



GHGT-9

## Trust as predictor of public acceptance of CCS

Bart W. Terwel<sup>a\*</sup>, Fieke Harinck<sup>a</sup>, Naomi Ellemers<sup>a</sup>,  
Dancker D. L. Daamen<sup>a</sup>, & Marjolein De Best-Waldhober<sup>a</sup>

<sup>a</sup> *Leiden University – Institute for Psychological Research, Department of Social and Organizational Psychology,  
Wassenaarseweg 52, 2300 RB, Leiden, The Netherlands*

---

### Abstract

Reduction of carbon dioxide emissions into the atmosphere can be realized by the implementation of carbon dioxide capture and storage (CCS) technology. Successful implementation of CCS will depend on public acceptance of this technology. It has been argued that public trust in organizations involved in complex novel technologies influences risk/benefit perceptions and, consequentially, public acceptance of these technologies (e.g., Siegrist, 1999, 2000). This paper discusses whether or not this model holds true in the context of CCS and whether or not it holds true for both integrity-based trust and competence-based trust.

© 2009 Elsevier Ltd. All rights reserved.

*Keywords* : CCS, perceived benefits, perceived risks, public acceptance, trust

### 1. Introduction

Implementation of carbon dioxide capture and storage technology (CCS) is an important strategy to achieve climate change mitigation. The employment of this technology is particularly important because alternative strategies, such as saving on energy consumption and increasing use of sustainable energy sources (e.g., solar energy, wind energy), will not be sufficient to reach the goal of reducing carbon dioxide emissions by 20 per cent in 2020 compared to 1990. CCS involves the long-term storage of carbon dioxide in underground sites [e.g., (partly) empty gas fields] after it has been captured in major industrial processes such as power generation. Public acceptance of CCS will, in addition to technical and economic aspects, determine whether or not CCS will be implemented successfully. That is to say, public opposition to the implementation of CCS in society would severely reduce the viability of this climate change mitigating strategy.

Most people only have very limited individual knowledge about scientific constructs (including carbon dioxide; [1]), let alone that they are able to personally judge CCS on its merits. Therefore, factors other than the actual qualities of CCS are most likely to (co)determine acceptance of CCS among members of the general public.

\* Corresponding author. Tel.: +0031-715276686.

E-mail: [bterwel@fsw.leidenuniv.nl](mailto:bterwel@fsw.leidenuniv.nl).

Besides several potentially relevant individual difference variables (e.g., worldviews, concern for climate change, attitudes toward sustainable energy), public acceptance of CCS has already been found to depend on people's trust in CCS decision makers, industrial stakeholders, and environmental organizations [2]. The importance of public trust in organizations with regard to public acceptance of complex technologies and hazardous activities has been found in previous research as well. For example, Siegrist [3] examined the effect of trust on people's perceptions of risks and benefits associated with gene technology and their acceptance of this technology. He hypothesized and found that people's trust affected their risk/benefit perceptions, which in turn affected public acceptance of gene technology (see Figure 1). This causal model may apply to CCS as well.

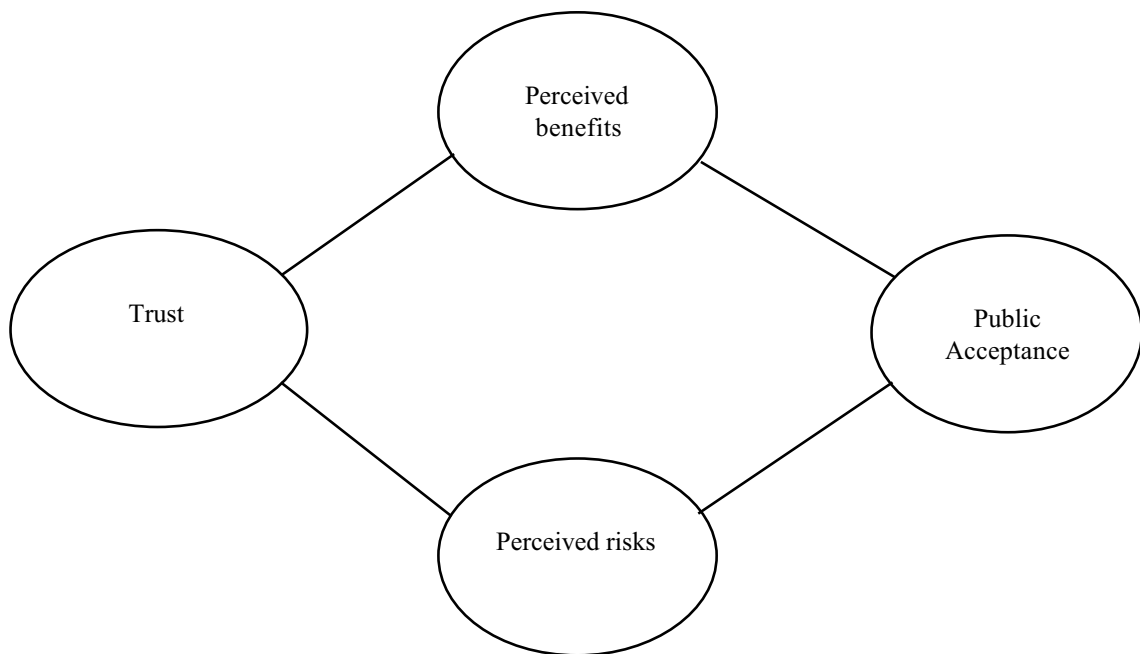


Figure 1. The causal model proposed by Siegrist [3].

The first thing to do is to identify the factors that influence whether or not people consider organizations to be trustworthy. Previous research in the context of CCS has shown that trust depends upon several factors, including people's ideas about whether or not the organization in question is honest in its communications, concerned with public interests, and fair in the way it arrives at its decisions [2,4]. These factors are often associated with trust. For example, Poortinga and Pidgeon [5] used principal component analysis (PCA) to examine the dimensionality of trust in government in relation to several risk issues. Their analysis revealed a two-factor solution. The first factor consisted of positive statements about the government that included items to assess people's perceptions of government concern for public interests, the competence of government, and openness. The second factor consisted of negative statements about government that included items to assess perceived dishonesty of government. The authors referred to the first factor as 'general trust', and referred to the second factor as 'skepticism'. In existing literature, however, several other factor analyses have been reported that point to another direction. For example, Metlay [6] found evidence for a two-factor solution of which the first factor consisted of items to assess people's affective reactions, including perceived honesty, integrity, concern, and so on and so forth. The second factor solely consisted of items to assess perceived organizational competence (e.g., perceived ability and experience). A similar distinction was made by Earle and Siegrist [7], who differentiated between the concepts 'social trust' and 'confidence'. Social trust is based on morality information and corresponds to Metlay's 'affect' dimension of trust, while confidence is based on performance information and corresponds to Metlay's 'competence' dimension of trust. In this paper, we use the terms 'integrity-based' and 'competence-based' trust to refer to these two concepts.

Although literature indicates that both competence and integrity affect public trust in organizations, and that trust in turn affects willingness to cooperate (i.e., accept CCS in the case that an organization is in favor of CCS implementation), it has remained unclear whether trust based on integrity and trust based on competence may affect cooperation through similar or different psychological processes. This paper addresses this issue.

## 2. Hypotheses

The hypotheses were based on Siegrist's [3] causal model (tested in the context of gene technology), and on findings in impression-formation and person-perception research [8], in which has been shown that negativity biases may occur in the integrity domain and that positivity biases may occur in the ability domain.

Hypothesis 1: The position of a CCS organization (proponent versus opponent) affects public acceptance of CCS when integrity-based trust (i.e., trust based on beliefs about positive intent and honesty) is low rather than high. Perceptions of risks and benefits mediate this effect.

Hypothesis 2: The position of a CCS organization (proponent versus opponent) affects public acceptance of CCS when competence-based trust (i.e., trust based on beliefs about experience and expertise) is high rather than low. Perceptions of risks and benefits mediate this effect.

## 3. Method and Results

In two experiments, we tested whether the relationship between trust in an organization involved in CCS and public acceptance of CCS is mediated by perceptions of the magnitude of several prespecified risks and benefits that are associated with CCS implementation. In Study 1, we tested the causal model for integrity-based trust; in Study 2, we tested the model for competence-based trust. In both experiments, participants were provided with trust-related information about the organizations, risks and benefits associated with CCS, and the organizational position concerning CCS. Results of the studies were the following:

- Both integrity-based and competence-based trust affected public acceptance of CCS.
- The relationship between competence-based trust and acceptance of CCS was mediated by perceptions of benefits (not risks), but no support was found for mediation in the case of integrity-based trust.
- Partial support for Hypothesis 1, rather full support for Hypothesis 2.

## 4. Conclusions

These results yield important new insights for a better understanding of how laypeople's judgments about risks and benefits associated with CCS are affected by organizational characteristics, and about how these judgements relate to public acceptance of CCS. They also have several practical implications. One implication is that organizations must act in ways that prevent them from being seen as lacking integrity. Therefore, industrial organizations that are often less trusted than environmental NGOs (because they are widely seen to be concerned with organizational interests rather than public interests) may benefit from openly and honestly communicating their concerns, while at the same time stressing and showing their competence in the matter. Moreover, results further suggest that people's judgments about risks and benefits (i.e., qualities of CCS) are influenced by trust, which implies that organizational communications should not only focus on explaining the qualities of CCS, but that these should focus on trust-relevant information as well (e.g., expressing how decisions are reached, thereby indicating openness and fairness).

## 5. References

1. Meijnders, A. L., Midden, C. J. H., & Wilke, H. A. M. (2001). Role of negative emotions in communication about CO<sub>2</sub> risks. *Risk Analysis*, 21, 955–966.

2. Terwel, B. W., Harinck, F., Ellemers, E., & Daamen, D. D. L. (2008). Voice in political decision making: The effect of group voice on trust in decision makers and acceptance of decisions. *Manuscript submitted for publication*.
3. Siegrist, M. (2000). The influence of trust and perceptions of risks and benefits on the acceptance of gene technology. *Risk Analysis*, 20, 195–203.
4. Terwel, B. W., Harinck, F., Ellemers, E., & Daamen, D. D. L. (2008). How organizational motives and communications affect public trust: The case of carbon dioxide capture and storage. *Manuscript submitted for publication*.
5. Poortinga, W., & Pidgeon, N. F. (2003). Exploring the dimensionality of trust in risk regulation. *Risk Analysis*, 23, 961–972.
6. Metlay, D. (1999). Institutional trust and confidence: A journey into a conceptual quagmire. In G. T. Cvetkovich & R. E. Löfstedt (Eds.), *Social Trust and the Management of Risk*. London, Earthscan.
7. Earle, T. C. & Siegrist, M. (2006) Morality information, performance information, and the distinction between trust and confidence. *Journal of Applied Social Psychology*. 2006, 36, 383–416.
8. Skowronski, J. J., & Carlston, D. E. (1989). Negativity and extremity biases in impression formation: A review of explanations. *Psychological Bulletin*, 105, 131–142.

## 6. Acknowledgements

This research is part of CATO, the Dutch national research program on CO<sub>2</sub> capture and storage. This program is financially supported by the Dutch Ministry of Economic Affairs under the BSIK program. More information can be found on [www.co2-cato.nl](http://www.co2-cato.nl). A more detailed report of the research discussed in this paper can be obtained by contacting the first author.