



Risk perceptions of an alleged CO₂ leak at a carbon sequestration site



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ABSTRACT

In January 2011 a local farm couple from Canada held a press conference claiming that carbon dioxide (CO₂) had leaked from a carbon sequestration project onto their land. This was the first public allegation of a leak from a carbon sequestration site and provides an opportunity to examine how a negative event can impact the perceptions of emerging technologies. A total of 76 in-depth interviews were held with residents in two communities including: (1) Weyburn, Saskatchewan, the location where the allegations of a leak were made; and (2) Priddis, Alberta, the location of a proposed carbon sequestration research project that was halted due to local concerns. Results demonstrate that communities perceived the allegations differently. Most participants who lived in the Weyburn area were not concerned about the allegations of a CO₂ leak. Some residents from Priddis were concerned about CO₂ leaks and the allegations made in Weyburn ultimately became a factor in the cancellation of the proposed project. This study compares and contrasts the differences in community perspectives, provides recommendations for risk communicators and ultimately considers the influence of early controversy on the development of emerging energy technologies.

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1. Introduction

As greenhouse gas emissions rise, the development and deployment of low carbon dioxide emitting energy systems become more critical. In many countries, strategies and policies have been put in place to encourage the deployment of innovative low emitting greenhouse gas energy technologies. One important factor in the deployment of such energy systems is public opinion of the technology (Wüstenhagen et al., 2007). The opinion of those living nearby proposed or current projects is particularly critical for the deployment of energy developments. If there is opposition or concern about the risks associated with a development in the region, there is more likely to be public protest and cancelled projects (Devine-Wright, 2005).

Many regions of the world have encouraged the development of geologic carbon dioxide (CO₂) sequestration as a technological strategy to mitigate climate change. Carbon sequestration has been put forth as a technological innovation that can reduce the release of carbon dioxide into the atmosphere from large point source emitters such as natural gas and coal fired power plants. It involves capturing CO₂ from large point source emitters, condensing it and transporting it to a suitable area where it is stored in deep underground reservoirs (Parson and Keith, 1998).

While there are benefits to carbon sequestration, many risks and uncertainties remain. There is the possibility of acute or chronic release of CO₂ from a sequestration site (Bachu, 2007; West et al., 2005). Risks at a local level could impact both workplaces and communities at sites of carbon sequestration. These risks could involve groundwater contamination as well as human and ecological health impacts if CO₂ accumulates in confined areas (Wilson, 2004; Siirila et al., 2012). The International Panel on Climate Change (IPCC) Special Report on Carbon Dioxide Capture and Storage states that while “storage projects are now in operation and being carefully monitored, time is too short and overall monitoring too limited to enable direct empirical conclusions about the long-term performance of geological storage” (IPCC, 2005; p. 246). However, the IPCC report also suggests that leakage rates would be very small among well selected and operated storage venues. Overall estimates suggest that more than 99% of stored CO₂ is likely to remain isolated in storage based on a 100 year projection (IPCC, 2005).

There has been one high profile public allegation of a CO₂ leak at a carbon sequestration site. On January 11, 2011 a farm couple living near Weyburn, Saskatchewan alleged a leak associated with the local project. The Weyburn site is one of the world's first and largest developments demonstrating the feasibility of carbon sequestration in an enhanced oil recovery project. Independent assessment reports have since stated that the CO₂ found on the property was not anthropogenic (Cenovus, 2011; IPAC-CO₂, 2011). However, there was an increase in media reports about the possibility of leaks from carbon sequestration projects and the impacts

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on future developments remain uncertain (Boyd et al., 2013). It is clear from past studies that the views of those who are located near proposed carbon sequestration projects are critical to the successful deployment of carbon injection projects (Bradbury et al., 2009). We know less about how negative events (such as the alleged leak at the Weyburn site) impact the views of locally affected communities.

This study examines how the allegations of a leak and communication processes surrounding these claims have contributed to the debate on deploying carbon sequestration in rural communities. In-depth interviews with seventy-six people were held in two Canadian communities during May to November 2011. The interviews were held *after* the allegations of the leak were made—but *before* the final assessments were released. Interviews during this timeframe provide the unique opportunity to better understand perceptions of the alleged leak before official studies stating that the CO₂ on the property was not anthropogenic were made public.

Research for this study was completed in two communities affected by proposed or current carbon sequestration projects: (1) Weyburn, Saskatchewan, which hosts one of the world's largest demonstration projects and was also the location of the alleged leak; and (2) Priddis, Alberta, where a carbon sequestration research project was proposed but was ultimately terminated due to local public opposition. This study focused on addressing three main research questions. First, were residents in the two communities aware of the allegations of a CO₂ leak in Canada? Second, what did residents think about the allegations of the CO₂ leak? Third, did the allegations of a leak impact the views of carbon sequestration development in the two communities?

This paper first reviews the importance of understanding public perceptions of carbon sequestration and discusses the impact of negative events on technological innovation processes. We then provide an overview of the allegations of a CO₂ leak at the Weyburn site. The methods are described, and the paper concludes with study findings and conclusions. Risk management and communication best practices are provided for both carbon sequestration technology and other energy systems development in general.

2. Background

2.1. Perceptions of carbon sequestration and CO₂ leaks

Public opinion can factor into the successful introduction or implementation of a controversial technology. Social science research demonstrates that the majority of the public relies on intuitive risk judgments, called “risk perceptions” to think about hazards (Slovic, 1987). An important factor in geologic carbon sequestration implementation is public support and acceptance of the technology (Ashworth et al., 2010). This is especially true for those who live near proposed or current developments, as these people may be more influential in the implementation of carbon sequestration projects through their support or opposition of the technology (Bradbury et al., 2009).

There have been a number of research projects that have examined the perceptions of this technology, including local populations' views of risks and benefits of hosting developments. Research on affected communities has included studies in the United States (Wong-Parodi and Ray, 2009; Bradbury et al., 2009; Feldpausch-Parker, 2010), the United Kingdom (Shackley et al., 2006), Germany (Dütschke, 2011), Australia (Anderson et al., 2012; Ashworth et al., 2009), the Netherlands (Huijts et al., 2007; Brunsting et al., 2011; Terwel et al., 2012) and Canada (Boyd, 2015a). Research by Oltra et al. (2012) also compared affected communities in a number of different European countries. Research demonstrates that there are a number of perceived risks and benefits associated with hosting carbon sequestration projects. Some of these risks include the

potential impact to local community and livelihood. For example the possibility of decreased property values (Wong-Parodi and Ray, 2009), increased traffic and impact on local business (Oltra et al., 2012). There is also often concern among community members about who holds the risks and who reaps the benefits of these projects. If there is little benefit to the local community—there may be little support for a carbon sequestration project in the region (Feldpausch-Parker, 2010). Community members may also be concerned about the potential for induced seismicity (Wong-Parodi and Ray, 2009) and carbon dioxide leaks (Bradbury et al., 2009). Residents could be concerned about how a leak may cause harm to human health or groundwater (Feldpausch-Parker, 2010), or the impact to local animals or wildlife (Boyd, 2015b).

Other research has examined how CCS stakeholders (i.e. members of the scientific community, non-governmental organizations and industry) thought the allegations of a leak at the IEA GHG CO₂ Weyburn-Midale Monitoring and Storage Project could impact carbon sequestration development and deployment (Boyd et al., 2013). Many stakeholders acknowledged that a leak could potentially contribute to and reinforce negative public perceptions of carbon sequestration technology. Stakeholders recognized that this was particularly true for communities where CCS projects were proposed. Some of the participants suggested that a controversy would expose the technical challenges involved with monitoring and identifying potential leakages. These challenges identified by stakeholders point to the potential for these events to focus the publics' attention on the downfalls of carbon sequestration technology.

2.2. The role of focusing events in the diffusion of energy systems

While there has been research on the publics' perceptions of carbon sequestration, there has been less research on how a “focusing event” can affect these perceptions. A potential focusing event can be defined as “an event that is sudden, relatively rare, can be defined as harmful or revealing the possibility of potentially greater future harms, and that is known to policymakers and the public virtually simultaneously” (Birkland, 1997; p. 32). Researchers have found two primary reasons why events gain focal power: (1) they affect many people (e.g. through a natural disaster that impacts a large region), or (2) they reveal the greater potential for disaster (e.g. through a nuclear power plant accident) (Birkland, 1997; Cobb, 1983). These sudden events can become important factors in shaping individual and collective risk perceptions. Technological or industrial disasters can become opportunities for some to elevate attention to a problem while other groups seek to prevent the issues from gaining prominence. Focusing events have the potential to shift the potential ‘risky’ aspects of a technological development to greater prominence and can cause greater public concern or even halt project deployment (Birkland, 1997). The allegations of a CO₂ leak could be considered a *potential* focusing event for carbon sequestration development, as it could reveal the greater potential for negative impacts to the environment and the health of nearby populations.

The Exxon Valdez oil spill, the Three Mile Island nuclear power accident, the Fukushima Daiichi nuclear disaster were all memorable events that focused the publics attention on disaster and influenced risk perceptions (Lindell and Perry, 1990; Visschers and Siegrist, 2013). These types of events also played an important role in stimulating greater public and political interest in a problem, and potentially impacting technological development (Cobb, 1983; Baumgartner and Jones, 2010). There are a number of other focusing events that have affected the perceptions of a technology or the ultimate siting of developments. For example, the Chernobyl nuclear power accident reinforced growing skepticism about the safety and risks of nuclear power generation, and caused damage

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