Origins and consequences of public trust : towards an understanding of public acceptance of carbon dioxide capture and storage

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Chapter 1

Decision making about carbon dioxide capture and storage: The role of trust in stakeholders

Climate change is among the most important issues on the current political and scientific agenda. Scientists and other experts in the field almost unanimously recognize that climate change is caused by ever-increasing greenhouse gas concentrations in the atmosphere.[2] In its 2007 report, the intergovernmental panel on climate change (IPCC) concludes that "most of the observed increase in the globally averaged temperature since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations" and that there is sufficient evidence "to conclude with high confidence that anthropogenic warming over the past three decades has had a discernable influence on many physical and biological systems" (IPCC, 2007, p. 9). In this report, the IPCC also discusses the far-reaching (and primarily negative) consequences of climate change, including consequences for ecosystems (e.g., extinction of plant and animal species), industry and society (e.g., economic and social costs of more intense and/or more frequent extreme weather events), and human health (e.g., increased casualties due to heat waves, floods, etcetera). While there are some benefits associated with climate change as well (e.g., fewer deaths from cold exposure, reduced demand for heating), the net effect will be decidedly negative (IPCC, 2007). Therefore, political and scientific attention is increasingly being directed to develop climate change mitigation strategies.

Carbon dioxide (CO_2) is the primary greenhouse gas, which is increasingly being released into the atmosphere due to the extensive use of fossil fuels in energy generation. Industrialized countries, the main contributors to increased carbon dioxide concentrations in the atmosphere, need to lower their emissions of carbon

[2] Media coverage tends to contrast a single representative of those who are convinced that climate change is caused by increased carbon dioxide emissions (the overwhelming majority of experts) to a single representative of those who do not believe in this causal relationship (a small minority of experts). As a result, a considerable number of people are falsely under the impression that there still is extensive debate and uncertainty on this issue.

dioxide to be able to mitigate climate change effectively. For this reason, the European Commission has formulated the aim to reduce carbon dioxide emissions in industrialized countries by 20% in 2020 compared to 1990. The Dutch government has committed to an even more stringent target of reducing carbon dioxide emissions in the Netherlands by 30% in 2020 compared to 1990. Policymakers are in search of strategies to reach these goals.

One of the most obvious strategies to decrease carbon dioxide emissions is to save on energy consumption. The problem with this strategy is that it requires a behavioral change that is not easily realized (De Young, 1993), not in the least because people attach great value to their current level of prosperity and are reluctant to take a step back. Moreover, because newly industrialized countries (e.g., India, China) aim to achieve higher standards of living, global energy use and concomitant carbon dioxide emissions will increase rather than decrease. A second strategy is to increase the use of sustainable energy sources (e.g., solar and wind energy). This option in isolation, however, will not generate enough energy to meet the existing energy demand. Because in the short run measures taken to stimulate use of sustainable energy sources and saving on energy consumption will be insufficient to prevent climate change from happening, more immediate measures need to be taken in addition to these more long-term climate change mitigation strategies.

Carbon dioxide capture and storage

Implementation of recently developed carbon dioxide capture and storage (CCS) technology is currently considered a relevant climate change mitigation strategy. This technology involves the capture of carbon dioxide (either pre or post combustion) in power plants or other major industrial organizations, the transport of the carbon dioxide to underground sites (e.g., depleted gas fields), and the subsequent injection and storage of the carbon dioxide in these sites. Once implemented, CCS will make a significant contribution to the decrease of carbon dioxide emissions. For that reason, policymakers regard CCS as the third central climate change mitigation strategy. Environmental NGOs also recognize the carbon dioxide reducing potential of CCS but some are, for a variety of reasons, somewhat more ambiguous (e.g., some have the concern that CCS may go at the expense of money and effort invested in development of more long-term and sustainable solutions).

Public acceptance of CCS will be crucial for the realization of this technology as a strategy to mitigate climate change. The need for public acceptance of policy initiatives such as CCS is illustrated, among other examples, by the 1995 Brent Spar case. In this instance, industrial organization Shell preferred the deep-sea disposal over the onshore disposal of Brent Spar, its decommissioned oil storage and loading structure. Shell had assessed the environmental risks of deep-sea disposal and concluded that these were negligible. Nevertheless, environmental NGO Greenpeace portrayed the deep-sea disposal option as highly risky, which instigated considerable public opposition to Shell's position on the issue. Ultimately, this lack of public acceptance and the political commotion it elicited forced Shell to develop an alternative to the deep-sea disposal of Brent Spar (for a more detailed description of the Brent Spar case, see Löfstedt and Renn, 1997). In a similar vein, the lurking danger concerning CCS is that members of the general public can mobilize political resistance against CCS implementation, which would severely reduce the viability of this technology. Accordingly, it is highly relevant to further examine how people decide to accept or oppose CCS.

The importance of public trust

The central proposition in this thesis is that public acceptance of CCS will depend on people's trust in CCS stakeholders rather than on specific qualities of the technology. Underlying this idea is the fact that members of the general public are not able to accurately judge CCS on its merits. After all, it is beyond doubt that a high level of expert knowledge and scientific training as well as a huge cognitive effort is required to be able to adequately judge such a complex technology. At the same time, most people simply are unable to access or judge relevant information (or do not have the opportunity or motivation to do so). In situations such as these, people's positions on the subject often do not result from in-depth analysis of the issue at hand, but more likely result from rules of thumb, so-called heuristics (see Kahneman, Slovic, & Tversky, 1982). In line with the position taken by Earle and Cvetkovich (1995) that trust can be thought of as "a tool for the reduction of cognitive complexity" (p.33), I propose that people will rely on their sense of trust in CCS stakeholders when they decide whether to accept or oppose CCS implementation. Thus, instead of considering the effects of specific qualities of *CCS technology* on public acceptance of this technology, this thesis focuses on how the (perceived) qualities of *CCS stakeholders* affect people's trust in these stakeholders and their subsequent acceptance of CCS.

There already is some empirical support for the general importance of public trust with regard to public acceptance of modern technologies. For example, Siegrist's (2000) research on public acceptance of gene technology suggests that trust in organizations that are responsible for the management and use of this technology serves as a guide in lay attitude formation. He hypothesized and found that people associated greater benefits and smaller risks with gene technology to the extent that they trusted the organizations involved. As a consequence, people were more accepting of this technology when trust was high rather than low. These results are consistent with the idea that people's sense of trust in organizations can function as a "guiding principle" in their decisions to accept or oppose complex technologies. Nevertheless, due to the correlational nature of Siegrist's research, the assumed causal direction of the psychological process (i.e., trust affects perceived risks and benefits, which in turn affect public acceptance) is subject of debate (see e.g., Eiser, Miles, & Frewer, 2002; Poortinga & Pidgeon, 2005). In addition, there are no conclusive empirical data indicating how organizations can instigate trust in the general public.

Origins of public trust

The identification of key factors that may build or destroy trust in CCS stakeholders requires some understanding of the concept of trust. Nowadays, the (cross-disciplinary) definition of trust provided by Rousseau and colleagues (Rousseau, Sitkin, Burt, & Camerer, 1998) is widely used. These authors conceptualize trust as "a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another" (p. 395). At the core of this definition are the terms "vulnerability", which refers to a degree of dependency, and "expectations", which implies some degree of uncertainty about another's intentions and future actions. These core elements, Rousseau and colleagues (1998) note, are recognized in many alternative definitions of trust and apply regardless of the type of party that is (not) trusted – another person or an organization. At the same time, despite extensive theorizing on the subject, trust has remained a rather fuzzy concept in the literature. For example, notwithstanding apparent consistencies across definitions, a fair amount of disagreement remains about whether trust is a unidimensional or multidimensional concept and, if multidimensional, what constitute these different dimensions.

Narrowing the scope from the broadest level of analysis to the specific concept of public trust in organizations (the central topic of the current thesis) does not provide an instant solution for this conceptual problem. That is, several scholars have argued that public trust in organizations should be thought of as a multidimensional concept, but some argue that it consists of five distinct dimensions (e.g., Renn & Levine, 1991), while others argue for four (e.g., Kasperson, Golding, & Tuler, 1992), three (e.g., Peters, Covello, & McCallum, 1997), or two (e.g., Jungermann, Pfister, & Fischer, 1996; Metlay, 1999). Illustrative in this regard is the paper by Metlay (1999) with the telling title "Institutional trust and confidence: A journey into a conceptual quagmire".[3] Herein, Metlay reviews some literature on the basis of which he identifies seven possibly distinct dimensions of trust. These included openness, consistency, honesty, credibility, fairness, concern, and competence. Nevertheless, Metlay's test to verify whether these dimensions could indeed be distinguished empirically indicated a two-factor solution rather similar to results obtained by Jungermann and colleagues (1996). The first factor represented what Jungermann and colleagues call the "honesty" dimension of trust and what Metlay refers to as the "affective" component of trust (which included all items except those that assessed organizational competence). The second factor represented the "competence" component of trust (which only consisted of items assessing organizational expertise). Based on this research, Metlay's conclusion is that trust is not very complex, but refers to a rather straightforward two-dimensional concept. In this thesis, I will focus on these two primary dimensions of trust.

My aim is to identify how CCS stakeholders can instigate trust in the general public and to show how trust affects public acceptance of CCS rather than to solve issues surrounding proper definition or measurement of the trust concept. The literature reviewed above suggests that interventions aimed at building trust can only be successful to the extent that they elevate perceptions of organizational integrity (i.e., the affective or honesty dimension of trust) and/or organizational competence. After all, most scholars recognize that the origins of public trust

[3] Metlay (1999) did not distinguish between trust and confidence, but some authors argue that conceptual differences exist (Earle & Siegrist, 2006; Siegrist, Earle, & Gutscher, 2003). According to Siegrist and colleagues (2003), the difference is that trust involves risk and vulnerability (cf. Rousseau et al., 1998), while confidence does not. Moreover, these authors note that the objects of trust are person-like entities (including organizations), while one can have confidence in about anything (e.g., confidence that an event will occur as planned).

consist of indicators of organizational integrity and organizational competence (regardless of whether these indicators are considered separate dimensions or part of one of these two overarching categories). Given the objective to understand people's current trust in CCS stakeholders and to develop strategies to raise it, I will address people's perceptions of stakeholder integrity and competence as bases for public trust in CCS stakeholders, which in turn may be used to predict and explain public acceptance of CCS.

Instigating trust through communication

Beliefs regarding the intentions of an organization constitute an important determinant of public trust (cf. Rousseau et al., 1998). Therefore, assessing people's expectations about the reasons for organizations to be involved in CCS is relevant to understand current levels of public trust in these organizations. For instance, CCS stakeholders may be seen by the general public as being motivated by a prospect of economic gain, or as being motivated by a prospect of a cleaner natural environment. I will refer to reasons such as these that are seen to underlie organizational policy and actions as *organizational motives*. I argue that people's inferences about organizational motives are likely to affect the level of public trust in CCS stakeholders.

Two principal types of motives can be distinguished: Motives reflecting concern for public interests and motives reflecting concern for organizational interests. In the literature, various labels have been used to refer to these two types of motives, including altruistic versus egoistic motives (e.g., Batson, 1994, 1996), other-centered versus self-centered motives (e.g., Ellen, Mohr, & Webb, 2000), societal interest versus self-interest (e.g., Funk, 2000), and external goals versus internal goals (e.g., Nilsson, Von Borgstede, & Biel, 2004). In this thesis, these two classes of motives are referred to as *public-serving* motives and *organization-serving* motives because this terminology best matches the organizational level of this thesis. Public-serving motives reflect organizational concern for public welfare and benefits of people outside the organization (i.e., members of the general public), while organization-serving motives refer to a focus of the organization on economic gain and maximization of benefits for the organization itself (cf. Forehand & Grier, 2003). I propose that an important factor that affects people's trust in CCS stakeholders is the extent to which these organizations are perceived to be concerned with public interests.

If environmental NGOs are trusted more than industrial organizations due to the public-serving motives that they are believed to act upon, then industrial organizations may raise trust by expressing such public-serving motives. In that sense, industrial stakeholders may benefit from communicating the positive impact that CCS will have on preservation of the natural environment. After all, members of the general public are likely to positively value the content of the motive communicated, not in the least because preservation of the natural environment serves public interests rather than that it directly serves the industrial stakeholders' interests. Hence, at first glance, expressing public-serving motives may be a relevant strategy to instigate trust in the general public for CCS stakeholders that are seen to act upon organization-serving motives.

On the other hand, an industrial stakeholder that communicates concern for the natural environmental runs the risk of being perceived as failing to acknowledge its "true" organizational motives and hence of being deemed dishonest. Previous research on corporate societal marketing (CSM) and corporate social responsibility (CSR) activities indeed suggests that while people generally appreciate companies that are sensitive to the societal effects of their activities, simply claiming concern with public interests may harm company evaluations (Ellen, Webb, & Mohr, 2006; Forehand & Grier, 2003; Yoon, Gürhan-Canli, & Schwarz, 2006). That is, people may be doubtful as to whether the concern that is expressed by the organization reflects its true organizational motives or whether it is invoked to mask ulterior organization-serving motives. In case of the latter, the content of the motive communicated is valued positively, but at the same time it will be seen as incongruent with the organizational motive, causing the organization to be perceived dishonest and untrustworthy. By contrast, to the extent that perceived organizational honesty affects people's trust in organizations, an alternative strategy for industrial stakeholders to consider is to disclose their concern for the organization-serving qualities of CCS. While its content is not very much valued, an organization-serving motive that is communicated (e.g., economic gain) is likely to be seen as congruent with the organizational motive, indicating honesty.

In sum, expressing concern for public interests may instigate trust in CCS stakeholders to the extent that public-serving motives are valued over organization-serving motives. This strategy may backfire, however, when communications are seen as an attempt to mask ulterior organization-serving motives. In that case, communicating public-serving motives will reduce rather than enhance perceptions

of organizational integrity and public trust. Thus, there may be a tradeoff between value and congruency that is relevant with regard to the instigation public trust. This thesis aims to show that it is the degree of congruency between inferred organizational motives and organizational communications rather than the sole content of organizational communications that determines public trust in organizations. I will address these communication issues in Chapter 3.

Political decision making and the instigation of trust

In addition to public perceptions of individual stakeholders, people's perceptions of the decision-making process are also relevant for the creation of public trust and acceptance of policy decisions concerning CCS. I propose that people who learn that the decision-making process has been proper and fair should be more inclined to trust the decision maker and, as a result, should be more likely to accept the decisions made. For this reason, communicating how decisions regarding CCS are reached may constitute an important tool for political decision makers to instigate trust in the general public. But what are important characteristics of proper decision making and do these actually help to raise public trust?

It is a well-established phenomenon that people often base their evaluations of decisions on whether or not they have received an opportunity to express their opinions in decision-making processes rather than on the specific outcomes or nature of the decisions made. This characteristic of decision-making processes is often referred to as "voice" (Folger, 1977). Why people care about personal voice in decision making is often explained by referring to instrumental and relational concerns (Tyler & Lind, 1992). From an instrumental perspective, an individual cares about opportunities to voice his or her opinion in decision-making processes because expressing one's view on an issue may persuade the decision maker to provide this person with more favorable outcomes. At the relational level, an individual values voice in decision making because being denied or provided with voice conveys self-relevant information concerning the extent to which the decision-making authority values and respects the individual in question. As such, both these perspectives on voice in decision making consider personal voice important because of the self-oriented implications of particular treatment.

It is important to note that in most previous research on voice individuals whose personal outcomes were at stake were personally involved in the decision-making process. Less attention has been paid to whether voice can also be considered an important characteristic of decision making when people are not

directly personally involved in the decision-making process, which is more likely to be the case in public decision making. In cases such as these, the effects of allowing for voice cannot as easily be explained by the traditional self-oriented explanations mentioned above, given that in this case personal implications of voice procedures are not as straightforward as they are with personal voice (cf. Lind, Kray, & Thompson, 1998). Nevertheless, I argue that people also consider voice an important characteristic of decision-making procedures when they are not directly personally involved in the decision-making process. That is, the provision of voice to parties involved in public decision making may indicate fair decision making and signals that the decision maker can be trusted for its integrity and openness to inputs from different parties. Accordingly, in this thesis I aim to show that political decision makers are likely to instigate trust and facilitate public acceptance of the decisions they make when they provide interest groups with an opportunity to voice opinions in CCS decision making (i.e., group voice). I will address this decision-making issue in Chapter 4. The next section summarizes the results of the empirical research per chapter.

Overview of empirical findings

Effects of integrity-based and competence-based trust

In Chapter 2, a distinction is made between trust based on indicators of organizational integrity and trust based on indicators of competence in order to examine how these two types of trust affect public acceptance of CCS implementation. Siegrist's (2000) research served as the starting point for these studies. Siegrist proposed a model in which lay judgments concerning risks and benefits associated with modern technologies mediate the influence of trust in organizations on public acceptance of such technologies. Eiser and colleagues (Eiser et al, 2002) have referred to this model as the *causal chain account of trust*. The causal chain account has neither been subjected to experimental testing, nor has previous research examined its validity for competence-based trust and integrity-based trust separately. Chapter 2 reports on two experimental studies that were designed to test the causal chain account for both competence-based trust and integrity-based trust.

The argument for the relevancy of distinguishing between competence-based trust and integrity-based trust stems from findings in person-perception research. Research in this area suggests that people tend to weigh positive

information about competence more heavily than negative information about competence, but tend to weigh negative information about integrity more heavily than positive information about integrity (Skowronski & Carlston, 1989). Based on this asymmetry principle, I predicted positive rather than negative information about the competence of an organization to affect public acceptance of CCS. By contrast, I expected negative rather than positive information about integrity to affect public acceptance of CCS. I further tested whether perceptions of risks and benefits associated with CCS mediated these effects.

Study 2.1 focused on organizational competence and followed a 2 (competence-based trust: high vs. low) by 2 (organizational position regarding CCS: pro vs. con) between-subjects factorial design. The first hypothesis was that organizational position would affect acceptance of CCS when competence-based trust was high, but not when competence-based trust was low. The second hypothesis was that perceptions of the risks and benefits associated with CCS would mediate the effect of competence-based trust and organizational position on acceptance of CCS (i.e., the causal chain model). Results indicated that people were indeed more positive about CCS when the organization was portrayed as a proponent compared to an opponent of CCS, but only in the case of high competence-based trust (organizational position did not affect acceptance of CCS in the case of low competence-based trust). Moreover, results showed that people's perceptions of the benefits associated with CCS (but not their perceptions of risks) mediated this effect. Thus, this study largely confirmed the hypotheses and indicates support for the causal chain account.

Study 2.2 focused on organizational integrity and followed a 2 (integrity-based trust: high vs. low) by 2 (organizational position regarding CCS: pro vs. con) between-subjects factorial design. The first hypothesis was that organizational position would influence acceptance of CCS only in the case of low integrity-based trust. Consistent with the causal chain model, the second hypothesis was that perceptions of risks and benefits would mediate the effect of integrity-based trust and organizational position on people's willingness to accept CCS. This time, results revealed that, in the case of low integrity-based trust, people were more *negative* about CCS when the organization was portrayed as a proponent compared to an opponent of CCS, while in the case of high integrity-based trust no reliable effects of organizational position were observed. Results did not provide support for the causal chain account because neither perceived benefits nor perceived risks

mediated the effect of integrity-based trust and organizational position on people's acceptance of CCS.

Organizational motives and communications

Chapter 3 focuses on public trust in CCS stakeholders as a function of inferred organizational motives and organizational communications. It provides insight into how inferred organizational motives affect trust and further suggests that organizational communications should at least in part match inferred motives to instigate trust. Study 3.1 was an internet survey among members of the general public designed to examine whether public trust in CCS stakeholders depends on people's inferences of organizational motives. The survey consisted of questions to assess public trust in CCS stakeholders as well as people's inferences of organizational motives. Respondents first indicated their familiarity with each of the CCS stakeholders. Subsequently, they completed a version of the questionnaire that asked them about their perceptions of one of these organizations (either one of three industrial stakeholders or one of three environmental NGOs). The hypothesis was that public trust in NGOs would be higher than trust in industrial organizations due to differential inferred motives of these organizations (i.e., public-serving motives in the case of NGOs and organization-serving in the case of industrial organizations). As expected, results of this study revealed that people thought environmental NGOs to be involved in CCS out of public-serving motives (e.g., public health, concern for the natural environment), whereas they thought that industrial organizations were involved in CCS out of organization-serving motives (e.g., economic gain, image). In turn, these different motives accounted for the higher level of public trust in environmental NGOs than in industrial organizations. Important to note is that perceived level of organizational competence did not differ between the types of organizations and thus cannot account for differences in trust.

Study 3.2 tested the hypothesis that it is the *congruency* between organizational communications and inferred organizational motives rather than the objective *content* of organizational communications that leads to public trust in organizations. It followed a 2 (type of organization: environmental NGOs vs. industrial organizations) by 2 (communicated argument: environmental argument vs. economic argument) between-subjects factorial design. In line with hypotheses, results showed that congruence between inferred motive and communicated motive (e.g., an industrial organization communicating an economic argument) instigated

more trust in organizations than incongruence (e.g., an industrial organization communicating an environmental argument) and that this effect was mediated by perceived organizational honesty.

Study 3.3 was designed to replicate the abovementioned congruency effect and to examine how trust would be affected by communications consisting of both a congruent and an incongruent argument. The design of this study was a 1 (type of organization: industrial organization) by 3 (communicated arguments: two environmental arguments vs. two economic arguments vs. an environmental argument and an economic argument) between-subjects factorial. Results replicated those of Study 3.2 in that congruence instigated more trust than incongruence, but also showed that communicating an argument incongruent with the inferred organizational motive (i.e., an environmental argument) does not necessarily undermine trust as long as an argument that is congruent with the inferred motive (i.e., an economic argument) is communicated simultaneously. Again, perceived organizational honesty mediated this effect.

Group voice and acceptance of political decisions

In Chapter 4, I focus on how the involvement of CCS stakeholders in decision making about CCS influences people's trust in the decision maker and acceptance of decisions made. Study 4.1 followed a 2 (procedure: group voice vs. no voice) by 2 (advice regarding CCS implementation: pro vs. con) between-subjects factorial design to test the hypothesis that a group-voice procedure would lead to higher levels of trust in the decision maker and greater acceptance of the decision made than a no-voice procedure. In the group-voice conditions, both environmental NGOs and industrial organizations had an opportunity to express their opinions about CCS to the decision maker (i.e., a political board that had been assigned the task to formulate an advice concerning CCS), while these organizations did not have such an opportunity in the no-voice conditions. Results supported the predictions in that participants in the group-voice conditions indicated to have more trust in the decision maker and, as a consequence, accepted the outcome to a greater extent than those in the no-voice condition, regardless of whether it was for or against CCS implementation.

Study 4.2 aimed to extend results of Study 4.1 by investigating whether the effects of the decision-making procedure on inferred trustworthiness and acceptance of the decision made were due to procedural features (i.e., the presence or absence of group voice) or due to the involvement of specific parties in the

decision-making process. The study followed a 3 (procedure: voice for NGOs only vs. voice for industrial organizations only vs. voice for both NGOs and industrial organizations) by 2 (advice regarding CCS implementation: pro vs. con) between-subjects factorial design. As expected, results replicated those of Study 4.1 in that inferred trustworthiness mediated the effect of decision-making procedure on acceptance of the advice. In addition, results showed that equal-voice procedures instigated more trust than unequal-voice procedures, regardless of the type of organizations that had received an opportunity to voice their opinions.

Study 4.3 focused on the influence of participants' knowledge level concerning CCS on their preference to include members of the general public in CCS decision making (i.e., public voice). The study followed a 2 (information about CCS: yes vs. no) by 2 (procedure: public voice vs. public no voice) between-subjects factorial design. Providing half of the participants with information about CCS created a relatively knowledgeable group of participants and a relatively unknowledgeable group of participants. The hypothesis was that people who had some knowledge about CCS would respond differently to public-voice procedures than people who had no knowledge about CCS. That is, knowledgeable people were expected to report higher trust in the decision maker and greater acceptance of decisions in the case of public-voice procedures than in the case of public-no-voice procedures, while no such differences were expected among unknowledgeable people. Results indicated support for this prediction.

Discussion and conclusions

As mentioned before, capture and storage of carbon dioxide (CCS) is considered an important strategy to mitigate climate change, but public acceptance of this technology will be critical for successful implementation of CCS in society. In this thesis, I argue that people's trust in CCS stakeholders (e.g., environmental NGOs, industrial organizations, governmental organizations) is a significant determinant of whether people accept or oppose CCS implementation. I further argue that people's perceptions of organizational integrity and organizational competence are central to understand trust in CCS stakeholders. By addressing processes that build or destroy trust in CCS stakeholders, this thesis has both important theoretical and practical value.

This thesis yields an interesting contribution to existing literature on the causal chain account of trust by showing that effects of competence-based trust and

integrity-based trust on acceptance of CCS are different. Whereas previous tests of the causal chain model (e.g., Siegrist, 2000; Tanaka, 2004) did not explicitly distinguish between competence-based trust and integrity-based trust, the research reported in Chapter 2 shows that it is important to make this distinction. This research sheds new light on the validity of the causal chain account of trust because it suggests that the causal model holds true for competence-based trust, but not for integrity-based trust. Furthermore, research in this chapter indicates that perceived lack of organizational integrity is detrimental for people's trust in CCS stakeholders and their subsequent willingness to cooperate with these organizations (i.e., go along with the organizational position). An organization that is seen to lack integrity instigates distrust rather than trust in the general public, which as a result causes people to oppose rather than to go along with the position advocated by the organization in question. Accordingly, for those who consider CCS implementation a good climate change mitigation strategy it is imperative to avoid being perceived as lacking integrity to be able to build trust and facilitate acceptance of CCS.

Indicators of organizational integrity

One element of organizational integrity is the extent to which organizations are perceived to be concerned with public interests instead of organizational interests. In this regard, it seems that perceived lack of integrity is less of a problem for environmental NGOs than it is for industrial organizations. Indeed, Chapter 3 indicates that inferred organizational motives constitute the basis for differential levels of public trust in environmental NGOs and industrial organizations. Industrial stakeholders are trusted less because they are expected to be involved in CCS out of organization-serving motives such as economic opportunities rather than out of public-serving motives such as concern for preservation of the natural environment. Thus, industrial organizations must act in ways that signal higher levels of organizational integrity than the currently perceived levels of integrity.

An obvious strategy that industrial stakeholders may utilize to elevate public perceptions of organizational integrity is to communicate the environmental benefits of CCS, thereby expressing their concern for public interests. If it were effective, this strategy would seem to attack people's negative thoughts concerning the organization-serving motives underlying actions of industrial organizations most directly. Research discussed in Chapter 3 reveals, however, that there are important drawbacks to this type of strategy. That is, people seem to expect ulterior organization-serving motives, causing industrial stakeholders to be seen as

dishonest. In the case that people suspect such a hidden agenda, this type of strategy, aimed to raise existing perceptions of organizational integrity, is likely to backfire in that it seems to reduce rather than increase perceived organizational integrity and public trust. This chapter further shows that a better strategy to instigate trust is to acknowledge the organization-serving benefits of CCS technology in addition to emphasizing its public-serving benefits. If industrial stakeholders are open in communicating that CCS also has qualities that may serve organizational interests, then this type of strategy signals that the organization is acting honestly. Perceived openness and honesty indicate organizational integrity and instigate trust. It therefore seems that organizations benefit most from communicating those qualities of CCS that are congruent with inferred organizational motives.

In a similar vein, distrust in government bodies is often associated with public suspicion of "backroom politics", indicating that people perceive a lack of openness in political decision-making processes. One way to tackle this problem is to write out referenda, so that all members of the general public have personal voice and are personally in charge of policy decisions. Such a strategy will reduce feelings of backroom politics and hence may instigate trust, but the difficulty is that members of the general public have little personal knowledge about chemical constructs such as carbon dioxide, let alone about how to judge CCS on its merits. Moreover, compared to members of the general public, it may be that people living nearby actual storage sites are more negative about CCS to the extent that they worry about personal risks and safety that are probably less relevant considerations for most other people. Therefore, a national referendum does not seem to be the most appropriate tool with regard to the issue of CCS, although this is not to say that policy makers can disregard public concerns about CCS.

This thesis suggests an alternative and rather simple strategy that may avoid public suspicion of backroom politics: Communicating how decisions about CCS will be or even have been reached. While relevant considerations that lead to particular decision preferences are often communicated (CCS should be implemented because…), the process that is used to arrive at such decisions is often not communicated explicitly. This is important to recognize because providing a rationale for decisions can only be done after decisions have been made, while communicating how decisions concerning CCS will be (or even have been) reached can already start in the early stages of CCS decision making, thereby building trust and reducing the conviction that backroom politics play a role.

Imperative in this regard is to stress that multiple parties with different identities and interests are involved in CCS decision making and that each of these organizations is heard before policy decisions will be made. Communicating that parties that are trusted by members of the general public (e.g., environmental NGOs) are involved in decision making about CCS is not sufficient to instigate trust, because decision-making procedures are only considered proper and fair to the extent that all parties involved receive an opportunity to voice their opinions about CCS. Fairness in and openness about decision making indicates integrity, instigating trust in the general public and creating greater willingness to accept the decisions made.

Informing the public about CCS

It is important to recognize the process through which provision of information about CCS influences public trust and acceptance of CCS with an eye to identify how people can best be informed on this issue. At this point in time, members of the general public have little knowledge about CCS. Therefore, it is relevant to think about how people can best be informed about CCS. In such matters, a great deal of attention is often paid to the content of the information to be provided (e.g., difficulty, scope, completeness), but only little to factors that influence how people perceive information (e.g., the source) or how responses to information may be different for informed compared to uninformed people. Some people may find it sufficient to know how parties that they trust think about CCS or that the decision-making process is accurate. Others may be more inclined to look for information to judge CCS on its merits on their own. But also in the latter case, source characteristics such as organizational integrity and organizational competence will affect how people perceive the information; information is not only judged on its objective content, but also on the source providing the information. For example, the same information is evaluated differently depending on whether or not the source is considered competent, which in turn affects whether people think CCS should be implemented (see Chapter 2). Similarly, when information about the environmental benefits of CCS is provided by an industrial stakeholder, this information instigates less trust than when the same information is provided by an environmental NGO (see chapter 3). Based on the research in this thesis [and on related research by Ter Mors (2008), and de Best-Waldhober and colleagues (de Best-Waldhober, Daamen, & Faaij, in press)] I would conclude that providing factual information about CCS is one aspect of informing the public, but one

should also be aware that public acceptance of CCS does not solely depend on the quality of the information provided, but on the source providing the information and the process of decision making as well.

Experimental simulations in an applied context

Except for the first study in Chapter 3, all studies reported in this thesis used experimental designs to test specific relationships between the variables of interest. This methodology offers excellent opportunities to study psychological processes on the basis of which future public acceptance of CCS can be predicted. For example, it enables the examination and identification of processes through which stakeholder communications affect public trust without contaminating the target population for future communications. Before CCS stakeholders start to inform members of the general public about their positions on the issue, with the insights derived from this thesis it has become possible to tailor their organizational communications accordingly. This type of research is important to conduct particularly in the early stages of CCS decision making, as it helps to predict factors that facilitate public acceptance rather than explaining afterwards what went wrong. The use of experimental paradigms makes it possible to try different types of communication strategies and to compare their effectiveness ahead of time, without interfering with real-life decision-making procedures concerning CCS at potential demonstration sites.

A potential point of concern is whether the undergraduate student samples that have been examined in this thesis provide knowledge that can be generalized to broader populations. Indeed, there may be differences between students and members of the general public concerning their psychological properties that may cause members of the general public to respond differently to the stimuli examined in the current research than students did. In the current research, potentially relevant differences between samples of undergraduate students and broader samples of the general public may represent differences in average intelligence and general knowledge of scientific constructs relevant to CCS, such as carbon dioxide. In addition, compared to the general public, undergraduate students are likely to be more politically active implying that they might care more about how political decisions are made.

While it is important to take such differences into account, they do not seem to represent significant barriers with regard to generalizing the current findings. Chapter 4 on group voice in CCS decision making shows that

undergraduate students who did not receive explicit information about CCS were clearly not able to answer questions about CCS correctly, indicating that knowledge about CCS among undergraduate students is as little as it is among the rest of the general public (see de Best-Waldhober et al., in press). Moreover, the importance of group voice in decision making seems independent of the research population in question because fairness and trustworthiness represent quite basic human values that are important to all and sundry. After all, people's willingness to cooperate with authorities has previously been found to depend on the fairness of decision-making procedures, regardless of whether the research sample consisted of employees receiving unfair treatment from their supervisors (e.g., Bies & Shapiro, 1988), citizens thinking of their encounters with the police (Tyler & Folger, 1980) or undergraduate students not receiving voice in the amount of lottery tickets that they think they should receive (e.g., Van den Bos, Wilke, & Lind, 1998). All in all, at this stage of CCS decision making, the advantages of the experimental approach used in this research outweigh its disadvantages.

Further research is needed to more specifically monitor and examine how the processes addressed in this thesis affect opinions of people living nearby an actual carbon dioxide storage site, as additional concerns are likely to play a role for this specific group. That is, participants in the current studies as well as members of the general public are more likely to accept CCS to the extent that they associate societal benefits with this technology. On-site residents, however, may be much more concerned with the personal risks that they associate with CCS than with the global or national benefits associated with CCS. At the same time, they may be especially sensitive to potential regional benefits (e.g., increased employment opportunities) that may be of less value to other people.

Another difference between the general public and on-site residents is that it seems likely that people living nearby storage sites are inclined to put even more weight on their trust in CCS stakeholders than members of the general public who are less directly affected by these measures. For the current research, I primarily focused on environmental NGOs and organizations in the oil and gas industry as it was considered important to select nationwide operating organizations that are known by many people and that are expected to act upon different motives. Because CCS will have significant environmental and economic consequences, focusing on environmental NGOs and industrial organizations was ideal in this regard. For on-site residents, however, other CCS stakeholders will also be relevant. For instance, in addition to industrial stakeholders and environmental

NGOs, trust in local (instead of national) government may be crucial to create acceptance of CCS. For these reasons, some of the current findings (for instance the finding that people's judgments of the benefits associated with CCS correlated more strongly with acceptance of CCS than judgments of associated risks; see Chapter 2) should predict what happens with public acceptance in general, but priorities may be different for on-site residents.

Concluding remarks

One of the main messages of this thesis is that public acceptance of CCS will not solely depend on the content of the information that is provided regarding the specific *qualities of CCS*, but also will depend to a considerable extent on the *type of information* (e.g., risks or benefits, environmental consequences or economic consequences), the *source providing information* (e.g., industrial stakeholders, environmental NGOs, government bodies), and the nature of the *decision-making process* (e.g., whether or not interest groups receive an opportunity to voice opinions). That is, people's judgments of the magnitude of benefits associated with CCS depend upon whether they learn about these benefits from a source that they consider trustworthy or from a source that they do not consider trustworthy. Moreover, environmental NGOs seem to instigate more trust than industrial organizations because they are perceived to serve public rather than organizational interests. Industrial organizations may overcome being perceived as untrustworthy, however, by communicating a two-fold message that acknowledges their organizational interests while at the same time showing concern for public interests. Finally, members of the general public do not necessarily call for personal voice in CCS decision making as long as relevant parties such as environmental NGOs and industrial organizations are heard in the decision-making process. Such group-voice procedures instigate trust in decision-making authorities, which in turn leads to greater acceptance of decisions made, regardless of whether these decisions are in favor of or against CCS implementation. This finding indicates the importance of informing members of the general public about the way decisions about CCS are reached.

In the mean time, global warming is becoming more and more apparent (e.g., the melting of the North Pole) and steps need to be taken to take away its cause: Ever-increasing carbon dioxide emissions into the atmosphere. An important strategy to reduce emissions of this greenhouse gas is to implement CCS on a large scale, but this strategy can only work if people do not oppose CCS implementation.

One thing may be clear from this thesis: Public acceptance of this complex and novel technology is highly dependent on the level of public trust in CCS stakeholders. I have outlined a number of factors that influence public trust in CCS stakeholders. Now it is their turn to use these insights for the public good.