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Communication approaches for carbon capture and storage: Underlying assumptions of limited versus extensive public engagement

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ABSTRACT

A pertinent issue in the literature on communication on emerging technologies such as carbon capture and storage (CCS) concerns the degree to which the public is actively involved in the communication process. While researchers have highlighted the pros and cons of limited versus extensive public engagement, the assumptions underlying various communication approaches have been largely neglected. Illuminating assumptions are important for scholarly understandings of what influences communication and for practitioner reflexive awareness in designing communication plans. This paper explores assumptions made about senders and receivers when involving the public to various degrees in CCS communication and how these assumptions relate to different communication objectives. We describe two contrasting communication approaches, the transmission and participatory approaches, relating them to CCS characteristics and research. We find that CCS communication may, deliberately or not, be based on different assumptions about the social framing of CCS concerning who should formulate the message, the public's ability to understand complex science, the public's interest in helping frame CCS, and whether public opinions should be taken into account. These assumptions also relate to different communication objectives – convincing the public or increasing dialogue – implying different communication fora, predictability, and input.

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1. Introduction

Carbon capture and storage (CCS) has repeatedly been pointed out by for example the International Energy Agency as a vital technology to decarbonise the energy system and combat climate change. In fact, the agency belongs to those that argue that emission targets cannot be achieved without capturing carbon dioxide (CO₂) generated by fuel combustion or industrial processes, transport it via ships or pipeline and store it underground. Others have highlighted CCS as a contested technology, pointing to the risks of e.g. reinforced fossil fuel lock-in effects (e.g. [1]). Regardless of one's positions on CCS, however, it has become increasingly apparent that the fate of the technology will largely hinge on how the public perceives it. In several cases, CCS projects have been

delayed or cancelled, mostly or partly due to public opposition, including Shell's project for the onshore storage of carbon dioxide in Barendrecht which was cancelled by the Dutch government in 2010. Many articles have examined public awareness of and attitudes towards CCS, surveying people's knowledge and opinions of the technology. Others have argued that public resistance to CCS demonstrates the complexities involved in communicating the technology [2]. Some scholars have argued that the high stakes involved in CCS motivates public engagement in dialogues on the pros and cons of the technology (e.g. [3]). Against this backdrop, scholars have called for research into CCS communication [4–6].

So far, the emerging field of research into CCS communication has had an empirical emphasis. Empirical data concerning the communication strategies applied in relation to specific local CCS projects have been collected and analyzed [7,8]. Such research has often aimed to identify the success factors of different communication strategies, while gathering material providing guidelines, toolkits, or best practices for effective communication with the public [9,10]. Other studies have explored and evaluated global or

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general empirical communication material not linked exclusively to a particular CCS project [6]. Although the CCS field has broadened its theoretical social scientific basis in recent years [11,12], only isolated studies of CCS have drawn on theoretical insights from communication theory to advance our understanding of the factors that influence CCS communication [5].

We argue that there is significantly more in the communication theory field that merits exploration by CCS researchers. While researchers have highlighted both the benefits [4,13] and possible pitfalls [13,14] of extensive public engagement, the assumptions one makes about the sender and receiver of CCS messages when involving the public to various extents have largely been neglected. This is unfortunate since assumptions, whether or not they are deliberate, are important for how CCS communication is designed and carried out. Illuminating these assumptions is useful both for researchers interested in the factors influencing communication and for practitioners seeking reflexive awareness in designing communication plans.

This paper addresses the following research question: What are the assumptions made about senders and receivers when involving the public to various degrees in CCS communication and how do these assumptions relate to different communication objectives? The paper draws on insights from communication theory, in particular the literature on public involvement in science and technology communication and previous work into communication models in environmental management [15,16], to systematize elements of communication into a clear-cut dichotomy. The paper starts by situating our study in relation to previous CCS research into the social frames and interactive elements of communication. Following that, we explain two contrasting approaches to the communication of science and technology to the public. The transmission approach is based on the one-way transfer of messages formulated beforehand by experts, i.e., limited public involvement [16]. This stands in contrast to the participatory approach, which is based on the co-creation of messages by experts and the public, i.e., extensive public involvement [16]. This distinction, while apparently simple, carries important assumptions about senders and receivers that have not yet been clearly voiced in the CCS field. They also relate to different communication objectives among senders. Unlike most previous research in the field, we explore both the strengths and weaknesses of the two communication approaches and outline their implications for forthcoming CCS communication research and practice.

2. A review of related CCS research

A compelling collection of studies has surveyed public awareness and opinions of CCS (for recent overviews, see, e.g., [17]). While this is a closely related topic, we focus our review on studies that inform our understanding of the interaction between the senders and receivers of messages concerning CCS. In particular, we explore three issues that will be useful to our subsequent introduction of the transmission and participatory approaches. First, we describe how CCS can be socially framed in various ways and how CCS messages can take various forms in communication activities. Second, we demonstrate what roles senders and receivers may play in CCS communication, which links to our subsequent discussion of who shapes the message in our two communication approaches. The review ends by examining essential questions raised in previous studies with regard to different degrees of public involvement in CCS communication.

2.1. Social framing of CCS

The concept of social framing tells us that there is not just one way to describe and understand CCS. Science and technology are

sometimes assumed to comprise objective truths that can be accurately described and understood in only one correct way. Singleton et al. [18] demonstrated an example of this in a study of public perceptions of CCS risks, in contrasting how the technical expert community “generally defines risk as the product of an event’s probability times its consequences” [18, p. 101], to public perceptions of risk based largely on subjective mental models based on how people think about the world. Regardless of whether or not descriptions of CCS are based on scientifically verifiable facts, different social frames, or representations, of the technology exist [11,19–21]. According to the social constructivist perspective, no technology can be said to be inherently objective. Instead, social framing means that certain aspects are always emphasized over others [22]. While some CCS researchers [20] use the concept of framing to refer to the strategic actions a sender undertakes to advance an interest, we align ourselves with researchers who use the concept to refer to the descriptions and interpretations of both senders and receivers, whether or not these represent the outcome of intentional framing [23,24].

Indeed, the fact that CCS has triggered significant and strong opinions suggests ample room for a variety of social frames. Many of these opinions are based on people’s values and are therefore largely subjective. CCS is a politically charged topic [25], with obvious links to energy production and policy, issues that are often passionately debated. CCS also raises ethical considerations that concern both current and future generations, with moral trade-offs between, for example, the responsibility to address climate change and the possible risks of sudden CO₂ leakage or micro-seismic activity.

The literature provides several examples of social framing of CCS. Besides studies examining whether CCS is described or interpreted mainly positively or negatively [26,27], scholars have demonstrated how various meanings are attached to CCS. Although CCS is predominantly described as a climate change mitigation option, it can also be presented as, for example, “a chance of survival, prosperity and competitiveness in a carbon-constrained future” by actors dependent on fossil fuels [11]. Hansson and Bryngelsson [19] identified three critical storylines among experts, who variously describe CCS as a moral issue that concerns solidarity, a bridge to renewable energy and long-term sustainability, and a technology compatible with current societal structures, situations, and trends, such as high dependency on fossil fuels. Associations, for example, with stigmatized technologies [28] or with metaphors such as the “moon landing” [29] have also been identified. Malone et al. [17] highlighted how researchers themselves frame CCS and thereby influence survey respondents. At another conceptual level, Stephens et al. [21] demonstrated that CCS is often described in an expert community as simply a technical issue and less frequently as a political, economic, or social issue.

The social framing of CCS is not enacted only by members of the general public, but also by researchers [17,19], the international community of professional CCS experts [21], international organizations [30], and the media [26,27,29]. Differences across countries in how CCS is framed have also been identified [12].

2.2. Senders and receivers of CCS messages

The distinction between the sender/source and the receiver of a message is not new to the study of CCS communication. Brunsting et al. [5] distinguished between “input factors” (i.e., source, message, channel, and receiver) and “output factors” (i.e., attention, interest, understanding, and attitudes). While we focus on assumptions underlying the input factors of two distinct overall communication approaches, most research to date has focused on the receiver of CCS messages and the output factors, i.e., questions

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