

Social acceptance of carbon dioxide storage

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Abstract

This article discusses public acceptance of carbon capture and storage (CCS). Responses by citizens are described in relation to responses by professionally involved actors. Interviews with members of the government, industry and environmental NGOs showed that these professional actors are interested in starting up storage projects, based on thorough evaluation processes, including discussions on multi-actor working groups. As appeared from a survey among citizens living near a potential storage site ($N = 103$), public attitudes in general were slightly positive, but attitudes towards storage nearby were slightly negative. The general public appeared to have little knowledge about CO₂-storage, and have little desire for more information. Under these circumstances, trust in the professional actors is particularly important. NGOs were found to be trusted most, and industry least by the general public. Trust in each of the three actors appeared to depend on perceived competence and intentions, which in turn were found to be related to perceived similarity of goals and thinking between trustee and trustor. Implications for communication about CCS are discussed.

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1. Introduction

The successful implementation of new energy technologies depends on multiple factors, such as technological developments and economic profits. Developments in the last 25 years, like the social conflicts surrounding energy technologies in the 1980s, have demonstrated that societal acceptance has developed into an imperative factor as well. Social opposition may cause delays and stagnation (see for example Hisschemöller and Midden, 1999; Renn et al., 1995).

Public responses to technologies are sometimes characterized as emotional and inconsistent (Hisschemöller and Midden, 1999). Although not completely untrue, this characterization may have the effect that public responses are not taken seriously. Often, emerging technologies bring considerable uncertainty resulting from their state of development. Lay persons who are confronted with these technologies will try to form judgments, but the information will often be limited. This makes it difficult for them to balance the risks and benefits against each other and to

come to a reasoned judgment. Under such circumstances, intuitive feelings, based on life experiences, will play a more dominant role. People can be more skeptical, for example, because of earlier experiences with associated technologies. Activated by minor incidents, latent fears can rapidly turn into strong reactions (Loewenstein et al., 2001). Social conflict may also heat up when concerns develop into so-called assured threats, beliefs being very persistent that are not necessarily related to factual risks (Flynn et al., 2006).

Social acceptance is not just a matter of individual feelings and perceived risks and benefits, but predominantly is a social process. Actors influence each other through various types of interaction. Public acceptance may depend on the views and information rendered available, often through the media, from professionally involved actors, such as the government and NGOs. Obviously, it may be difficult for lay men to understand, select and process this information well and to form balanced personal views on the technology. As a consequence people will have to rely on others. This is where trust becomes important. Trust can be understood as the willingness to be vulnerable under conditions of risk and interdependence (Rousseau et al., 1998). It expresses the extent to which one expects the other to act in line with the

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needs and interests of oneself. Acting upon trust can be seen as an alternative to acting upon full knowledge (Luhmann, 1979; Siegrist and Cvetkovich, 2000). A lack of trust in leading actors regarding the protection of citizens, doubts about the fair allocation of risks and benefits, and a supposed disregard of public interests may all discourage people's cooperation in the political arena, hamper adoption by consumers and reduce openness to new information. In contrast, trust may cause greater tolerance of uncertainties, willingness to explore opportunities, and openness to new information. It allows people to make decisions and enjoy the benefits of new and potentially risky technologies without having to understand all the details. In line with this reasoning, people have been found to rely on trust particularly in the case of hazards they are not very knowledgeable about (Siegrist and Cvetkovich, 2000). Regarding public reactions to CCS, Midden and Huijts (2006) found support for the theory that feelings of trust (trust in government and trust in industry) lead to more positive and less negative affects towards CCS, and that these affects in turn influence the perception of risks and benefits and the acceptance of CCS.

The importance of trust in determining public acceptance raises the question how people develop a feeling of trust in professional actors. One of the ways in which this question has been addressed in the literature, is by studying the relation between trust and perceived characteristics of professional actors. A multitude of characteristics has been proposed to be related to trust, like honesty, fairness, expertise, competence, predictability, and intentions (see e.g. Frewer et al., 1996; Peters et al., 1997). These different suggestions seem to contain common elements. Several authors have suggested a simplified model distinguishing two main factors (e.g., Johnson, 1999; Metlay, 1999). One factor is representing the perceived good intentions of a trustee and the other is representing perceived competence. According to this two-factor view, the willingness to make oneself vulnerable to the trustee thus depends on the belief that the trustee is both motivated and able to act in line with the interests of oneself. These perceptions of a person's competence and intention can be considered logically independent (see also Yamagishi and Yamagishi, 1994). After all, a novice who is charged with a difficult task will lack the competence to perform the task properly but may nevertheless try with the best of intentions. Conversely, a heartless villain, although guided by bad intentions, may be very competent.

Impressions of an actor's intentions and competencies may be based on different cues. In assessments of the actor's intentions, perceived similarities between oneself and the actor may play an important role. Earle and Cvetkovich (1994, 1995) made a plea for trust being grounded in salient value similarity. We would like to add that this relation is probably mediated by perceived intentions. Having similar values and goals implies having similar ideas about what is important in respect to the technology and one's life in relation to the technology,

and thus having similar motives with respect to the technology.

The implementation of a new technology is usually a multi-actor enterprise. This raises the question whether trust in a multi-actor group can be understood as composed of trust in the various participating actors. We will address this question in the current article by examining the relation between overall trust and trust in separate actors.

1.1. Carbon dioxide storage

The study in this article focuses on the social acceptance of carbon dioxide storage, commonly referred to as carbon capture and storage (CCS).¹ For the reduction of greenhouse gas emissions, policy makers are considering storage of CO₂ in geological formations such as depleted gas fields, also in The Netherlands (VROM, 2005).² The greenhouse gas CO₂ can be captured at point sources, such as power plants and chemical plants. In the case of power plants, CO₂ needs to be separated from other flue gases. Under high pressure, the gas can be transported and injected into a geological location. Risks concern the possibility of leakage of smaller or larger amounts of gas and possible earthquakes due to underground pressure changes.

The main actors who are professionally involved in CCS are governmental policy makers, the energy industry, and environmental non-governmental organizations. Government policies, such as subsidies and regulations, can stimulate, limit or ban the use of the technology. Utilities are involved when the CO₂ is gathered from the flue gases of a power plant and oil and gas companies are involved when the storage takes place in depleted gas and oil fields. Because of their interest in the environment, including the climate change problem and possible risks of CO₂-storage, environmental NGOs will try to influence the public debate and social acceptance concerning CCS.

The aim of this article is to analyze public judgments of the acceptability of CCS, in particular how these evolve and get shaped in the social context comprising of the professionally involved actors, and how opinion formation of lay citizens and that of professionally involved actors interact. For this purpose, the viewpoints of professional actors are gathered and analyzed, and a survey is held among citizens, both in the Netherlands. We start with exploring the views of professional actors.

2. Views of professional actors

2.1. Method

Our description of the views of professional actors is based on two types of data. Firstly, in 2003, eight

¹Carbon dioxide storage is also referred to as carbon sequestration.

²Storage in the ocean is also an option but falls beyond the scope of the current study.

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