WP5.1-D02 reports the levels of CCS-related knowledge among a representative sample of the Dutch general public and does not specify the results for the Northern Netherlands sample in isolation. The results of the Northern Netherlands sample and the national sample are largely similar though.

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subsample of people living in the adjacent Portland district in Rhoon). The main aims of this survey were to assess local public attitudes towards the proposed CO₂ storage project and to identify factors that have contributed to these attitudes. Details of the procedure and results of this survey can be found in deliverable CATO-2-WP5.1- D14.²

3.3 Findings concerning CCS-related knowledge.

One may argue that members of the (local) public must have accurate knowledge of all elements in the entire chain of “the production of energy by means of fossil fuels” to “the implementation of a (local) CCS project” to really be able to judge CCS on its merits. For example, people might think differently about a CCS project depending on whether or not they realize how much CO₂ is emitted by coal- and gas-fired power plants and depending on whether or not they are aware of the consequences of emitting large quantities of CO₂ into the atmosphere. People who are not aware that global warming is caused by ever-increasing CO₂ emissions may not see the reason why CCS is considered in the first place. The same holds true for knowledge about specific CCS projects. For example, CO₂ storage is likely perceived as more hazardous if people (erroneously) think that the storage reservoir is located at a depth of only a few meters rather than 1500 meters below the surface.

Our data indicate that one should not assume public knowledge of all aspects of CCS-related knowledge. People are quite accurately aware of the sources of CO₂. Regarding the impact of several activities—car use, coal-fired power plants, steel factories, nuclear power plants, wind turbines, and planting trees—on CO₂ concentrations in the atmosphere, many (though not all) people know that the first three of these activities increase CO₂ concentrations and the other three activities do not. However, public knowledge about which environmental issue will be addressed by implementing CCS is rather limited: Many people believe that CCS addresses the issue of global warming (about one third admitted not to know this), but many of them also believe that CCS addresses a number of other environmental issues (e.g., smog, depletion of the ozone layer, acid rain). Importantly, only very few people recognize combating global warming as the unique aim of CCS. Thus, at least at the time of the survey in the Northern Netherlands (October 2009), people thought of CCS as a ‘one size fits all’ solution to a range of environmental problems.

Another remarkable finding is that many people, both in the Northern Netherlands and in Barendrecht, are either unsure about the depth of proposed CO₂ storage reservoirs or believe that these reservoirs are located at a depth of (much) less than actually is the case. The limited knowledge about this

² The current discussion concerning the findings of the Barendrecht survey is largely based on: Terwel, Ter Mors, & Daamen (2012). It's not only about safety: Beliefs and attitudes of 811 local residents regarding a CCS project in Barendrecht. *International Journal of Greenhouse Gas Control*, 9, 41-51.

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aspect among Barendrecht residents is especially surprising considering that, at the time the survey was conducted, the CO₂ storage project in Barendrecht was in the final stages of the planning phase. One would expect the members of local public to be more knowledgeable of this basic aspect of the project than our data indicate, also because most of the residents of Barendrecht had accurate knowledge of other aspects of the proposed CO₂ storage project (such as that the CO₂ would come from a refinery in Pernis and that it was to be stored in depleted natural gas field).

Barendrecht residents considered it desirable to have measures that help to combat global warming, but many also believed that the local CCS project was not really helpful in this regard. Indeed, the two depleted gas fields situated in Barendrecht have only very limited storage capacity so this is correct by objective standards. On the other hand, the CCS project in Barendrecht would have been a relevant step towards the deployment of CCS on a larger scale. When people are confronted with plans for a small-scale demonstration project in their residential area, they are unlikely to become favorably disposed towards such a project if they do not realize that the project is a necessary first step towards the large-scale deployment of CCS. Therefore, public communications should not only focus on educating the local public on energy production by means of fossil fuels, CO₂ emissions and climate change, and CCS, but should also explain the relevance of small-scale CCS demonstration projects in the wider context.

However, one should not expect miracles from public communication. Proper information provision is a precondition for the success of any CCS project (e.g., this may reduce initial concerns about the consequences of a project and may help to avoid that people suspect that parties intentionally withhold information from the public), but it is certainly no guarantee for creating local acceptance of CCS projects. Our survey showed that Barendrecht residents were mostly satisfied with the possibilities of obtaining information about the proposed CCS project, but these satisfaction ratings were unrelated to people's attitudes toward the project. Furthermore, we found that the majority of the Barendrecht residents surveyed did not have a need for additional information about the local CCS project. Moreover, residents who claimed to have considerable knowledge about the proposed project slightly more often indicated a need for additional information than those who indicated to know only little about the project. Although this may seem counterintuitive, it is in line with the knowledge gap hypothesis (see Tichenor, Donohue, & Olien, 1970), which posits that, once established, differences in knowledge between certain groups of individuals typically increase rather than decrease as a result of information campaigns. Continued attempts to inform members of the public about a proposed local CCS project are more likely to reach those who are already knowledgeable than those who have less knowledge about the issue. The latter group is probably not so much concerned with getting thoroughly informed, but might consider it more relevant to know the positions of the parties that they trust. The issue of trust is the second theme discussed in this deliverable and relevant results are described below.

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3.4 Findings concerning trust

As indicated before, people may not have enough relevant CCS-related knowledge to be able to personally judge CCS on its merits, but knowledge is not necessarily increased by public communications. That is, many people are not really interested to acquire more knowledge, but rely on their sense of trust in the parties involved in CCS. Trust can serve as a tool for the reduction of cognitive complexity in situations where people are confronted with a complex issue and large amounts of new information. Indeed, this reasoning aligns with research by Siegrist and Cvetkovich (2000), who found that trust is more predictive of attitudes towards hazards and technologies when people's knowledge about the attitude object is limited.³

The results (and concomitant correlation and multiple regression analyses) of the Barendrecht survey suggest that a lack of public trust in the proponents of the CO₂ storage project (Shell, the national government) and perceived procedural unfairness have contributed to the grow of negative attitudes towards the proposed project. Most people placed trust in the town council and the activist group CO₂isNee (both confirmed opponents of the project), but not in the national government and Shell. Most residents further perceived the decision-making process as unfair and felt that the people of Barendrecht and the town council should have had more influence in the process (note that the survey was conducted a few months before the project was cancelled). Thus, consistent with principles formulated in the facility siting credo (e.g., Kunreuther, Fitzgerald, & Aarts, 1993), the Barendrecht survey illustrates how unfair decision-making procedures (at least as perceived as such by the public) and a lack of public trust in project developers and political authorities make it difficult to establish local acceptance of proposed CCS projects.

The importance attached to social-political factors such as trust and procedural fairness further implies that while 'not-in-my-backyard' (NIMBY) sentiments may have played a role, the existence of such sentiments within the local public by no means fully explains why most people were (very) negative about the proposed CO₂ storage project in Barendrecht. The NIMBY concept specifically refers to local opposition motivated by self-interest (Wolsink, 2007). Indeed, concerns about local safety and property value partly explained why many Barendrecht residents were opposed to the CCS project. However, anti-process sentiments and a lack of trust in Shell and the national government played an important role as well, indicating that the local opposition was not (completely) motivated by NIMBY sentiments (for discussions of other factors that are relevant to consider when interpreting opposition to local developments, see e.g., Bell, Gray, & Haggett, 2005; Devine-Wright, 2009, Terwel & Daamen, 2012).

³ The importance of public trust in the context of CCS has also been demonstrated in CATO-1 research (for an overview, see Terwel, Harinck, Ellemers, & Daamen, 2011).

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The survey in the Northern Netherlands also included a general measure of trust in different parties involved in CCS. The results showed that research institutions—TNO, universities—were trusted most, followed by well-known environmental organizations (WNF, Greenpeace, SNM). Interestingly, companies such as Essent, Gasunie, NUON and NAM were considered relatively trustworthy as well (regarding trust in the companies, people living in the Northern Netherlands reported slightly higher levels of trust than people living in the other provinces). We should note that our trust measure did not specifically focus on trust in relation to CCS; it was more general and focused on trust in relation to ‘energy-related issues’ because, at the time of the survey, the plans to apply CCS in the Northern Netherlands were less developed than the CCS plans in Barendrecht. Furthermore, the possibility exists that trust levels have decreased in recent years; especially trust in NAM might have dropped as a result of recent events in the region (damage to houses as a result of earthquakes due to gas extraction). In any case, the level of trust in the various stakeholders suggested a good starting point for the execution of the initially proposed WP5.1 plans to establish a “Stakeholders & Scientists Committee” in order to create a local “knowledge base” once a CO₂ storage location in the Northern Netherlands had been selected.

3.5 Suggestion for the introduction of future projects

Although we have not had the chance to implement the initially proposed WP5.1 research and intervention plans, based on the above-discussed survey findings as well as CATO-1 research (e.g., Ter Mors, Weenig, Ellemers, & Daamen, 2010; Terwel et al., 2011), we think that the creation of a Stakeholders and Scientists Committee (SSC) and a local knowledge base might be a useful approach to the successful implementation of CCS and other energy-related projects. In this procedure, multiple stakeholders and scientists collaborate in a SSC to jointly develop a knowledge base that consists of high-quality information relevant to local CCS activities. That is to say, the SSC acquires information on all relevant aspects and consequences of local CCS activities. Eventually, the SSC should reach consensus about the quality of the information (namely that it is valid, balanced, relevant and comprehensible). Note that the information should be factual and not include opinions of specific stakeholders. This procedure would generally involve the following steps.

At the selected location, the relevant stakeholders must be identified. Then, different stakeholders and scientists are invited to participate in the SSC. Thus, a range of parties with different interests should participate in the SSC, including companies, environmental NGOs, regional government, local opinion leaders who are not active in the political arena, scientists and other experts in the field (e.g., from TNO, Ecofys, Universities). The aim of the SSC is to gather high-quality information on all aspects and consequences of local CCS activities. To this end, each member of the SSC can add new aspects and consequences for which he or she wants expert information. Independent experts who

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participate in the SSC collect this expert information by reviewing the relevant literature and consulting other experts in the field. Next, the SSC checks whether the information provided by the experts is indeed valid, balanced, and relevant. Once all relevant information is acquired, it is made comprehensible for laypeople and checked on accuracy again. When ready, the local knowledge base consists of credible and high-quality information that can be presented to the local public as the basis for a local information-on-demand campaign. We believe that this is a useful approach for the several reasons.

First, the knowledge base can be used to fill gaps of CCS-related knowledge and to correct misconceptions. For example, the implication of our survey findings (as well as the findings of WP5.3 research, which has focused on knowledge among the general public; see e.g., CATO-2-WP5.3-D02b and CATO-2-WP5.3-D04) is that there is a need to educate people on the topic. It should be noted, however, that the survey in the Northern Netherland assessed levels of public knowledge about sources of CO₂ and the environmental concern CCS aims to address, but did not cover other aspects of relevant CCS-related knowledge. Therefore, a much more elaborate knowledge test remains necessary to assess people's knowledge of all elements CCS-related knowledge, starting with questions about how energy is produced, followed by knowledge questions about the emission of CO₂, about the properties of CO₂, the link between CO₂ and global warming, consequences of global warming, and then finally about CO₂ reduction by means of CCS. Such an elaborate knowledge test help to identify those aspects of the CCS chain for which public knowledge is lacking and that may cause people to completely miss the point of CCS or hold false beliefs based on which they eventually decide to accept or to oppose CCS implementation. In WP5.3, the levels of CCS-related knowledge among the general public have been assessed, but this is also relevant to determine in a specific local context.

Second, this approach is not only useful to people who are motivated to reach their own informed opinion and can learn more about the specifics of local CCS activities through consulting the knowledge base; it is also useful to those who are not particularly motivated to reach their own informed opinion but prefer to rely on their sense of trust. The fact that there are multiple parties with different interests involved in the SSC (and the creation of the local knowledge base) is anticipated to increase public trust and the credibility of the introduction procedure. The perceived quality of CCS information provided by a stakeholder depends on whether or not people perceive this stakeholder to be credible, but a coalition of parties with different interests to provide CCS information is seen as most credible and likely to supply high-quality information (Ter Mors et al., 2010). Importantly, this

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approach may not only produce public trust in the process (cf. Terwel, Harinck, Ellemers, & Daamen, 2010), but might also help to create trust among stakeholders.⁴

And third, this approach might help to avoid the creation, or reduce the impact of activist groups. A number of CCS projects, including the Barendrecht project, have faced opposition by activist groups. For instance, the activists of “Citizens against CO₂ sequestration” have successfully protested against the CCS plans of Battelle in Greenville, Ohio, and in Jutland, Denmark, landowners have set up the “No to CO₂ storage association” to oppose Vattenfall's CCS plans in the region. Activist groups may not in all cases manage to generate widespread support for their position among the local public, but an important reason why they often do succeed is that, above all, they seem to pursue local interests and, therefore, are trusted by the local public (the Barendrecht survey also showed that the local activist group CO₂isNee was trusted by the local public). Moreover, it is probably easier for activist groups to make communities doubt the safety of a proposed CCS project than it is for project developers to convince members of the local public that a project is safe. We think that by communicating to the public that a proper procedure is used—a procedure in which parties with different interests have worked together to create a knowledge base with high-quality information, covering all aspects and consequences of local CCS activities that involved parties deem relevant—might help to avoid the creation of, or reduce the impact of activist groups.

⁴ The fact that research institutions are involved should also enhance the perceived credibility of this procedure because these parties (e.g., TNO, universities) are relatively trusted by the public. This is important considering that research institutions are the parties that need to provide scientifically sound answers to questions raised by the other parties involved (e.g., local opinion leaders who are not active in the political arena, environmental NGOs, regional government bodies).

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3.6 References

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