Pitfalls in the communication about CO2 capture and storage

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Chapter 3

Pitfalls in the Use of Emphasis Framing

This chapter is based on: de Vries, G., Terwel, B. W., & Ellemers, N. (under review). Perceptions of manipulation and judgments of illegitimacy: Pitfalls in the use of emphasis framing when communicating about CO_2 capture and storage.

One of the greatest environmental challenges the world is facing today is combating global warming. According to the Intergovernmental Panel on Climate Change, warming of the climate system is unequivocal (IPCC, 2013). This change in climate has potentially harmful consequences for humankind and nature, including disturbance of ecosystems, extinction of some plant and animal species, and a rising sea level. Global warming is largely due to growing emissions of the greenhouse gas carbon dioxide (CO_2). Emissions of CO_2 partially result from natural-induced processes; however, human-induced CO_2 emissions are regarded as the most important contributors to global warming (IPCC, 2013; WMO, 2013). A well-known example is the CO_2 release from the combustion of fossil fuels such as coal, oil, and natural gas to produce energy and electricity. To combat global warming, many industrialized countries have agreed to reduce their emissions of CO_2 and other greenhouse gases (United Nations, 1998; 2012). One of the measures to reduce CO_2 emissions is the large-scale implementation of CO_2 capture and storage (CCS) (IPCC, 2007). In a nutshell, CCS involves the capture of CO_2 in fossil fuel power plants or other major industrial processes, and the subsequent transport and long-term storage of this CO_2 in deep geological formations such as depleted natural gas fields and saline aquifers.

Besides technical and regulatory issues, the viability of CCS is codetermined by whether or not members of the public accept its use. For example, a proposed CCS demonstration project in the Dutch town of Barendrecht has been cancelled in 2010 because of local opposition to this project (Terwel et al., 2012). This opposition could be partly due to communication issues, for example, information from the project partners was not always perceived as relevant and trustworthy (Brunsting et al., 2011). In contrast, a local activist group called 'CO_2isNee' (i.e., CO_2isNo) argued very fiercely against the demonstration project through publications on its website, messages in local newspapers, and public meetings (Brunsting et al., 2011; Terwel et al., 2012).

Research supports the potential influence of communication on public attitudes towards controversial, novel technologies. For example, the public opinion about nanotechnology can be influenced by the extent to which risks and benefits of the technology are described (Cobb, 2005). Similarly, attitudes towards nuclear power can

be affected when this energy resource is related to climate change mitigation (Jones et al., 2012).

More than not, public communications about novel technologies are persuasive instead of informative; they are to create, reinforce, modify or extinguish the beliefs, attitudes, intentions, motivations, and/or behaviors of an audience (e.g., Fishbein & Ajzen, 1975; Gass & Seiter, 2007; Hovland et al., 1953). Scientists as well as practitioners tend to focus on the effectiveness of persuasive communication, for instance regarding its influence on people's attitude. However, less scientific attention goes to how recipients perceive persuasive communications. Because the psychological effects are rather neglected, some persuasive communication techniques might appear to be effective on the short run while people's (presumably negative) perceptions about their use stay undetected. Yet, these perceptions are important because they can have long-term costs. In the current research, we aim to examine whether or not persuasive communication can lead to unforeseen, unfavorable perceptions about the message and the communication source (i.e., pitfalls). More specifically, we aim to identify potential pitfalls in the use of emphasis framing when communicating about CCS.

Emphasis Framing

Emphasis framing is a persuasion technique in which greater weight is given to one aspect of an issue over another aspect (e.g., Chong & Druckman, 2007). Emphasis framing has shown to be effective regarding shaping people's attitudes. For example, information that genetically modified food helps to combat world hunger moves attitudes towards the food into a more positive position than information that genetically modified food impacts on biodiversity and the food chain (Druckman & Bolsen, 2011). This example—where only a single proposition is communicated and any opposing considerations are omitted—illustrates a strong form of emphasis framing: one-sided framing. A more subtle form is two-sided framing. Two-sided framing involves the communication of two competing frames with an emphasis on one of them. Two-sided framing can also be an effective technique to shape people's attitudes towards an issue. For example, people indicated more tolerance towards the Ku Klux Klan after reading a news article that characterized a planned rally of this organization both as an act of freedom of speech and as a risk to public safety, but emphasized the aspect of freedom of speech, than when the article emphasized public safety (e.g., Nelson, Clawson, & Oxley, 1997).[8]

[8] Another well-known type of framing—that will not be addressed in the current research—is equivalency framing. This type of framing refers to ways in which logically equivalent alternative phrases (e.g., "75% fat free" versus "25% fat") can lead to different attitudes and/or decisions (e.g., Levin, Schneider, & Gaeth, 1998; Tversky, & Kahneman, 1981).

Perceived Manipulation

Although emphasis framing can be effective in shaping attitudes, a potential pitfall in the use of this technique is that it can be perceived as manipulative. That is, people are regularly confronted with a variety of messages and are usually able to distinguish persuasion attempts from informative communications (e.g., Campbell & Kirmani, 2000; Friestad & Wright, 1994). When confronted with communications that emphasize one aspect over another, people may perceive being manipulated into supporting (or opposing) an issue. Such perceptions of manipulation likely elicit negative evaluations of the communications and the communication source (see Campbell, 1995; Friestad & Wright, 1994). Emphasis framing could even backfire in a sense that people may react against the advocated position if they perceive manipulation and feel that their freedom to make up their own mind is threatened. They might even adopt the opposite position in order to try to regain control over their own opinion (i.e., psychological reactance; e.g., Brehm & Brehm, 1981). This backfire effect is also identified in research that found that people became more negative about CCS when they placed little trust in the integrity of organizations that supported the implementation of the technology (Terwel et al., 2009a).

In short, perceived manipulation is a potential pitfall in the use of emphasis framing. In this paper, we will test the prediction that people perceive more manipulation when they read a news article about CCS that emphasizes advantages over disadvantages (or vice versa) compared to when they read a balanced article about the technology (Hypothesis 3.1).

Communication Source

Perceptions of manipulation in communications could depend on the communication source. That is, recent studies have shown that people perceive and evaluate communications about environmental issues such as climate change and CCS differently depending on the communication source (e.g., Rabinovich et al., 2012; Ter Mors et al., 2010; Terwel et al., 2009b). Dual process models such as the heuristic-systematic model (HSM; Chaiken, 1980) and the elaboration likelihood model (ELM; Petty & Cacioppo, 1986) can explain this dependence. According to these models, recipients process information in a more or less systematic (central) and heuristic (peripheral) way. Systematic processing means that people scrutinize all available information and are persuaded especially by message characteristics (i.e., the content). If people process information heuristically, they are persuaded especially by cues that are unrelated to the message, such as source characteristics. People are inclined to process information heuristically because they are “cognitive misers”; they tend to afford as little cognitive effort as possible (Fiske & Taylor, 1991). People will particularly follow a more heuristic route when they are not very motivated, involved

or able to process information. This is the case, for instance, when the issue does not interest them much (Chaiken, 1980; Petty & Cacioppo, 1986).

Accordingly, people could easily process communications about CCS heuristically if they are not very interested in this difficult, novel issue. As a result, source characteristics might function as a cue that affects how these communications are perceived. For example, regardless of whether an article about CCS is balanced or biased, it will probably be perceived as more manipulative when it is produced by an oil and gas company that supports the implementation of the technology, than when it is produced by a news agency that supposedly provides objective information. In the current research, we will test whether communications from oil and gas companies are generally perceived as more manipulative than communications from press agencies (Hypothesis 3.2).

Legitimacy Judgments

Although it is likely that people perceive biased communications as relatively manipulative, the application of emphasis framing might not be necessarily judged as inappropriate. We predict that the perceptions of manipulation caused by emphasis framing primarily lead to judgments of illegitimacy when people have good reason to expect balanced information. This is for example the case when the information comes from a news agency or another source that is supposed to be impartial. Indeed, objectivity is a fundamental requirement for journalists (Ryan, 2001). However, objectivity is not the norm for sources that are economically involved in an issue, such as oil and gas companies that invest in the development of CCS. People have become accustomed to the fact that—in order to try to gain the favors of the public—organizations with a specific interest in an issue use persuasive communication, instead of informative communication (Campbell, 1995; Campbell & Kirmani, 2000; Friestad & Wright, 1994). As a result, biased messages from these organizations are probably not judged as less legitimate than balanced messages.

Accordingly, we will test two predictions. The first is the prediction that for news agencies, the use of emphasis framing in communications about CCS is considered as less legitimate than the provision of balanced information. However, this does not hold true for oil and gas companies involved in the development of CCS (Hypothesis 3.3). The second prediction is that the relation between perceived manipulation and legitimacy judgments is stronger when people evaluate communications about CCS from news agencies than when they evaluate communications from oil and gas companies (Hypothesis 3.4).

The Current Research

We examine support for our hypotheses in two experiments. Experiment 3.1 tests the hypothesis that people perceive more manipulation when they read a news article that emphasizes advantages of CCS over disadvantages (or vice versa) compared to when they read a balanced article (Hypothesis 3.1). Both one-sided and two-sided frames are considered in this experiment. Furthermore, Experiment 3.1 aims to replicate the finding from prior research in examining the effectiveness of emphasis framing regarding shaping attitudes towards CCS. Experiment 3.2 examines the combined effects of emphasis framing and communication source on perceived manipulation and legitimacy judgments (all four hypotheses). The experiment focuses on differences between (positively) biased and balanced information, either from a news agency or an oil and gas company involved in CCS.

Experiment 3.1

Method

Participants and design. Participants were 120 undergraduate students from Leiden University (20 male and 99 female [1 unspecified]; M_{age} = 19.83, *SD* = 3.91). Sixty-three participants had heard about CCS prior to participating in the experiment, while 57 participants had not. Awareness of CCS did not moderate the results reported here and will not be discussed any further. Participants were randomly allocated to either one of five experimental conditions (Communication: one-sided pro CCS vs. two-sided pro CCS vs. balanced vs. two-sided con CCS vs. one-sided con CCS). Participants received either €1.50 or course credits for their voluntary participation.

Procedure. The experiment consisted of two parts. First, participants were requested to indicate their gender and age, and to answer some general questions.[9] Among these questions were items assessing how important participants considered a number of environmental topics to be. Two of these topics—combating global warming and the quality of groundwater—were of primary interest because these topics were addressed in our communication manipulation and we wanted to be able to confirm that they were judged as relevant. The remaining environmental topics were filler items concerning genetically modified food, air pollution, and deforestation. After participants had completed this first part of the experiment, they were presented with a fictitious news article about CCS (e.g., the stimulus material). When they had read the article, participants completed another questionnaire, which included items to measure attitudes towards CCS, perceived manipulation, awareness of CCS, and

[9] We do not report all measures in this paper for reasons of clarity and conciseness. Measures and results are available on request.

perceived emphasis of the article (i.e., the manipulation check). Finally, participants were debriefed, paid, and thanked for their participation.

Stimulus materials. We tailored the appearance of the article after true newspaper copy, following previous experimental research on emphasis framing (e.g., Druckman, 2001). The article was allegedly written by the Dutch national news agency ANP and displayed the logo of the agency in the upper left corner. In the opening paragraph, all articles provided the same general background information about CO_2 and CCS. The differences between the articles were in the headline and following paragraphs. The one-sided articles addressed either the positive consequences of CCS for the climate (stating that CCS helps to combat global warming by reducing CO_2 emissions) or the negative consequences for the quality of groundwater (stating the risk of acidification should CO_2 leak from the storage reservoir) without mentioning any opposing information. The two-sided articles addressed both the advantage and disadvantage but emphasis was placed on one of them (cf. Druckman, 2001). The balanced article gave equal weight to advantages and disadvantages. See Appendix B for an exact description of all five articles.

Measures

Relevance of arguments. To assess whether or not the advantage and the disadvantage mentioned in the articles were related to environmental topics that participants considered relevant prior to reading the article, we asked: "To what extent do you find it important to combat global warming?", and "To what extent is quality of the groundwater important to you*?"* (1 = *not at all*; 7 = *very much*).

Perceived emphasis. We measured perceived emphasis (i.e., the manipulation check) within the article with two items: "To what extent did you feel that the emphasis in the article was on the advantages of CCS?", and "To what extent did you feel that the emphasis in the article was on the disadvantages of CCS?" (1 = *not at all*; 7 = *very much*).

Perceived manipulation. We measured perceived manipulation with four items: "To what extent did you think that information was kept from you?", "To what extent did you think that you heard only one side of the story?", "To what extent did you perceive the information to be biased?", and "To what extent did you perceive the article as partial?" (1 = *not at all;* 7 = *very much*), $\alpha = .82$. The responses to these items were averaged into a single index of perceived manipulation.

Attitude towards CCS. We assessed participants' attitude towards CCS with four 9-point semantic differential scales (e.g., Petty & Cacioppo, 1984): "I find CCS [bad–good, harmful–beneficial, foolish–wise, unfavorable–favorable]", α = .91.

Results

Relevance of arguments. Participants considered both environmental topics relevant. Ratings of relevance of ground water quality were significantly higher than the midpoint of the 7-point scale, $t(118) = 22.27$, $p < .001$ ($M = 6.09$, $SD = 1.03$). Ratings of the relevance of combating global warming showed a similar effect, $t(118) = 9.13$, $p < .001$ ($M = 5.18$, $SD = 1.41$).[10]

Perceived emphasis. We performed a repeated measures ANOVA with Perceived Emphasis (Advantages vs. Disadvantages) as the within-subjects factor and the five communication conditions as the between-subjects factor to check the adequacy of the communication manipulation. The results showed the anticipated Communication × Perceived Emphasis interaction, $F(4, 115) = 48.23$, $p < .001$, $\eta_p^2 = .63$. As intended, participants in the pro conditions (one-sided and two-sided) perceived more emphasis on advantages than on disadvantages (ps < .001). In contrast, participants in the con conditions (one-sided and two-sided) perceived more emphasis on disadvantages than on advantages (ps = .001). Interestingly, participants in the balanced condition also perceived more emphasis on advantages than on disadvantages ($p < .001$). See Table 3.1 for means and standard deviations.

Table 3.1.
Means (and standard deviations) for perceived emphasis on advantages and disadvantages as a function of communication.

	One-sided pro CCS (N = 24)	Two-sided pro CCS (N = 24)	Balanced (N = 24)	Two-sided con CCS (N = 24)	One-sided con CCS (N = 24)
Perceived emphasis on advantages	6.29 (0.69)	5.50 (1.25)	4.25 (1.68)	3.71 (1.17)	2.96 (1.49)
Perceived emphasis on disadvantages	1.71 (1.30)	3.00 (1.02)	2.71 (0.96)	4.92 (1.35)	5.04 (1.65)

[10] One person did not answer these questions.

Perceived manipulation. We predicted that the use of emphasis framing would evoke higher levels of perceived manipulation compared to the provision of balanced information (Hypothesis 3.1). An ANOVA with Communication as the independent variable and perceived manipulation as the dependent variable revealed a significant effect, $F(4, 115) = 5.44$, $p < .001$, $\eta_p^2 = .16$. Bonferroni post hoc analyses confirmed that participants perceived the article as significantly more manipulative when emphasis framing was applied (i.e., the one-sided and two-sided pro and con conditions) than when the article was balanced ($ps \leq .01$). The level of perceived manipulation did not differ between the four emphasis-frame conditions ($ps \geq 1.00$). See Table 3.2 for means and standard deviations.

Table 3.2.
Means (and standard deviations) for perceived manipulation and attitude towards CCS as a function of communication.

	One-sided pro CCS (N = 24)	Two-sided pro CCS (N = 24)	Balanced (N = 24)	Two-sided con CCS (N = 24)	One-sided con CCS (N = 24)
Perceived manipulation	5.15 (1.00)	5.10 (1.42)	3.83 (1.26)	4.94 (0.88)	4.93 (1.06)
Attitude towards CCS	6.25 (1.60)	5.57 (1.89)	5.57 (1.80)	4.55 (1.88)	4.94 (1.84)

Note: Attitude towards CCS was measured on a 9-point scale. Perceived manipulation was measured on a 7-point scale.

Attitude towards CCS. We performed an ANOVA with Communication as the independent variable and attitude towards CCS as the dependent variable to examine the extent to which emphasis framing influenced attitude. The analysis revealed a significant effect, $F(4, 115) = 3.15$, $p = .02$, $\eta_p^2 = .10$. Bonferroni post hoc analyses showed that people in the 'one-sided pro' condition had a more positive attitude towards CCS ($M = 6.25$, $SD = 1.60$) than people in the 'two-sided con' condition ($M = 4.55$, $SD = 1.88$), $p = .02$. Further differences between conditions were not significant ($ps \geq .13$). See Table 3.2 for means and standard deviations.[11]

Discussion

Experiment 3.1 revealed the hypothesized effect of emphasis framing on perceived manipulation (Hypothesis 3.1). Participants perceived the biased news articles about CCS as more manipulative than the balanced article. Furthermore, Experiment 3.1 replicated—to some extent—the finding from previous research that emphasis

[11] In comparison, the survey shows that the general attitude towards CCS is just above the midpoint of a (7-point) scale ($M = 4.49$, $SD = 1.45$), $t(844) = 9.76$, $p < .001$. See Appendix A.

framing can affect attitudes. Participants who read that CCS can help combat global warming (without reading about risks for the quality of the ground water) were more positive towards the technology than participants who read that although CCS has positive and negative consequences, the possible risks for the ground water outweigh the advantages for the climate.

Participants in the balanced condition perceived more emphasis on advantages than on disadvantages and evaluated CCS as relatively positive. Although this effect was unanticipated (the effects of two competing frames with equal weight are expected to cancel out each other, Druckman, Peterson, & Slothuus, 2013), it did not interact with the predicted effects on perceived manipulation. As predicted, the balanced article was perceived as significantly less manipulative than the biased articles. The perceived emphasis on advantages and the more positive attitude might be explained by the fact that in the balanced article, the advantage was mentioned before the disadvantage. Information that is mentioned first can make a stronger impression than information that follows, it can be better remembered and can have more influence (i.e., primacy effect; e.g., Asch, 1952; Crowley & Hoyer, 1994). We will examine the possibility of a primacy effect in Experiment 3.2.

Experiment 3.2

Experiment 3.2 aimed to replicate the main finding of Experiment 3.1 that biased CCS communications are perceived as more manipulative than balanced communications (Hypothesis 3.1). Experiment 3.2 extends the previous experiment by also comparing different sources. More specifically, we test the hypothesis that communications from oil and gas companies are generally perceived as more manipulative than communications from press agencies (Hypothesis 3.2). Furthermore, we examine whether the use of emphasis framing in communications about CCS is judged as less legitimate than providing balanced information in the case of news agencies, but not for oil and gas companies (Hypothesis 3.3). Finally, Experiment 3.2 tests the prediction that perceptions of manipulation and judgments of legitimacy are stronger related when a news agency communicates about CCS than when an oil and gas company is the source (Hypothesis 3.4).

The basic assumption underlying our predictions is that, in general, news agencies are expected to be less manipulative than oil and gas companies. To check whether or not this assumption is correct, we assess expectations of manipulation prior to the presentation of the stimulus materials in Experiment 3.2. As an additional check, Experiment 3.2 includes two versions of the balanced article to counterbalance the order in which the advantage and disadvantage of CCS are presented. This allows us to check whether a primacy effect might explain why participants in the balanced

condition in Experiment 3.1 perceived more emphasis on advantages than on disadvantages. Whereas Experiment 3.1 revealed that pro and con articles were considered equally manipulative (regardless of their strength), we selected the (two-sided) pro CCS article for use in Experiment 3.2. We chose this particular article in order to secure the credibility of the communications. After all, it is more likely that an oil and gas company that is involved in CCS emphasizes the benefits associated with the technology rather than the risks.

Method

Participants and design. Participants were 139 undergraduate students from Leiden University (32 male, 106 female [1 unspecified], M_{age} = 20.05, *SD* = 2.82). Eighty-one participants had heard about CCS prior to participation, 58 participants had not. Again, awareness of CCS did not moderate the results reported here and will not be discussed any further. Participants were randomly allocated to one of the six experimental conditions in this 2 (Source: news agency vs. oil and gas company) × 3 (Communication: two-sided pro CCS vs. balanced advantage-first vs. balanced disadvantage-first) between-subjects design. Participants received either €1 or course credits for their voluntary participation. Individuals who had participated in Experiment 3.1 were not allowed to participate in Experiment 3.2.

Procedure. The procedure and stimulus materials were largely similar to those of Experiment 3.1 (see Appendix B). Participants in the 'two-sided pro CCS' condition read the same article as participants in this condition in Experiment 3.1. Participants in the 'balanced advantage-first' condition read the same article as participants in the balanced condition in Experiment 3.1. Participants in the 'balanced disadvantage-first' condition read a similar article, but here the disadvantage preceded the advantage. Importantly, depending on experimental condition, the article allegedly had been written by an independent news agency (as in Experiment 3.1) or an unspecified oil and gas company that invests in CCS. Upon completion of the experiment, participants were debriefed, paid, and thanked for their participation.

Measures

We used the same items as in Experiment 3.1 to measure perceived relevance of the arguments, perceived emphasis on (dis)advantages within the article, and perceived manipulation (α = .86).

Expected manipulation. We assessed the extent to which participants expected manipulation from news agencies and oil and gas companies by means of five questions per source, asked prior to presentation of the article. The items read: "To what extent do you think that [news agencies/oil and gas companies] try to influence

the public opinion?", "To what extent do you think that [news agencies/oil and gas companies] try to manipulate people by means of communication?", "To what extent do you think that [news agencies/oil and gas companies] try to convince people of their own viewpoints?", "To what extent do you think that information from [news agencies/oil and gas companies] is objective?", and "To what extent do you think that information from [news agencies/oil and gas companies] is honest?" (1 = *not at all;* 7 = *very much*; last 2 items reversed). The responses to these items were averaged into a single index of expected manipulation from oil and gas companies (α = .89) and expected manipulation from news agencies (α = .89).

Legitimacy judgments. Participants' judgments of the legitimacy of the communications were assessed by means of four 9-point semantic differential scales. Participants were requested to respond to the phrase "I consider the manner in which the article describes the issue of CCS [illegitimate–legitimate, unacceptable–acceptable, inappropriate–appropriate, not suitable–suitable]", α = .93. Responses were averaged to form a single index of legitimacy judgments.

Principal component analysis with Varimax rotation revealed that legitimacy judgments and perceived manipulation represented different constructs. The items loaded on two separate components with no substantial cross loadings (all cross loadings ≤ -.18) explaining a total variance of 76.22% in the individual items. The eigenvalue of the first component (legitimacy judgments) was 4.93; the eigenvalue of the second component (perceived manipulation) was 1.17.

Results

Relevance of arguments. As in Experiment 3.1, participants considered both environmental topics relevant. Ratings of relevance of ground water quality were significantly higher than the midpoint of the 7-point scale (t[137] = 18.30, p < .001 [M = 5.78, SD = 1.14]), as were ratings of the relevance of combating global warming, (t[137] = 14.19, p < .001 [M = 5.31, SD = 1.09]).[12]

Expected manipulation. As anticipated, participants expected news agencies to be significantly less manipulative (M = 4.25, SD = 1.12) than oil and gas companies (M = 5.06, SD = 1.11), t(138) = -5.83, p < .001. This validated our manipulation of source identity.[13]

[12] One person did not answer these questions.

[13] The survey data indicate that this expectation about manipulation by oil and gas companies is in line with general expectations (M = 5.21, SD = 1.15). See Appendix A.

Perceived emphasis. A repeated measures ANOVA with Perceived Emphasis as the within-subjects factor and Communication as the between-subject factors showed a significant interaction-effect, $F(2, 136) = 17.29$, $p < .001$, $\eta_p^2 = .20$. As in Experiment 3.1, participants in the 'two-sided pro CCS' and balanced conditions perceived more emphasis on advantages in the article than on disadvantages. However, this perceived imbalance was clearest in the pro condition. More specifically, within this condition, we found the largest difference between perceived emphasis on advantages ($M = 5.67$, $SD = 1.21$) versus disadvantages ($M = 2.74$, $SD = 1.20$), $F(1,45) = 85.39$, $p < .001$, $\eta_p^2 = .66$. Participants in the two balanced conditions also perceived more emphasis on advantages than on disadvantages. However, these differences were less pronounced than in the 'two-sided pro CCS' condition. Importantly, the difference did not only occur in the 'balanced advantage-first' condition ($M_{advantages} = 4.51$, $SD = 1.52$, $M_{disadvantages} = 3.26$, $SD = 1.21$, $F[1,46] = 27.71$, $p < .001$, $\eta_p^2 = .38$), but also in the 'balanced disadvantage-first' condition ($M_{advantages} = 3.80$, $SD = 1.54$, $M_{disadvantages} = 3.17$, $SD = 1.32$, $F[1,45] = 4.50$, $p = .04$, $\eta_p^2 = .09$). Thus, the order in which the arguments had been provided cannot explain the perceived emphasis on advantages over disadvantages. Therefore, we do not differentiate between the two balanced conditions in all further analyses, but focus on the pro CCS article versus balanced article contrast instead.

Perceived manipulation. To test Hypothesis 3.1 and 3.2, we performed an ANOVA with the Communication contrast (pro condition vs. the two balanced conditions) and Source as the independent variables, and perceived manipulation as the dependent variable. In support of Hypothesis 3.1, this analysis revealed a significant main effect of the Communication contrast, $F(1, 133) = 25.58$, $p < .001$, $\eta_p^2 = .16$. Participants in the 'two-sided pro CCS' condition perceived the article as more manipulative ($M = 4.76$, $SD = 1.36$) than participants in the balanced conditions ($M_{adv\text{-}first} = 3.91$, $SD = 1.33$, $M_{disadv\text{-}first} = 3.32$, $SD = 1.21$). Furthermore, we found the predicted main effect of Source (Hypothesis 3.2). Participants perceived the article as more manipulative when it was produced by an oil and gas company ($M = 4.31$, $SD = 1.32$) than when it was produced by a news agency ($M = 3.68$, $SD = 1.46$), $F(1, 133) = 8.63$, $p = .004$, $\eta_p^2 = .06$. There was no interaction effect, $F(1, 133) = 0.99$, $p = .32$, indicating that the effect of the type of communication (biased vs. balanced) on perceived manipulation was not moderated by the identity of the source. See Table 3.3 for all means and standard deviations.

Legitimacy judgments. We predicted that for news agencies, providing biased information is considered as less legitimate than providing balanced information, but for oil and gas companies, this does not hold true (Hypothesis 3.3). To test this prediction, we performed an ANOVA with the Communication contrast and Source as the independent variables, and legitimacy judgments as the dependent variable. The

analysis revealed a main effect of the Communication contrast, $F(1, 133) = 13.26$, $p < .001$, $\eta_p^2 = .09$, a main effect of Source, $F(1, 133) = 4.19$, $p = .04$, $\eta_p^2 = .03$, and the hypothesized interaction effect, $F(1, 133) = 4.33$, $p = .04$, $\eta_p^2 = .03$. Participants in the 'news agency' condition judged the biased article as less legitimate than the balanced articles, whereas such a difference was not observed in the 'oil and gas company' condition. These results offer support for Hypothesis 3.3. See Table 3.3 for all means and standard deviations.

Table 3.3.
Means (and standard deviations) for perceived manipulation, legitimacy judgments and attitude towards CCS as a function of source and communication.[14]

	News agency			Oil and gas company		
	Two-sided pro CCS	Balanced (adv. first)	Balanced (disadv. first)	Two-sided pro CCS	Balanced (adv. first)	Balanced (disadv. first)
	(*N* = 23)	(*N* = 23)	(*N* = 23)	(*N* = 23)	(*N* = 24)	(*N* = 23)
Perceived manipulation	4.60 (1.52)	3.75 (1.23)	2.71 (0.94)	4.92 (1.18)	4.07 (1.43)	3.93 (1.14)
Legitimacy judgments	5.50 (1.31)	6.43 (1.02)	7.21 (1.07)	5.70 (1.33)	6.18 (1.40)	5.93 (1.48)
Attitude towards CCS	5.10 (1.80)	5.71 (1.45)	5.51 (1.49)	5.50 (1.39)	5.47 (1.34)	5.33 (1.79)

Note: Attitude towards CCS and legitimacy judgments were measured on 9-point scales. Perceived manipulation was measured on a 7-point scale.

Furthermore, we predicted that the relation between perceived manipulation and legitimacy judgments is stronger when people evaluate communications from news agencies than when they evaluate communications from oil and gas companies (Hypothesis 3.4). Consistent with this hypothesis, we found that the more manipulative a news agency's article was perceived, the less legitimate it was judged ($r = -.74$, $p < .001$). This correlation was less strong when the article came from an oil and gas company ($r = -.47$, $p < .001$). Fisher's Z test confirmed that the difference between these correlation coefficients was significant, $z = -2.54$, $p = .01$.

[14] The effect of pro CCS communication on attitude could not be compared with the effect of communication against CCS because the design did not include a con condition. However, in order to be consistent, we assessed participants' attitude towards CCS with the same semantic differential scales as in Experiment 3.1, $\alpha = .86$. An ANOVA with the Communication contrast and Source as the independent variables, and attitude towards CCS as the dependent variable revealed no statistically significant effects ($ps \geq .26$).

Mediation

Furthermore, we performed a bootstrap analysis that allows for the inclusion of contrast coding (Hayes & Preacher, in press) to test whether the effect of emphasis framing on legitimacy judgments in the 'news agency' condition was mediated by perceived manipulation. This approach uses resampling of raw data to estimate the confidence interval (CI) of the indirect effect. We used 10000 resamples (bias corrected) and obtained a 95% confidence interval that did not include zero (lower CI = 0.36; upper CI = 1.41), indicating the proposed indirect effect.

General Discussion

The implementation of CO_2 capture and storage technology (CCS) is considered a useful measure to achieve significant CO_2 emission reductions in the short run. People form opinions about the technology based on informative and persuasive communications. Informative communications provide unbiased information about an issue and pay attention to relevant aspects without pushing people into one direction over another. This allows people to form their own informed opinion. Persuasive communications also provide information; however, in these types of communications, information is often framed in a way that a specific position is advanced over another in order to nudge people into that position. This is referred to as emphasis framing (e.g., Chong & Druckman, 2007).

This research contributes to literature by revealing potential pitfalls in the use of emphasis framing. We discovered that people can perceive this persuasive communication technique as manipulative which is particularly problematic when people expect informative communications. We addressed emphasis framing by the provision of a news article that either emphasized an advantage of CCS (i.e., that it is a way to combat global warming) or a disadvantage (i.e., that the technology entails a risk of groundwater acidification). We found that no matter which direction people are pushed into or how hard they are being pushed, a biased news article is perceived as more manipulative than a balanced article. That is, regardless of whether a news article reports only on the positive or negative consequences of CCS (one-sided framing), or covers both aspects but places emphasis on one of them (two-sided framing), the article is perceived as more manipulative than an article that gives equal weight to advantages and disadvantages.

We found that people find manipulation inappropriate when news agencies emphasize the advantages of CCS in their coverage. In contrast, when oil and gas companies emphasize advantages of CCS, people also find this manipulative (even more than when done by news agencies), but in this case it does not result in judgments of illegitimacy. We demonstrated that this difference is caused by the expectations

people have from the communication source. We found that people associate oil and gas companies with persuasive communications and news agencies with informative communications. This finding is in line with general views that news agencies are expected to be balanced (Ryan, 2001) and commercial organizations to be biased (e.g., Campbell, 1995). Thus, expectations play a large role in determining whether a manipulative communication technique is considered as illegitimate or not.

Finally, the current research indicates that emphasis framing can be effective when it comes to influencing people's attitudes towards CCS. People have a more positive attitude towards CCS after reading a positively framed article about the technology than after a negatively framed article. This finding in the domain of energy technologies adds to previous research on the effectiveness of emphasis framing on the shaping of attitudes (Druckman & Bolsen, 2011; Nelson et al., 1997).

Limitations and Future Research

One might expect that if advantages and disadvantages of an issue receive equal weight in a news article, they would cancel out each other's effect on attitude (Druckman et al., 2013). However, we found that people were more positive about CCS (and perceived more emphasis on advantages) when equal emphasis was placed on the benefits and risks of CCS. This is an interesting finding, moreover because participants showed relatively more concern for groundwater pollution (i.e., a risk) than for global warming (i.e., a benefit). We ruled out that this effect was due to the order in which the advantage and the disadvantage were presented. A possible explanation could be that participants perceived the information about CCS in the opening paragraph of the article as positive. Although we strived to provide a neutral introduction, it conveyed that CCS is a way to meet targets set in international agreements to reduce CO_2 emissions, which could be regarded as an advantage. Importantly, despite this perceived emphasis on advantages over disadvantages, participants perceived the balanced article as significantly less manipulative than the biased articles. Thus, although the factual description of CCS may not have been perceived as completely neutral, this perception has no implications for the impact of our experimental manipulations, nor does it undermine the interpretation of our results and the validity of our conclusions.

In our experiments with undergraduate students as participants, the level of awareness of CCS prior to participation did not affect perceptions of manipulation, legitimacy judgments, or attitude towards CCS. However, different processes might come into play when people are deeply and personally involved in CCS, for example when they live near CCS demonstration sites. Greater personal involvement with an issue typically makes people process information more systematically (Chaiken, 1980;

Petty & Cacioppo, 1986), which may limit the power of framing (e.g., Brewer 2001; Joslyn & Haider-Markel, 2002). Furthermore, local residents are more likely to have negative opinions about CCS if they believe that it is unsafe to transport and store CO_2, or if they fear falls in local property value (Terwel et al., 2012). In that case, they might focus primarily on arguments against the implementation of CCS (i.e., selective exposure; e.g., Frey, 1986; Hart et al., 2009; Smith et al., 2008) and dismiss any pro-arguments as manipulative. As a result, it is unlikely that a positively framed message will be sufficient to change already existing, strongly negative attitudes. Future research could take a closer look at how issue involvement influences the extent to which people consider communications as manipulative or (il)legitimate.

We know from prior research that public communications about environmental issues are most effective when they fit people's expectations about their purposes (Rabinovich et al., 2012). This would imply that news agencies can best communicate about CCS in an informative manner and oil and gas companies can best communicate in a persuasive manner. Indeed, the current research seems to suggest that oil and gas companies can apply emphasis framing to their communications relatively hassle-free. However, framing might not always be the best technique for oil and gas companies. That is, this type of company is generally not considered to be very credible when it comes to environmental communications (Terwel et al., 2009a), and this low credibility could decrease the effectiveness of framing (Druckman, 2001).[15] Moreover, oil and gas companies can be evaluated negatively when they frame their communications about CCS. For instance, they may be accused of corporate greenwashing when they frame the implementation of CCS as a useful measure to mitigate climate change instead of a corporate investment that might help them to make a profit in the long run (de Vries et al., in press). A better strategy for oil and gas companies might be to provide balanced information about CCS in which both advantages and disadvantages are reported. Although balance in CCS communications might be unlikely to influence people's attitudes towards the technology, it might lead to positive long-term effects such as increased trust in the integrity of organizations (cf. Terwel et al., 2009a).

In the current research, we considered communications from news agencies and oil and gas companies. This leaves open the question of how people might perceive the use of emphasis framing by other types of organizations, such as national and local government, (environmental) non-governmental organizations, pressure groups and scientists. Our findings suggest that it may be possible to predict how people will respond to framed messages from such sources, depending on the expectations of the

[15] The survey data support that people have relatively low expectations about oil and gas companies' honesty in communications about CCS. That is, expected honesty is significantly below the midpoint of a scale from 1 (*not at all*) to 7 (*completely*) (M = 3.14, SD = 1.23), $t(844) = -20.36$, $p < .001$. See Appendix A.

general public about the overall aims and goals of these parties. When the public expects the source to be persuasive in their communications, emphasis framing effects should resemble the effects we found when oil and gas companies were the source. When the source is expected to be objective, the effects are more likely to be in parallel to what we found when news agencies were the source.

Most prior investigations of emphasis framing have examined how framing benefits the communicator (e.g., Chong & Druckman, 2007). However, so far, less attention has been paid to potentially negative aspects that may only become apparent over time. As such, the identification of pitfalls in the use of emphasis framing contributes to literature. We discovered two (related) pitfalls that are likely to be highly important: perceptions of manipulation and judgments of illegitimacy.

Future research might extend our findings, for instance by taking into account behavioral effects of perceiving illegitimate manipulation. It would be interesting to investigate the number of subscribers that would discontinue a newspaper when perceiving their paper's coverage as biased.[16] Alternatively, future research could take into account effects such as the number of people completely discarding information from a source that is seen as—legitimately—framing its communications. We would anticipate perceived manipulation and legitimacy judgments to be relevant for such effects. In this way, our results offer a starting point for further research into the pitfalls in the use of emphasis framing and the conditions under which they occur.

[16] CCS coverage has shown to be focused on benefits, rather than risks (Feldpausch-Parker et al., 2013). However, not all coverage is biased (Dowd, Ashworth, Rodriguez, & Jeanneret, 2012).