



Spare the details, share the relevance: The dilution effect in communications about carbon dioxide capture and storage



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ABSTRACT

The mitigation of climate change may require the implementation of carbon dioxide capture and storage technology (CCS). Both proponents and opponents of CCS will try to convince the public of the (dis) advantages of this technology. This research examines the relative persuasiveness of communications that only contain highly relevant information (e.g., the argument that the implementation of CCS would have important climate benefits) or combine highly relevant with irrelevant or moderately relevant information. The results of three experiments consistently show that adding irrelevant information dilutes the impact of highly relevant information: Irrelevant information reduced the persuasiveness of communications (Experiments 1 and 2) and weakened people's beliefs about the issue (Experiment 3). This dilution effect occurred with both positive (pro-CCS) information and negative (con-CCS) information, but the effect was stronger with positive information. Awareness of the source of the communications moderated the dilution effect. Implications for public communications about CCS are discussed.

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1. Introduction

The mitigation of human-induced climate change is one of the greatest environmental challenges facing the world today. Considering that climate change is largely due to carbon dioxide (i.e., CO₂) emissions arising from ever-increasing energy use, the natural solution to the problem would be to increase the use of clean, sustainable energy sources (e.g., wind) and to encourage individuals, organizations, and societies to save on energy consumption. Unfortunately, this is easier said than done. Relatively few people and organizations (are willing to) engage in sustainable behavior for the purpose of mitigating climate change (Whitmarsh, 2009). A substantial increase in sustainable behavior in the near future is unlikely, among other things because of a variety of “psychological barriers” such as limited cognition about the problem and discredence of experts and authorities (Gifford, 2011). In addition to focusing on these more long-term solutions, governments all over the world are currently thinking about other, more immediate mitigation measures.

According to reports by the Intergovernmental Panel on Climate Change (IPCC, 2007) and the International Energy Agency (IEA,

2012), the large-scale implementation of carbon dioxide capture and storage (CCS) technology is a measure that would make a significant contribution to the mitigation of climate change in the short run. In a nutshell, it involves the capture of carbon dioxide in fossil fuel power plants or other major industrial processes, and the subsequent transport and long-term storage of this carbon dioxide in deep geological formations (e.g., depleted natural gas fields and saline aquifers). Despite the fact that several countries are considering the use of CCS, a recent Eurobarometer survey commissioned by the European Commission (2011, pp. 1–185) shows that the majority of the public is unfamiliar with the technology. Due to the lack of public knowledge and awareness of CCS there is plenty of opportunity for stakeholders (i.e., the proponents and opponents of CCS) to educate people on the matter and to convince them of the benefits and the risks associated with CCS.

In the current research, we focus on the relative persuasiveness of communications that consist of either highly relevant information only (e.g., the argument that the implementation of CCS has important climate benefits) or that combine highly relevant with less relevant information. This is important to examine because persuasiveness plays a central role in the attitude formation process (e.g., Petty & Cacioppo, 1981). On the one hand, previous studies suggest that a message's persuasiveness may increase with length (i.e., the length-implies-strength heuristic; Stec & Bernstein, 1999). Thus, it might be useful to increase the length of communications about CCS by adding less relevant arguments (or perhaps even information that is irrelevant for attitude formation) to the

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most relevant argument in order to increase the persuasiveness of public communications. On the other hand, based on insights from research on the dilution effect (e.g., Nisbett, Zukier, & Lemley, 1981), one might anticipate the added information to weaken the impact of the relevant argument. This would make public communications less instead of more persuasive. That is, although only the most relevant information should dictate people's judgments and beliefs, less relevant details can cause people to alter their judgments (Nisbett et al., 1981). The main question that we intend to answer is whether adding less relevant information to relevant information makes communications about CCS more or less persuasive than sharing merely the most relevant information.

1.1. The dilution effect

The dilution effect has been defined as “a judgment bias in which the presence of nondiagnostic cues, when processed along with diagnostic cues, causes a judge to under-weight the diagnostic cues” (Waller & Zimbelman, 2003, p. 254). This bias has been documented by researchers from various disciplines and across different settings. Research has revealed dilution in relation to the effects of stereotypical information on impression formation (Nisbett et al., 1981; Tetlock & Boettger, 1989) and the effects of auditing cues on financial evaluations (Ettenson, Shanteau, & Krogstad, 1987). Furthermore, the dilution effect plays a role in juror decisions (Smith, Stasson, & Hawkes, 1998) and product evaluations (Meyvis & Janiszewski, 2002). For example, Meyvis and Janiszewski (2002) found that consumers' beliefs about the speed of a computer were diluted when relevant information (“this computer has a very powerful processor”) was mixed with irrelevant information (“this computer can be ordered online”). Up till now, the dilution effect has not been examined in regard to evaluations of the persuasiveness of communications.

Prior research on the dilution effect has mainly focused on the effects of adding irrelevant (i.e., nondiagnostic) information to relevant information, while less is known about the possible diluting effect of moderately relevant information (i.e., less strong than highly relevant information, but pointing in the same direction). At first sight, it might seem logical to assume that if irrelevant information dilutes the impact of relevant information, moderately relevant information has a similar effect. Indeed, this would be in line with the human tendency to average evaluations of different pieces of information into a single evaluative judgment (i.e., the averaging bias; Lichtenstein, Earle, & Slovic, 1975). Nevertheless, Tetlock and Boettger (1989) found no dilution effect when people had to predict a student's study performance after reading relevant information as well as information that was moderately relevant for this prediction. Moreover, Meyvis and Janiszewski (2002) suggest that moderately relevant information can even strengthen the persuasiveness of highly relevant information. They showed that participants who evaluated the speed of a computer were more confident that a computer was fast when they had received both highly relevant information and three pieces of moderately relevant information than when they had only received the relevant information.

Based on the above, we hypothesize that the persuasiveness of highly relevant information is diluted when irrelevant information is added (Hypothesis 1). Furthermore, we explore whether or not adding moderately relevant information also alters the persuasiveness of highly relevant information.

2. Experiment 1

Experiment 1 examines the hypothesis that the persuasiveness of a highly relevant pro-CCS argument is diluted when irrelevant

information is added (Hypothesis 1). It furthermore explores the effect of adding moderately relevant pro-CCS information.

2.1. Method

2.1.1. Participants and design

Seventy-nine undergraduate students from Leiden University participated in the study. They were randomly allocated to either one of three experimental conditions (Information Relevance: “highly relevant” vs. “highly relevant + moderately relevant” vs. “highly relevant + irrelevant”) and received either €1 or course credits for their participation.

2.1.2. Procedure

Participants first received some general background information about energy production and CO₂ emissions, and a brief description of CCS. Next, participants in the “highly relevant” condition read a pro-CCS argument that a pilot study had identified as highly relevant¹:

By implementing CCS, approximately 90 percent of the CO₂ emissions released by the burning of fossil fuels can be captured. This helps to combat global warming because the CO₂ is not released into the air.

Participants in the “highly relevant + moderately relevant” condition read the highly relevant pro-CCS information complemented with three pro-CCS arguments that the pilot study had identified as moderately relevant:

A small proportion of the captured CO₂ can be used for the production of carbonated drinks. By implementing CCS, approximately 90 percent of the CO₂ emissions released by the burning of fossil fuels can be captured. This helps to combat global warming because the CO₂ is not released into the air. Dutch companies can qualify for European subsidies so that they do not have to finance the development of CCS completely by themselves. Also, as one of the main developers of CCS, the Netherlands can export knowledge of the technology to foreign countries.

Participants in the “highly relevant + irrelevant” condition read the highly relevant pro-CCS information complemented with three pieces of irrelevant information about CCS.

In English, CCS is referred to as “CO₂ storage” or “CO₂ sequestration”. In French also two terms are used, namely “CO₂ stockage” and “CO₂ séquestration”. By implementing CCS, approximately 90 percent of the CO₂ emissions released by the burning of fossil fuels can be captured. This helps to combat global warming because the CO₂ is not released into the air. September last year, a conference on CCS was held in Amsterdam. A lot of information on CCS is available on the internet, for example at Wikipedia.

After reading these communications, participants completed a questionnaire that included items to measure the persuasiveness of the communications and the perceived relevance of the different pieces of information (this measure served as the manipulation

¹ The pilot study ($N = 50$) was conducted in March 2011 and served to identify arguments for and against the implementation of CCS that varied in perceived relevance. The identification of irrelevant information was not part of the pilot study because this type of information was already anticipated to be quite irrelevant for the purpose of forming an opinion, due to its nondirectional nature. Individuals who participated in the pilot study were not allowed to participate in the subsequent experiments.

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