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Citizen perceptions of fracking: The risks and opportunities of natural gas development in Canada

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ABSTRACT

The extraction of oil and gas has increasingly shaped Canada's economy and culture in recent years. As Canada attempts to move toward a low carbon economy, it is important to know how Canadians perceive the risks and opportunities associated with various energy sources. In particular, fracking, or hydraulic fracturing, is one such energy extraction technique that has received much media attention but little systematic research from social scientists in Canada. Drawing on survey data from a representative sample of citizens in a province that has utilized fracking extensively (British Columbia) and one that has placed a moratorium on its use (New Brunswick), this article examines public perceptions of the use of hydraulic fracturing. In particular, this paper explores the risks and opportunities people perceive from this technology in these different provincial energy contexts. The findings suggest that while New Brunswick residents saw more benefits and fewer risks from fracking than British Columbia residents, the variables shaping perceptions within each province were mostly similar. We argue that contemporary risk theorizing should more closely consider how people perceive opportunities associated with the use of this disruptive technology as well as how context shapes people's perceptions.

1. Introduction

Hydraulic fracturing, commonly known as 'fracking', is a method of unconventional oil and natural gas extraction [1–4]. The use of this technique has recently attracted much controversy and media attention due to the potential economic benefits and risks associated with its use [1,5–9]. In Canada, hydraulic fracturing (HF) has been utilized primarily in the western provinces while moratoriums have been put in place in many of the eastern provinces of the country. Despite this, there has been little social science research conducted on how people in Canada perceive the issue or on the social impacts associated with its use.

Understanding public perceptions of HF within Canada and elsewhere is important for several reasons. First, Canada holds substantial natural gas reserves and, in comparison to other countries, ranks fifth in terms of natural gas production [10]. While studies suggest that much of the world's fossil fuel deposits must stay in the ground if we are to limit the earth's warming to two degrees Celsius [11], it is still unclear whether the public will truly support such an endeavour. Second, as the findings from other countries suggest, the development of natural gas deposits is likely to hinge on, or at minimum be impacted by, public perceptions of fossil fuel use [12]. In particular, Canada's heavy reliance on fossil fuels for economic growth in recent years raises questions about how seriously it will take on the issue of reorienting Canada's economy toward less carbon intensive industries. It is likely that Canada's move towards a less carbon intensive economy will at least in part depend on public perceptions of the issue [13]. Finally, although there are similarities found in how the public perceives the development of shale gas, researchers have also highlighted important differences found both across and within countries [14–16]. While similarities and differences will be discussed below, these differences in public perceptions suggest that findings in one location do not easily translate into different places due to disparate histories, cultures, and economies [5].

Therefore, this article adds to the literature by providing an understanding of public perceptions of HF within the Canadian context. This paper builds on research that highlights the importance of considering place and context when examining people's perceptions of shale gas development (e.g., [5]). Our research set out to gain a better understanding of people's perceptions of HF as well as the variables that shaped these perceptions in a province that had utilized this technology extensively (British Columbia) and in one that had a moratorium on HF (New Brunswick). More specifically, our research questions were:

RQ1: Are there differences in how people perceive the impacts of fracking in two different provincial energy contexts (i.e., New Brunswick (NB) with a moratorium and British Columbia (BC)

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without one)?

RQ2: What shapes people's attitudes toward fracking in each of these provinces?

The decision to conduct a within country comparison was guided in part by Ashmoore et al.'s () argument that comparisons "within the same nation could be more useful in some ways than comparisons across nations, due to the cultural baseline across which to compare similarities and differences."

In what follows, we first discuss the process of HF in more depth and situate its use in Canada in relation to other countries. The reasoning for comparing public perceptions in New Brunswick and British Columbia is also addressed, as is the energy contexts in both provinces. Second, drawing on theorizing on risk society, we discuss the risks and opportunities associated with the use of HF. We also examine the research that has been completed thus far on people's perceptions toward HF and what helps to shape these perceptions. Fourth, the methods section discusses the survey instrument utilized to examine people's perceptions. Finally, the findings and discussion sections are organized around the key differences and similarities found between BC and NB residents' perceptions.

More specifically, this article considers public perceptions of opportunities alongside people's perceptions of risks. We argue that risk theorizing could be enhanced by also incorporating people's reflexive understandings of opportunities associated with disruptive technologies, not just risks. Perceptions of opportunities, as well as risks, are especially important to consider in relation to local contexts and a range of socio-demographic variables. As will be discussed in more depth in the next section, public understandings of HF appear to be filtered through multiple complex factors.

2. The fracking process and shale gas development

Over time, and with the development of new technologies, the term HF has come to encompass a wide range of activities and processes used to access, drill, extract, and transport gas, oil, and waste disposal [2,17]. However, Evensen et al. [2] state that fracking has become the most commonly used word to describe natural gas extraction from shale deposits. The process of HF essentially creates fractures in rock formations to facilitate the flow of natural gas [3]. Furthermore, the process involves drilling vertical wells deep into land surface, then drilling horizontally into subsurface [18–20,3,4]. During this process, water, sand, and various chemicals are forced at high pressures to create fractures in energy-bearing rock formations, where the trapped hydrocarbons flow through the fractures and are recovered at the surface [18,17,2,8]. These fluids are then forced back to the surface through the internal pressure of the rock formations [18]. The used injection fluids, or 'flowback', can be recycled off-site, but are usually injected into the subsurface through a deep-injection well for disposal [18,3]. Typically, the additives associated with HF can be toxic or carcinogenic [17,6,20].

2.1. The Canadian context

In Canada, natural resource extraction has always played a prominent role in shaping the country's identity, economy, and culture. For example, single-industry resource communities or boomtowns have been prominent across Canada's vast landscape [21]. However, in recent years, increasing oil and gas extraction, led predominantly by the extraction of oilsands in northern Alberta, has played a particularly important role in helping to make Canada a petro-state. The increasing use of HF to extract natural gas has also contributed to this.

In comparison to other countries, Canada's experiences with resource extraction arguably best compares to that of Australia. Both countries export large amounts of natural resources to much larger markets that control purchases (i.e., the US for Canada and China for Australia) [22–24]. Further, ownership of resources in each country is vested in the crown. Mainly, it is the provinces/states that manage mining and resource development in both countries [15,25]. Whereas, in the United States resources are managed by each state, but individual land owners retain much of the rights over resources [15]. In comparison, while countries within the European Union have various levels of regulation, resources are mostly managed across nations or at the country level [26].

In terms of shale gas development utilizing HF, the United States and Canada lead the way in comparison to other locales [13]. However, Australia is readily increasing its capacity to extract unconventional gas [27–29]. In Europe, the development of shale gas has been slow to non-existent, despite substantial available reserves [30].

2.2. Comparing British Columbia and New Brunswick

British Columbia and New Brunswick were chosen as the focus of this research for several reasons. First, these two locations allowed for a comparison of public perceptions between a province that has actively embraced HF (i.e., BC) and one that initially embraced it and had several active wells but then placed a moratorium on its use in 2014 until the risks could be examined further (i.e., NB). Second, these two provinces have a long history of oil and gas exploration and development. Thus, comparing these two provinces helps to control for the impacts of oil and gas exploration being something novel to provincial residents. Finally, both provinces have experienced protests and controversies over HF development and potential environmental damage. In this section, we provide more context on each of the provinces.

British Columbia is Canada's third largest province with a population of approximately 4.6 million people in 2016 [31]. Roughly half of British Columbians reside in the urban Vancouver area with the remainder of the population residing in substantially smaller cities or rural communities [32]. This leaves nearly two-thirds of the province covered in forest (60 million hectares) [33]. Much of the shale gas development in BC occurs in the northeast portion (e.g., Montney Basin Shale) of the province. In approximately 2005, this area began producing some of the first shale gas in Canada, and by 2012, close to 1100 wells had been drilled throughout the country. However, most of these wells were drilled in BC, and to a lesser extent, Alberta [34]. In total, BC's reserves are estimated to contain 349 trillion cubic feet of natural gas making it the second largest provincial producer of natural gas in Canada [35].

New Brunswick's population in 2016 was approximately 747,000 people, making it Canada's eighth largest province [36]. From 2011 to 2016, NB was Canada's only province to see negative population growth. New Brunswick's three largest urban areas (Moncton, Saint John, and Fredericton) all have populations under 100,000 people [37]. The remainder of NB is covered by a series of smaller communities, rural landscapes, and forests (6 million hectares) [37,38]. New Brunswick's shale reserves are mostly located in the southeastern portion of the province (e.g., Frederick Brook Shale) [34]. In total, NB's reserves are estimated to contain 78 trillion cubic feet of natural gas [39]. Throughout the 2000s, several new oil and gas wells were drilled across the province. However, in total there were less than 100 wells drilled and only a small proportion of these involved HF. Despite this, a moratorium was put in place in 2014 due to public concerns and protests over the use of this technology [40–42]. The moratorium has essentially prevented further development of natural gas in NB.

Given these contexts, it was expected that there would be differences in how the public perceive HF in each of the provinces. Further, research that has made comparisons between locations at the state level in the United States has found public perceptions of HF were more favourable in states that had embraced HF (e.g., Pennsylvania) as a matter of public policy than those states that did not (e.g., New York) [43–45]. Thus, it was expected that public perceptions would align with public policy: