

Citizen Acceptance of Unconventional Fossil Fuels in Canada

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Ethics Statement

The author, whose name appears on the title page of this work, has obtained, for the research described in this work, either:

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Abstract

Citizen acceptance can represent a significant barrier to the implementation of energy projects, which is increasingly relevant as unconventional fossil fuel production is forecasted to expand in Canada. I use a nationally representative survey sample of the Canadian population (n=1407) to examine citizen acceptance of five prominent unconventional fossil fuel developments: oil sands, Northern Gateway Pipeline, Trans Mountain Pipeline, Energy East Pipeline, and hydraulic fracturing. Across Canada, oil sands and pipeline developments tend to have lower acceptance than renewable energy and conventional oil, but more acceptance than nuclear and coal. Among Canadian regions, acceptance for unconventional fossil fuel developments is consistently higher among respondents in Alberta (the province where most fossil fuel development occurs), who are more likely to perceive economic benefits and less likely to perceive environmental and social costs. Opposition tends to be higher among respondents in British Columbia and Quebec. Acceptance levels are similar for oil sands and oil sands pipelines within all Canadian regions, while hydraulic fracturing has significantly lower acceptance in each region. Otherwise, regression analyses indicate consistent patterns of fossil fuel development acceptance across the full sample: biospheric and altruistic values and environmental concern predict higher acceptance, and egoistic and traditional values and trust in oil and gas companies predict lower acceptance. Results provide a number of insights to policymakers and stakeholders, including the strong regional differences in development acceptance, and how citizens perceive oil sands related projects quite differently from hydraulic fracturing development.

Keywords: citizen acceptance; survey; oil sands; pipeline; hydraulic fracturing; values

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Chapter 1.

Introduction

A lack of citizen acceptance can present significant barriers to the implementation of large-scale energy projects (Wüstenhagen et al., 2007), challenging policy-makers, energy project developers, stakeholders, and civil societies with vested interests in energy development. Improved understanding of citizen acceptance can help to anticipate support or opposition to energy projects, and perhaps to better engage with citizens on future energy development. This project seeks to improve understanding of citizen acceptance for Canadian energy developments, focusing on unconventional fossil fuels.

In Canada, unconventional fossil fuels make up a large proportion of the current energy portfolio and hold the potential for further expansion in coming decades (NEB, 2017a; CAPP, 2017; NEB 2016a). Unconventional fossil fuels are found in relatively novel geologic reservoirs and are extracted using specialized processes (International Energy Agency, 2017), such as surface mining for oil sands deposits, or use of hydraulic fracturing techniques to develop shale gas reservoirs. This study compares social acceptance for unconventional fossil fuels to other major Canadian energy sources, including conventional oil, which is oil that flows freely or is easily pumped to the surface, and renewable energy, which is energy that is derived from continuously replenished natural processes (International Energy Agency, 2017) such as hydroelectricity, solar power, and wind power.

The focus of the work includes five different Canadian unconventional fossil fuel resources, infrastructure projects, and extraction techniques. Specifically, this research examines oil sands development (in aggregate, as opposed to individual projects) and three oil sands infrastructure projects that were under consideration at the time of the data collection (2016): the Northern Gateway Pipeline, Trans Mountain Pipeline, and Energy East Pipeline. I also examine one unconventional fossil fuel extraction technique, natural gas extraction using hydraulic fracturing. Throughout this report, these are collectively referred to as unconventional fossil fuel developments.

Canadian unconventional fossil fuel developments have recently been subject to significant public controversy, prominently reflected in news media where competing economic and environmental tradeoffs have dominated the discourse (Dusyk et al., 2016). Commonly claimed benefits of unconventional fossil fuel developments include regional and national economic growth, job growth, access to global markets, energy security, and promotion of ethical energy (Canadian Energy Research Institute, 2017; Levant, 2010). Claimed risks include that unconventional fossil fuel developments incur environmental and social costs, such as risks of contamination due to spills, and adverse health impacts to local communities (Pembina Institute, 2014; Palen et al., 2014; Chen, 2009). Climate risks are also salient concern, considering research suggests that unrestricted extraction of unconventional fossil fuels is inconsistent with goals of limiting global warming to 2 degrees Celsius (McGlade and Ekins, 2015).

The research agenda of this project is motivated by the controversial nature of unconventional fossil fuel developments, the significance of these projects with respect to economic, social, environmental, and energy objectives in Canada, and the potential for citizen acceptance to influence the fate of these developments. Although several other studies have explored aspects of citizen acceptance across different energy types, this study is the first to assess acceptance and perceptions of i) multiple unconventional fossil fuels ii) alongside other major energy sources iii) using a nationally representative survey of Canadians. This project adds to the growing body of energy acceptance literature with the following research objectives:

1. Compare citizen acceptance for major energy types, including fossil fuels, renewables, and nuclear energy among regions in Canada;
2. Compare how citizen acceptance for conventional oil and unconventional fossil fuel developments varies by Canadian region;
3. Compare perceptions of costs and benefits of unconventional fossil fuel developments by Canadian region;
4. Explore factors that influence citizen acceptance of unconventional fossil fuel developments and conventional oil in Canada, including values, environmental concern, trust, proximity, socio-demographics, and regional effects.

This paper is comprised of four chapters. The remainder of chapter one consists of an overview of unconventional fossil fuel developments and provides context from literature related to the study of citizen acceptance. Chapter two explains details of the survey, sample, and methodology. Chapter three describes key results and presents findings from the statistical analyses completed. Chapter four discusses the results, study limitations, conclusions, and policy implications related to citizen acceptance of unconventional fossil fuel developments.

1.1. Overview of unconventional fossil fuel developments in Canada

Canada has the third largest oil reserves in the world, approximately 97 percent of which come from deposits called oil sands found in the province of Alberta (CAPP, 2017; NRCAN, 2014). The term “reserves” is commonly used to represent a known amount of oil, or other valuable commodity, that has been accurately quantified and can be extracted with existing technology profitably. Oil sands deposits are found as a mixture of sand, clay, water, and a viscous type of oil, bitumen, which is extracted using mining techniques or other relatively novel processes. Alberta’s oil sands reserves contain an estimated 168 billion barrels of oil, (NRCAN, 2014) and accounted for 66 percent of Canadian production (i.e. the quantity of oil extracted from the reserve) in 2016 (CAPP, 2017). The oil and gas industry are planning for further expansion of oil sands to account for 71 percent of forecasted oil production by 2030 (CAPP, 2017). In contrast, Canada’s other two main sources of oil production, conventional oil from Western Canada and offshore oil from Eastern Canada, are forecasted to remain stable or decline in the coming decades (CAPP, 2017).

At the time this research project was implemented, four major pipelines had been proposed to transport oil sands petroleum products to global markets: Kinder Morgan’s Trans Mountain Pipeline, TransCanada’s Energy East Pipeline, Enbridge’s Northern Gateway Pipeline, and TransCanada’s Keystone XL Pipeline. This study focuses on the first three of these pipelines, as the Keystone XL Pipeline application had been rejected

in 2015 by the Obama administration prior to survey implementation¹ (Table 1; CEAA, 2010; Kinder Morgan, 2016; NEB, 2016b; NEB, 2017a).

Table 1: Summary of proposed oil sands pipelines

Pipeline	Start – end location	Barrels per day transported	Key attributes
Trans Mountain	Edmonton, Alberta – Burnaby, British Columbia	890,000 (up from 300,000)	Expansion of existing pipeline; export crude oil from marine terminal
Northern Gateway	Bruderheim, Alberta – Kitimat, British Columbia	525,000	Export crude oil from marine terminal
Energy East	Hardisty, Alberta – Saint John, New Brunswick	1,100,000	Oil refined in Eastern Canada; export oil from marine terminal

At the time of writing in April 2018, the status of two of the studied pipelines had changed since survey implementation and data collection in mid-2016. The Northern Gateway Pipeline application was rejected by the federal government of Canada in November 2016 (NRCAN, 2017), and the Energy East Pipeline proposal was terminated by the project proponent in October 2017 (TransCanada, 2017). These pipelines remain a part of the analyses of this report as they contribute meaningfully to understanding citizen acceptance of unconventional fossil fuel developments. As of April 2018, the Trans Mountain Pipeline has the continued support of the project proponent, the government of Canada, and the provincial government of Alberta, but is publicly opposed by provincial and municipal governments in British Columbia.

In addition to Canada’s significant oil reserves, Canada is also a major producer of natural gas, ranking as the fifth largest producer of natural gas globally (NEB, 2017b). Tight gas and shale gas production, which are extracted using hydraulic fracturing technology, represent a rapidly growing share of natural gas production, accounting for 50 percent of Canada’s current production and 82 percent of Canada’s forecasted production by 2040 (NEB, 2017b). Hydraulic fracturing technology has prompted energy companies to develop gas reserves that were previously inaccessible or uneconomic (Armstrong et. al, 1995). These advances in drilling techniques allow energy companies

¹ The Keystone XL pipeline application has since been revived by the Trump administration.

to orient new wells horizontally through targeted geologic layers, increasing a wellbore's contact with the gas-producing zone of interest. After drilling is completed, mixtures of water, sand and chemicals are injected into the targeted layer at high pressures, intentionally fracturing and propping open the rock in the gas-producing formation. These two processes are typically known as directional drilling and hydraulic fracturing. In this report, I refer to these collectively as hydraulic fracturing, to reflect commonly used terminology. Advancement of hydraulic fracturing has prompted development of large shale gas reserves in British Columbia and Alberta (Rivard et. al, 2014). Hydraulic fracturing has also resulted in oil and gas industry interest in numerous undeveloped shale gas reserves located in Yukon, Northwest Territories, Quebec, New Brunswick and Nova Scotia, which have become near-economic or economic to develop because of the technology (Rivard et. al, 2014).

With declining production from conventional reserves, oil and gas companies are exploring resource potential in relatively new regions, using new technologies, and uncovering new social dialogue around development of energy resources. Oil and gas industry forecasts suggest that unconventional sources of oil and gas are set to take prominent role in future energy development in Canada, with direct and indirect implications on many regions within the country. Citizen acceptance can influence the implementation of these projects, which is increasingly relevant as new unconventional fossil fuel developments affect the energy landscape in Canada.

1.2. Conceptual framework on citizen acceptance of energy development

Wustenhagen et al. (2007) conceptualize acceptance of energy development into three distinct categories: socio-political, community, and market acceptance. Socio-political elements include acceptance by the public, key stakeholders, and policy-makers, as well as overall acceptance of technologies and policies. Community acceptance refers to acceptance by local stakeholders and residents directly affected by projects. Market acceptance refers to acceptance by consumers and investors related to energy projects. The key focus of this work is socio-political acceptance by the public (described henceforth as citizen acceptance), however, this project also includes some limited examination of community acceptance.

In this study, citizens are defined as members of the public who reside in a region of interest. I adopt a modified definition of the term acceptance in alignment with Perlaviciute and Steg (2014), where acceptance is considered a general evaluation that conveys the extent to which people favour, or disfavor, an energy development. Here, these general evaluations are measured through stated levels of respondent support, opposition, neutrality, or uncertainty related to different types of energy developments.

The existing literature suggests that a wide variety of contextual, social, and psychological factors can affect citizen acceptance of energy projects (Huijts et al., 2012; Perlaviciute and Steg, 2014). Two studies have proposed comprehensive frameworks which help to conceptualize the fundamental aspects of acceptance. Huijts et al.'s (2012) technology acceptance framework posits that one's acceptance of an energy technology is the product of complex interactions between trust, perceptions of fairness, costs, benefits, risks, behavioural control, and personal and social norms related to a technology. These factors are additionally influenced by experience and knowledge pertaining to a technology. Perlaviciute and Steg (2014) contribute another conceptual framework, proposing that one's emotional bonds to their home region (place-attachment), symbolic identity associated with that region (place-identity), and core values are also important factors contributing to evaluation of energy projects. The authors of the latter study also suggest that perceptions of fairness related to the energy projects, such as distribution of costs and benefits, compensation strategies, and fair development procedures also play an important role in acceptance.

Direct insights about citizen acceptance of unconventional fossil fuels can be drawn from studies on pipelines in both Canada (Axsen, 2014) and the United States (Clarke et al., 2016; Gravelle and Lachapelle, 2015), as well as hydraulic fracturing (Theodori et al., 2014) and offshore oil drilling in the United States (Smith et al., 2010). A wider body of research focusing on a variety of other energy projects such as power lines (Aas et al., 2014), nuclear power (de Groot et al., 2013, Kim et al., 2014; Whitfield et al., 2009) and wind power (Bidwell, 2013) also provide useful insight into public acceptance of large energy infrastructure across different countries. While these energy acceptance studies suggest a wide diversity of factors are likely to affect acceptance, the major focus of this research is to specifically examine the influence of a subset of these, including regional effects, perceived costs and benefits, human values, trust, socio-demographics, environmental concern, and proximity. Despite recent research using

more comprehensive frameworks to evaluate energy acceptance (e.g. Huijts et al., 2012), this project mainly utilizes factors which have been more commonly applied in prior survey-based research on unconventional fossil fuels. The breadth of energy projects examined in the survey instrument used for this research, including renewables, fossil fuels, and other energy types, necessitated that variables included needed to have strong empirical support and history of successful measurement in prior surveys. For example, regional effects, values, environmental concern, trust, and socio-demographics have been empirically studied using surveys directly related to unconventional fossil fuels (e.g. Axsen, 2014, Boudet, 2014). The following sub-sections review literature and opinion polls related to the research objectives outlined for this study. Hypotheses related to each research objective are subsequently summarized in Section 1.4 of this report.

1.3. Canadian citizen beliefs and perceptions

In addition to differences in citizen beliefs, recent public opinion polls by research companies provide a helpful gauge of public opinion for unconventional fossil fuel developments across Canada. When implemented correctly (with a representative sample, with non-biased questions), polling results can be a useful indicator of general trends in public opinion. Though, caution is warranted when considering the accuracy and comparability of specific results, including the potential biases of the funding source, and the fact that results typically do not undergo peer review.

Trends from recent opinion polls suggest that more Canadians support new oil sands pipelines than oppose them (Abacus, 2017; EKOS, 2016), most Canadians support continued conventional oil and oil sands development (Abacus, 2016), and that strong regional variation in public opinion exists on these developments across provinces (Abacus, 2016; Abacus, 2017; EKOS, 2016). According to a 2016 poll, 47% of Canadian respondents supported the Trans Mountain Pipeline, 48% supported the Northern Gateway Pipeline, and 59% supported the Energy East Pipeline, with between 35% and 43% opposed to each proposed project, respectively (EKOS, 2016). Between 6% and 12% respondents indicated that they were unsure about their opinion (Abacus, 2017). Positive feelings toward new pipelines are strongest in Alberta (67% positive; 7% negative), and negative feelings for new pipelines are strongest in British Columbia and Quebec (39% and 27% positive, 29% negative in both regions, respectively; Abacus

2017). Ontario and Atlantic regions showed less positivity about new pipelines than Alberta (43% and 51% positive, respectively) and less negativity than Quebec and British Columbia (20% and 15% negative, respectively; Abacus, 2017). The percentage of respondents who were unsure about building new pipelines ranged from 27% in Alberta to 43% in Quebec (Abacus, 2017). The response scales used in these polls generally align with the response scale employed in the present study, each containing some measure of support and opposition, and categories for uncertainty or neutrality. As such, the results referenced above are helpful in guiding hypotheses for this research.

Polls on conventional oil, oil sands, and hydraulic fracturing suggest similar regional trends as pipelines. In these polls, Albertans showed the most support for developing new conventional oil and oil sands reserves (93% and 90% support, 7% and 10% opposition, respectively), whereas Quebec showed the strongest opposition (27% and 48% opposition, 72% and 52% support, respectively), followed by British Columbia (17% and 29% opposition, 82% and 71% support, respectively; Abacus, 2016). In this poll, “unsure” or “don’t know” were not included as a response category, which likely exaggerates the support or opposition in comparison to polls referenced above. For hydraulic fracturing, a 2013 poll suggests that Albertans have considerably lower acceptance levels (48% support, 29% opposition, 23% unsure), but still have higher acceptance than British Columbians (26% support, 47% opposition, 27% unsure; Insights West, 2013).

Lastly, polls on renewable energy show that a large majority of Canadians are in favour of expanding the renewable energy portion of Canada’s energy mix (Abacus, 2017; EKOS, 2016). Solar power and wind energy appear to be the most favored renewable energy sources in the country (Abacus, 2017). Findings from these opinion polls align with favorable public evaluations of renewable energy observed in the broader academic literature (Visschers and Siegrist, 2014).

Regional effects may also impact perceptions of benefits, costs, and risks of energy developments, where research strongly suggests that increased perceptions of benefits are associated with higher citizen acceptance, and increased perceptions of costs and risks are associated with decreased citizen acceptance (Huijts et al., 2012). Examining the Northern Gateway Pipeline, which proposed to transport oil from central Alberta to the north coast of British Columbia, Axsen (2014) found higher levels of

support in Alberta, where survey respondents more strongly associated the pipeline with economic benefits and job creation. Survey respondents from British Columbia had lower levels of support, and were more likely to perceive environmental risks such as climate change and local environmental quality impacts (Axsen, 2014). Trends in acceptance levels found in Axsen (2014) for the Northern Gateway Pipeline align with the trends found in public opinion polls (Abacus, 2017). Evidence from hydraulic fracturing research in the United States suggests similar effects, where people who believe that hydraulic fracturing has positive economic and energy supply impacts are more likely to support it, and those who associate hydraulic fracturing with environmental impacts are more likely to oppose it (Boudet, 2014). Across other energy technology studies, such as nuclear and wind energy, similar associations are found between citizen perceptions of benefits and costs and support or opposition for energy projects (e.g. de Groot et al., 2013; Kim et al., 2014; Visschers and Siegrist, 2011, Whitfield et al., 2009).

The distribution of real (quantifiable and objective) benefits and costs are likely a major factor affecting citizen perceptions of benefits and costs of unconventional fossil fuel developments. For example, economic benefits of oil sands pipelines are predominantly concentrated in Alberta where oil sands reserves are developed (Hoberg, 2013), resulting in regional increases in economic growth, jobs, revenues to oil companies, royalty payments to government, and other direct or indirect economic benefits. Environmental risk and social costs of pipelines tend to be concentrated in jurisdictions where pipelines cross and terminate, such as British Columbia, in the case of Trans Mountain and Northern Gateway Pipelines, and provinces east of Alberta to New Brunswick in the case of Energy East. As such, jurisdictions outside of Alberta do not stand to gain the same level of economic benefits, and face a proportionally higher distribution of potential costs and risk. These differences in the real distribution of costs and benefits explain, at least to some extent, the differences in regional perceptions.

1.4. Factors of citizen acceptance

In addition to differences in citizen beliefs and perceptions among Canadian regions, I also explore other factors that influence citizen acceptance of fossil fuel developments, including values, environmental concern, trust, proximity, and socio-demographics. Relevant literature related to each of these factors is reviewed in the following sub-sections, while Section 1.5 articulates specific hypotheses that I will test.

1.4.1. Values

Values are defined as a “(1) belief (2) pertaining to desirable end states or modes of conduct, that (3) transcends specific situations, (4) guides selection or evaluation of behavior, people and events and (5) is ordered by importance relative to other values to form a system of priorities” (Schwartz and Bilsky, 1987, p. 551). Schwartz’s (1994) value theory proposes a comprehensive set of universally applicable values that can be organized across two dimensions: openness to change versus conservation, and self-enhancement versus self-transcendence (Schwartz, 1994). Researchers building off this work have shown that value theory provides a useful framework for exploring pro-environmental concern and behavior (Stern et al., 1995; Stern et al., 1998).

Stern et al. (1995) empirically link Schwartz’s (1994) two-dimensional value framework with research indicating that environmental concern is related to three value orientations: egoistic, altruistic, and biospheric values. Stern et al. (1995) showed that Schwartz’s (1994) self-enhancement dimension closely correspond to egoistic values, and Schwartz’s (1994) self-transcendence dimension correspond to biospheric and altruistic values, which could not be empirically separated. Egoistic values generally focus on preservation and promotion of one’s individual well-being, whereas altruistic and biospheric values are interested in the well-being of others and the environment (Stern et al., 1998). In early studies, traditional (sometimes called conservation) and openness to change values, which emphasize stability, self-restriction, conformity, and traditional practices (Schwartz, 1994), showed no significant effects on environmental concern and behavior (Stern et al., 1995). Studies completed since indicate that traditional value orientations can have an impact on energy acceptance, with the direction of that influence varying by energy type examined.

Prior research on the Northern Gateway Pipeline shows that biospheric and altruistic values are associated with perceptions of environmental risk, reduced perceptions of economic benefits, and are generally associated with opposition to the project (Axsen, 2014). Egoistic and traditional values are associated with perceptions of economic benefits and stated support of the Northern Gateway Pipeline. Studies on nuclear energy have revealed somewhat inconsistent relationships between egoistic and altruistic values and acceptance. In one study, egoistic values showed a positive effect on nuclear acceptance (de Groot et al., 2013), while other work shows no effect of

egoistic values on nuclear acceptance (Whitfield et al., 2009). In contrast, altruistic values are found to have a positive effect on nuclear acceptance in some studies (Whitfield et al., 2009), with non-significant effects noted in other studies (de Groot et al., 2013). Research also shows that traditional values can have a positive effect on nuclear acceptance (Whitfield et al., 2009), and biospheric values can have negative effect on acceptance on nuclear energy (de Groot et al., 2013; Table 2).

Table 2: Summary of energy acceptance studies using value theory (+=positive effect, -=negative effect, NS=not significant, NM=not measured)

Author(s), year	Country	Sample size	Energy Alternative	Influence of values on acceptance (egoistic, traditional, biospheric, altruistic)			
Axsen, 2014	Canada	2628	Pipeline	+	+	-	-
de Groot et al., 2013	Netherlands	123	Nuclear	+	NM	-	NS
Whitfield et al., 2009	USA	380	Nuclear	NS	+	NM	-
Bidwell, 2013	USA	375	Wind	NS	-	+	+

Value theory case studies often demonstrate that values are an important factor in perception and acceptance of energy developments, but the effects of values can vary depending on the context and perceived effects of the project in question (Perlaviciute and Steg, 2014; Perlaviciute and Steg, 2015). Research on wind power illustrates this point. Values in this context predominantly show the opposite effects when compared to effects of values on nuclear power (Bidwell, 2013).

1.4.2. Environmental concern

Levels of concern regarding climate change and environmental conditions can play an important role in contributing to citizen acceptance of energy technologies (Culley et al., 2010; Spence et al., 2010). A common measure that assesses environmental concern in surveys is called the New Environmental Paradigm (NEP)

scale (Dunlap, 2008). The scale measures whether a respondent's views correspond to the view that humans dominate over the environment (i.e. human-centered orientation), or whether humans are one element participating in broadly connected environment (i.e. environment centered orientation; Dunlap et. al., 2000).

Environmental concern has been previously examined in energy acceptance research, where higher levels of environmental concern are associated with opposition to unconventional fossil fuels (Axsen, 2014). Regarding concern for climate change, Axsen's (2014) study on the Northern Gateway pipeline suggests that those who believe climate change is a serious problem are less likely to support the project, whereas those who believe climate change is less of a problem are more likely to support the project. Another study focused on renewable energy and nuclear power showed that concern about climate change and general environmental concern was associated with positive evaluations of renewable energy sources and negative evaluations of nuclear energy (Spence et al., 2010).

1.4.3. Trust

Trust in energy regulators and project developers is an important determinant of increased acceptance of energy technologies (Aas et al., 2014; Brasier et al, 2013; Huijts et al., 2012; Midden and Huijts, 2009; Perlaviciute and Steg, 2014; Kim et al., 2014; Visschers and Siegrist, 2014; Whitfield et al., 2009). Though no formal definition exists, Rousseau et al. (1998) propose that “[t]rust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another” (p. 395). When evaluating an energy project, citizens' trust can be placed in any number of relevant energy development actors including private industry (proponents), government, regulators, and those disseminating information such as university scientists, non-governmental organizations, and other interest groups. People often rely on these types of actors because energy developments are inherently complex and can be difficult for non-expert citizens to evaluate (Midden and Huijts, 2009).

Numerous energy acceptance studies have shown that higher levels of trust in those involved in energy development is associated with higher levels of acceptance across a variety of energy contexts including shale gas (Brasier et al, 2013), powerlines (Aas, et al., 2014), and nuclear power (Kim et al., 2014; Visschers and Siegrist, 2013;

Whitfield et al., 2009). Trust in shale gas developers, state regulators, and science agencies tends to reduce perceived risks associated with shale development, whereas trust in local environmental groups is associated with increased risk perceptions (Brasier et al, 2013). Trust in both energy system operators and energy developers are also linked to increased acceptance of high voltage powerlines in Norway, Sweden, and the UK (Aas, et al., 2014). This research focuses on trust in three key energy project actors: oil and gas companies, federal environmental agencies, provincial environmental agencies. These actors were included in the scope of this work because there is strong empirical support to contribute to hypothesis development, and that these actors have a role that is essential to unconventional fossil fuel development in Canada.

1.4.4. Proximity

Energy acceptance literature has made a concerted effort to clarify and expand the common assumptions around the “Not In My Backyard” idea (also known as NIMBY’ism), whereby individuals living in close proximity to energy projects are expected to protect their personal interest by opposing nearby development—even if they support such development more generally (Devine-Wright, 2005). Wustenhagen (2007) suggests that NIMBY’ism is related to the community acceptance dimensions of overall social acceptance, where specific decisions about project siting are mainly impacted by residents, local authorities, and stakeholders that are more closely engaged with energy project discussion. In this study, I consider proximity to be a measure of community acceptance. Energy acceptance research thus far shows that the effect of proximity to energy projects on acceptance is variable. One’s proximity to an energy development may contribute to either support or opposition or, or not significantly impact acceptance, depending on the unique characteristics of individual projects and nearby communities and residents (Boudet et. al, 2016, Devine-Wright, 2005; Gravelle and Lachapelle, 2015; Jacquet, 2012).

Research specifically on unconventional fossil fuels thus far mainly shows that individuals located in closer proximity to unconventional energy development have tended to more strongly support these projects (Boudet et. al, 2016, Gravelle and Lachapelle, 2015), though some other studies show no impact of proximity (e.g. Jacquet, 2012). For example, Gravelle and Lachapelle (2015) find that probability of support for the Keystone XL pipeline increases when respondents live closer to the proposed

location of the pipeline. Hydraulic fracturing studies show that proximity to shale gas producing regions is also associated with increased acceptance levels towards those projects (Boudet et. al, 2016).

1.4.5. Socio-demographics

Socio-demographic variables such as gender, age, education, and income have featured prominently as factors affecting energy acceptance in existing studies (Boudet et al., 2014; Firestone and Kempton, 2007; Gravelle and Lachapelle, 2015; Kim et al., 2014; Klick and Smith, 2010; Smith et al., 2010). Prior research shows that women are more likely to oppose hydraulic fracturing (Boudet et al., 2014), pipelines (Gravelle and Lachapelle, 2015), hazardous waste facilities (Hunter and Leyden, 1995), offshore oil drilling (Smith et al., 2010), and nuclear power (Kim et al., 2014). No effect of gender was observed, however, in studies related to offshore wind power (Firestone and Kempton, 2007), and women may be less likely to support land-based wind power (Klick and Smith, 2010). Canadian public opinion polls show that belief in environmental protection is displayed more prominently in women (EKOS, 2016). Age also has an impact on one's views of energy developments, with evidence suggesting that older individuals tend to be more supportive of hydraulic fracturing (Boudet et al., 2014), pipelines (Gravelle and Lachapelle, 2015), hazardous waste facilities (Hunter and Leyden, 1995), nuclear power (Kim et al., 2014), and (onshore) wind power (Klick and Smith, 2010). EKOS Research's (2016) poll also finds that older people are particularly inclined to believe that oil and gas is important to Canada's economy now and into the future.

In previous studies, effects of education and income level have not shown a consistent positive or negative association with acceptance of energy infrastructure (Axsen, 2014; Boudet et al., 2014; Whitfield et al., 2009). For example, neither income or education were significantly different among clusters of respondents with differing levels of acceptance for the Northern Gateway Pipeline (Axsen, 2014), or for acceptance levels of nuclear power (Whitfield et al., 2009). Income is not associated with support for hydraulic fracturing, but higher education positively predicted support in one study (Boudet et al., 2014). In contrast, previous research on natural gas drilling in the United States shows the opposite effects of education, where higher education is associated with opposition to this type of development (Jacquet, 2012). Canadian polling results

suggest that individuals with higher incomes are more likely to perceive that oil and gas energy projects are important to Canada's economy, and that pipelines are the safest way to transport oil and that support for unconventional fossil fuel pipelines consistently rises with income (EKOS, 2016).

1.5. Conceptual framework and hypotheses

This project intends to improve citizen acceptance of unconventional fossil fuel developments using four research objectives. Each research objective has relevant hypotheses based on the relevant literature and public opinion polls reviewed. As already noted, the research objectives for this study are as follows:

1. Compare citizen acceptance for major energy types, including fossil fuels, renewables, and nuclear energy among regions in Canada;
2. Compare how citizen acceptance for conventional oil and unconventional fossil fuel developments varies by Canadian region;
3. Compare perceptions of costs and benefits of unconventional fossil fuel developments by Canadian region;
4. Explore factors that influence citizen acceptance of unconventional fossil fuel developments and conventional oil in Canada, including regional effects, values, environmental concern, trust, proximity, and socio-demographics.

Based on recent Canadian public opinion polls on unconventional fossil fuel development, my hypotheses for research objective 1 include the following:

- H1: Alberta will have high acceptance (defined here as greater than 50% support and less than 25% opposition) for all fossil fuel developments, except for hydraulic fracturing;
- H2: Renewable energy will have high acceptance (defined here as greater than 50% support and less than 25% opposition) across all Canadian regions.

Based on the distribution of benefits and costs of unconventional fossil fuel developments, and findings from public opinion polls and peer-reviewed research, my hypotheses for research objective 2 include the following:

- H3: Residents of Alberta will have higher levels of acceptance for conventional oil and unconventional fossil fuel developments relative to all other Canadian regions;
- H4: Residents of Quebec and British Columbia will have lower levels of acceptance for conventional oil and unconventional fossil fuel developments relative to all other Canadian regions;
- H5: Conventional oil will have higher levels of acceptance relative to unconventional fossil fuel development types;
- H6: Hydraulic fracturing will have lower levels of acceptance relative to other unconventional fossil fuel development types;
- H7: Citizens will have lower acceptance for pipelines that cross their province of residence, and higher acceptance for pipelines that cross provinces where they do not reside, in all regions except Alberta.

For research objective 3, I use insights from previous academic research, in addition to cues drawn from Canadian public opinion polling, to develop my hypotheses for regional perceptions of costs and benefits of fossil fuel projects. These include the following:

- H8: Residents of Alberta will have higher perceptions of benefits of conventional oil and unconventional fossil fuel developments;
- H9: Residents of Alberta will have lower perceptions of costs and risks of conventional oil and unconventional fossil fuel developments.

For research objective 4, I use insights from the literature reviewed to develop hypotheses for the effects of factors of citizen acceptance. My hypotheses include the following:

- H10: Biospheric and altruistic values will be associated with decreased acceptance of conventional oil and unconventional fossil fuel developments;
- H11 and H12: Egoistic and traditional values, respectively, will be associated with increased acceptance of conventional oil and unconventional fossil fuel developments;
- H13 and H14: Environmental concern and concern about climate change, respectively, will be associated with decreased acceptance of conventional oil and unconventional fossil fuel developments;
- H15, H16, and H17: Trust in federal regulatory agencies, provincial regulatory agencies, and oil and gas companies, respectively, will be associated with increased acceptance of conventional oil and unconventional fossil fuel developments;
- H18: Respondent proximity will be associated with increased acceptance of conventional oil and unconventional fossil fuel developments;
- H19: Older citizens will have increased acceptance for conventional oil and unconventional fossil fuel developments;
- H20: Female citizens will have decreased acceptance for conventional oil and unconventional fossil fuel developments;
- H21: Income will be positively associated with acceptance of conventional oil and unconventional fossil fuels;
- H22: Education will be positively associated with acceptance of conventional oil and unconventional fossil fuel developments.
- H23: Alberta will have higher levels of acceptance for conventional oil and unconventional fossil fuel developments, when compared to any other Canadian regions.

Chapter 2.

Methods

The survey used in this research, called the Canadian Energy Acceptance Survey, was designed and implemented in 2016 to address the research objectives outlined in Chapter 1. Questions unrelated to this study were also included in the survey to contribute to ongoing research by the Sustainable Transportation Action Research Team at Simon Fraser University. A full copy of the Canadian Energy Acceptance Survey can be found in the Appendix. In this chapter I describe the data collection, survey instrument, and data analysis.

2.1. Data collection

Leger Research Intelligence Group (Leger) was retained to program and implement the web-based Canadian Energy Acceptance Survey. Leger recruited respondents through their web-panel, which is made up of over 400,000 Canadian respondents across a range socio-demographic target groups such age, education, gender, and location. Leger first programmed the survey, and pre-tested the online survey in full with 83 respondents, to ensure that web-programming and the survey interface worked as expected. I then quality-checked the pre-test data by examining response times and checking for general consistency in responses. Leger subsequently translated the survey from English to French to allow sampling in all Canadian regions in either official language of Canada. The full survey collected data from June 24, 2016 to July 11, 2016. Leger sent 19,096 email invitations to the panel, which contained information about expected survey response times and incentives. Respondents were offered a reward of \$3.50 or 7 Air Miles to complete the survey, as well as being included in a prize draw in the month they completed the survey. Upon opening the invitation, respondents were provided information regarding the content and potential benefits of the survey, confidentiality risks, compensation, and researcher contact information. A consent agreement was provided in accordance with Simon Fraser University Ethics approvals.

Leger accepted 1493 completed surveys in total, which was then stratified into demographic groups which were intended to be closely representative of the Canadian population by region and socio-demographics, including age, sex, education and income. 86 survey responses were removed for quality control purposes, where total completion time was less than 40% of the median completion time of 28 minutes. The resulting final sample was 1407 Canadian citizens aged 19 and older. Representative samples were obtained from Saskatchewan (n=32), Manitoba (n=37), Ontario (n=407), Quebec (n=259), New Brunswick (n=23), Nova Scotia (n=30), Newfoundland (n=16), and Prince Edward Island (n=4). Over-representative sample sizes, higher than each province's relative proportion of the Canadian population, were intentionally collected from British Columbia (total sample n=294) and Alberta (total sample n=305) to allow for detailed comparison of these regions in future studies. No respondents from Yukon Territory, Northwest Territory, or Nunavut completed the survey.

Comparing the final sample with Statistics Canada population data shows that the age profile of the survey sample is closely representative of the Canadian population (Table 3). The survey sample is slightly skewed towards higher education levels than the Canadian population, and slightly under-representative of households with income below \$50,000 and above \$100,000, with 12.4% of the survey sample preferring not to disclose their income. British Columbia and Alberta samples over represent these regions compared to Statistics Canada regional population data. Region-based corrective weighting is applied to British Columbia and Alberta samples in any subsequent analysis examining Canada-wide acceptance.

Table 3: Representativeness of survey sample versus Canadian population statistics

	Survey Sample (%)	Statistics Canada Data (%)
Sex		
Male	49.7	49.0
Female	49.8	51.0
Prefer not to disclose	0.6	-
Age		
19-24	10.9	10.0
25-34	16.3	16.6
35-44	16.9	17.2
45-54	20.1	20.5
55-64	17.4	16.9
65-74	10.6	10.2
75+	7.8	8.6
Education		
Grade school or some high school	2.7	12.7
High school graduate	16.8	23.2
Some university/college	20.1	12
University/College graduate	49.0	42.7
Masters/Doctoral, or Professional Degree	11.4	9.4
Household income		
Less than \$49,999	33.6	40.8
\$50,000 to \$99,999	32.3	33.2
>\$100,000	21.7	25.9
Prefer not to disclose	12.4	-
Region		
BC (oversample)	20.9	13.1
Alberta (oversample)	21.7	11.7
Ontario	28.9	39
Quebec	18.4	23
Atlantic	5.2	7

2.2. Survey instrument

The survey questionnaire consisted of questions organized into eight sections, A through H. Respondents were presented sections B through F in random order to minimize potential bias from ordering:

- A. Electricity generation types
- B. Oil
- C. Pipelines
- D. Renewable energy
- E. Hydraulic fracturing
- F. Liquefied Natural Gas (*not relevant to the present study*)
- G. Values, views and activities
- H. Respondent details

In section A, respondents were provided a list of thirteen different ways to produce electricity, including renewable, fossil fuel, and nuclear generation types was provided, and asked about their support or opposition for these types of electricity generation:

- “Based on what you know, how much do you support or oppose the following ways that electricity can be made?” Responses ranged on a five-point scale from “strongly oppose” to “strongly support”, with an option for “I don’t know”.

In sections B through E, a short informational section with a descriptive photo was provided for each energy project or type of energy, consisting of neutrally-worded details related to the function, role, and expansion potential of each respective energy project or type of energy (Table 4; Appendix). The survey provided this information to ensure that respondents had a sufficient knowledge-base of the energy technology or project to provide meaningful responses.

Table 4: Informational text provided to respondents for fossil fuel developments

Conventional Crude Oil: Conventional crude oil is produced in British Columbia, Alberta, Saskatchewan, Manitoba, Yukon, and the Northwest Territories. Typically, conventional crude oil is accessed through drilling of deep underground wells. The term “conventional” means that oil from these wells flows freely to the surface, or can be raised to the surface using a mechanical pump. Accessing “conventional oil” does not require specialized processes, such as those used for “unconventional” sources like oil sands or shale oil.

Conventional crude oil accounts for roughly one third of the country’s current oil production. The Canadian Association of Petroleum Producers forecasts that conventional crude oil production rates will decrease over the next 15 years.

Oil Sands: The Canadian oil sands are large deposits of oil located mainly in northern Alberta. These deposits are found as a mixture of sand, clay, water and an extra-thick type of oil known as bitumen.

Oil sands deposits in Alberta lie underneath a land area about twice the size of New Brunswick (roughly 140,000 km²). A small portion of this area can be recovered using open-pit mining (3%). The remaining area has oil deposits that are recovered using procedures to heat the oil so that it can be pumped to the surface. Oil sands currently account for over half of Canada’s total oil production, and these deposits represent the vast majority (97%) of Canada’s remaining oil reserves (the total that can be potentially extracted in the future). The Canadian Association of Petroleum Producers forecasts that production from the oil sands will double over the next 15 years.

Northern Gateway Pipeline (Proposed): The Northern Gateway Pipeline Project is a proposed ‘twin’ pipeline from the Edmonton area (Alberta) to the northern coast of BC. The pipeline would have the capacity to transport large volumes of oil from Alberta’s oil sands to a marine shipping terminal for export (525,000 barrels per day; enough to fill roughly 33 Olympic-size swimming pools).

In 2014, the Federal Government (The National Energy Board) recommended approval for the Northern Gateway Pipeline application, subject to conditions and further consultation with communities along the planned route. Construction of the pipeline has not started.

Trans Mountain Pipeline (Proposed): The TransMountain Pipeline Project proposes to expand an oil sands pipeline system from the Edmonton area (Alberta) to Vancouver, British Columbia. The project is expected to triple the transportation capacity in the pipeline (from 300,000 barrels of crude oil per day to 890,000 barrels per day; enough to fill roughly 56 Olympic-size swimming pools). Oil would be collected at a marine terminal and exported.

In May 2016, The Federal Government (The National Energy Board) recommended approval for the TransMountain Pipeline application, subject to conditions and further consultation with communities along the planned route. Construction of the pipeline has not started.

Energy East Pipeline (Proposed): The Energy East Pipeline Project is a proposed crude oil pipeline from Hardisty, Alberta (near Edmonton) to Saint John, New Brunswick. The project proposes construction of new pipeline and repurposing of existing pipeline along the planned route. The proposed pipeline would have the capacity to transport large volumes of crude oil from Alberta’s oil sands to refineries and shipping terminals in eastern Canada (1,100,000 barrels per day; enough to fill roughly 70 Olympic-size swimming pools). Oil from this pipeline would be refined domestically or exported.

The Energy East Pipeline application is currently under review by the Federal Government (The National Energy Board). No decision date for approval or denial has been announced.

Sections B through F asked respondents about their support or opposition for continued development of conventional oil, continued development of oil sands, the three proposed pipelines (Northern Gateway, Trans Mountain, and Energy East), solar farms, wind farms, large hydro, and hydraulic fracturing:

- “Based on what you know, how much do you support or oppose development of [Energy Project/Type] in your province or territory.” Responses ranged on a five-point scale from “strongly oppose” to “strongly support”, with an option for “I don’t know”.

Sections B through F also asked respondents about their perceptions of costs, risks, and benefits of unconventional fossil fuel developments:

- “What effect do you think development of [Energy Project/Type] in your province or territory will have on the following?” Response categories included “My province or territory’s economic development”, “Canada’s economic development”, “Local environmental quality near [Energy Project/Type]”, “Health quality of residents near [Energy Project/Type]”, “Greenhouse gas (climate warming) emissions” and “Prices you pay for energy.” Responses ranged on a five-point scale from “greatly decrease” to “greatly increase”, with an option for “I don’t know”.

Section G respondents about their proximity to energy projects, trust in federal and provincial environmental agencies and energy companies, values, environmental concern, and climate change beliefs. Values were measured using 12 items from Stern et al.’s (1998) Brief Values Inventory. Three value statements were provided for each of the four orientations from Stern’s (1998) brief values inventory: egoistic, altruistic, traditional, and biospheric values. Environmental concern was measured using the New Ecological Paradigm (NEP) scale (Dunlap et al. 2000), where respondents were asked to indicate their agreement with eight statements related to perceptions of environmental conditions. General question structure and response categories for section G consisted of the following

- Proximity: “Are any of the following energy projects located within 50 km of your primary residence?” Response categories were “Yes, I live within 50km

of this existing or proposed project”, “No, I do not live within 50km of this existing or proposed project”, and “Unsure.”

- Trust: “In assessing the different energy projects mentioned in this survey, please indicate your level of trust in each of the following organizations?” Response categories included federal government environmental agencies, provincial government environmental agencies, and oil and gas companies. Responses ranged from “very low” to “very high” with an option for “I don’t know” included.
- Values (12 items): “Indicate how important each value is as a guiding principle in your life.” Response categories ranged from “not important” to “very important.”
- New Ecological Paradigm (example): “When humans interfere with nature, it often produces disastrous consequences.” Respondents were asked to indicate their agreement with eight statements on a scale from “strongly disagree” to “strongly agree, with an option for ‘undecided/neutral’”.

Lastly, socio-demographic information was collected in section H, including information on age, sex, education, and income (Appendix).

2.3. Data analysis

Three statistical methods were used to analyze the survey data: descriptive statistics, Analysis of Variance (ANOVA) with post-hoc Tukey tests, and multiple linear regression. All statistical analyses were completed using IBM SPSS Statistics Version 24.

First, I used descriptive statistics to address research objective 1, which compares citizen acceptance for fossil fuels, and renewable energy types, among regions in Canada. In this study, acceptance is defined as a general evaluation that conveys the extent to which people favour (or disfavour) an energy development, measured through stated support or opposition. To address this objective, I report percentage of respondents that oppose or support a wide variety of energy projects or types of energy, including rooftop solar, solar farms, wind farms, large hydroelectric

power, conventional oil, oil sands, Energy East, Northern Gateway, and Trans Mountain Pipelines, hydraulic fracturing, nuclear power, and coal power. Note that “neutral” and “I don’t know” responses are not reported in descriptive figures for research objective 1. I limit descriptive comparisons of acceptance to select regions: Canada-wide, British Columbia, Alberta, Ontario, Quebec, and Atlantic (which consists of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland). These regions were selected because they represent Canada’s most populous areas. Sample sizes in Saskatchewan (n=32) and Manitoba (n=37) were relatively small in comparison. British Columbia and Alberta samples are down-weighted as part of the Canada-wide analysis, to ensure that each of these oversamples remains representative as a proportion the Canadian population. For the purposes of research objective 1, I define high acceptance as greater than 50% support and less than 25% opposition, and low acceptance as greater than 50% opposition and less than 25% support.

Second, I conducted a one-way ANOVA with post-hoc Tukey tests to address research objectives 2 and 3. For both research objectives, a one-way ANOVA test was used determine whether there are statistically significant differences between the means of the following:

- British Columbia, Alberta, Ontario, and Quebec acceptance of each unconventional fossil fuel and conventional oil
- Unconventional fossil fuel and conventional oil acceptance within each province
- British Columbia, Alberta, Ontario, and Quebec perceptions of costs and benefits for each unconventional fossil fuel.

Post-hoc Tukey tests were used to indicate which individual means differed within the ANOVA, while ensuring that the overall significance level (alpha level) is maintained even though multiple tests are computed. Regions selected for these analyses are limited to British Columbia, Alberta, Ontario and Quebec, to ensure that Canada’s most populous regions are represented and to ensure that provinces with highest acceptance (Alberta) and lowest acceptance (Quebec) of unconventional fossil fuels are represented. Note that “neutral” and “I don’t know” responses are not reported in descriptive figures for research objectives 2 and 3.

Third, I used multiple linear regression to address research objective 4. I estimate a full regression model for each of the five unconventional fossil fuels and conventional oil. Each multiple regression model contains multiple independent variables that are hypothesized to influence acceptance of unconventional fossil fuels and conventional oil. Treatment of independent variables used in the regression are outlined in Table 5.

Table 5: Treatment of independent variables used in regression analysis

Independent Variable	Type of Variable	Explanation
Region		
British Columbia	Dummy	Reference case (0) = Alberta
Saskatchewan/Manitoba	Dummy	Reference case (0) = Alberta
Ontario	Dummy	Reference case (0) = Alberta
Quebec	Dummy	Reference case (0) = Alberta
Atlantic	Dummy	Reference case (0) = Alberta
Values		
Biospheric/altruistic	Continuous	Composite of 3 biospheric values, and 3 altruistic values statements. Each statement score ranged from 1 to 4, for a total possible sum of 24
Egoistic	Continuous	Composite of 3 egoistic values statements. Each statement score ranged from 1 to 4, for a total possible sum of 12
Traditional	Continuous	Composite of 3 traditional values statements. Each statement score ranged from 1 to 4, for a total possible sum of 12
Environmental Concern	Continuous	Composite of 8 statements from New Ecological Paradigm Scale. Responses coded from 1 (strongly disagree) to 5 (strongly agree), adjusted for reverse coding where applicable, with a total possible sum of 40
Climate concern	Continuous	Responses reverse coded 1 (yes climate change is a problem and immediate action is required) through 4 (climate change is not a problem and no action required), with "I don't know" grouped with response 4
Trust		
Federal Agency		Responses coded from -2 (very low), to +2 (very high), with "I don't know" = 0
Provincial Agency		Responses coded from -2 (very low), to +2 (very high), with "I don't know" = 0
Oil company		Responses coded from -2 (very low), to +2 (very high), with "I don't know" = 0
Proximity	Dummy	1= Yes, I live within 50km of the proposed or existing project
Socio-demographics		
Age	Continuous	Age transformed to mid-point of age range represented in each response category. 75 or older category transformed to 79.5
Sex	Nominal	Male = 1, Female = 2, prefer not to disclose responses (n=8) excluded from regression
Income	Continuous	Income transformed to mid-point of range represented in each response category. <\$10,000 response transformed to \$5000, and >\$150,000 transformed to \$162,500. Prefer not to disclose transformed to median value
Education	Dummy	Some graduate school or higher

Chapter 3.

Results

In this chapter, I present the key results of analysis related to the stated research objectives. First, I begin by comparing Canadian acceptance of fossil fuels and renewable energy. Second, I detail results related to acceptance of unconventional fossil fuels by Canadian region, and varying perceptions of costs and benefits of unconventional fossil fuels by Canadian region. Lastly, I detail the results of the multiple regression model, which explores the factors that influence acceptance of conventional oil and unconventional fossil fuel developments across Canada.

3.1. Comparing citizen acceptance of fossil fuels and renewable energy

Canada-wide and regional acceptance of fossil fuels and renewable energy are depicted in Figure 1. Examining unconventional fossil fuels, Canadian acceptance for oil sands and pipeline developments are similar, whereas hydraulic fracturing has lower acceptance in comparison to other unconventional developments. Canada-wide support for oil sands and pipeline developments ranges from 40% to 54%, and opposition ranges from 22% to 34%. In contrast, support for hydraulic fracturing is stated by 24% of Canadians, while 55% state opposition to it.

As expected from hypothesis 1, Alberta has high levels of acceptance (which I define as greater than 50% support and less than 25% opposition) for oil sands and pipeline development, with support ranging from 72% to 76% and opposition ranging from 9% to 14%. No other region shows high acceptance for oil sands or pipeline developments. Also, as I expected, hydraulic fracturing has 41% support and 37% opposition in Alberta—not falling into the “high” support category. All other regions have low acceptance (less than 25% support and greater than 50% opposition) of hydraulic fracturing.

Renewable energy and conventional oil have higher acceptance than unconventional fossil fuel developments, except in Alberta where unconventional fossil

fuel developments are evaluated similarly to these energy types. As expected from hypothesis 2, Canadians have high support for renewable energy. Canada-wide support for renewables ranges from 70% for large hydroelectric to 88% for rooftop solar. Canada-wide opposition to renewables is less than 11% in all cases. Conventional oil is the next most accepted energy type, with 54% support and 22% opposition among all Canadians—making it generally more acceptable than oil sands related development.

Nuclear power and coal power have less acceptance than oil sands and pipeline development, except for Ontario and Atlantic regions where nuclear is evaluated more favorably. Nuclear power is supported by 39% of Canadians and opposed by 38% of Canadians. Canada-wide acceptance for coal is the lowest among all energy development types, with 14% support and 59% opposition (Figure 1).

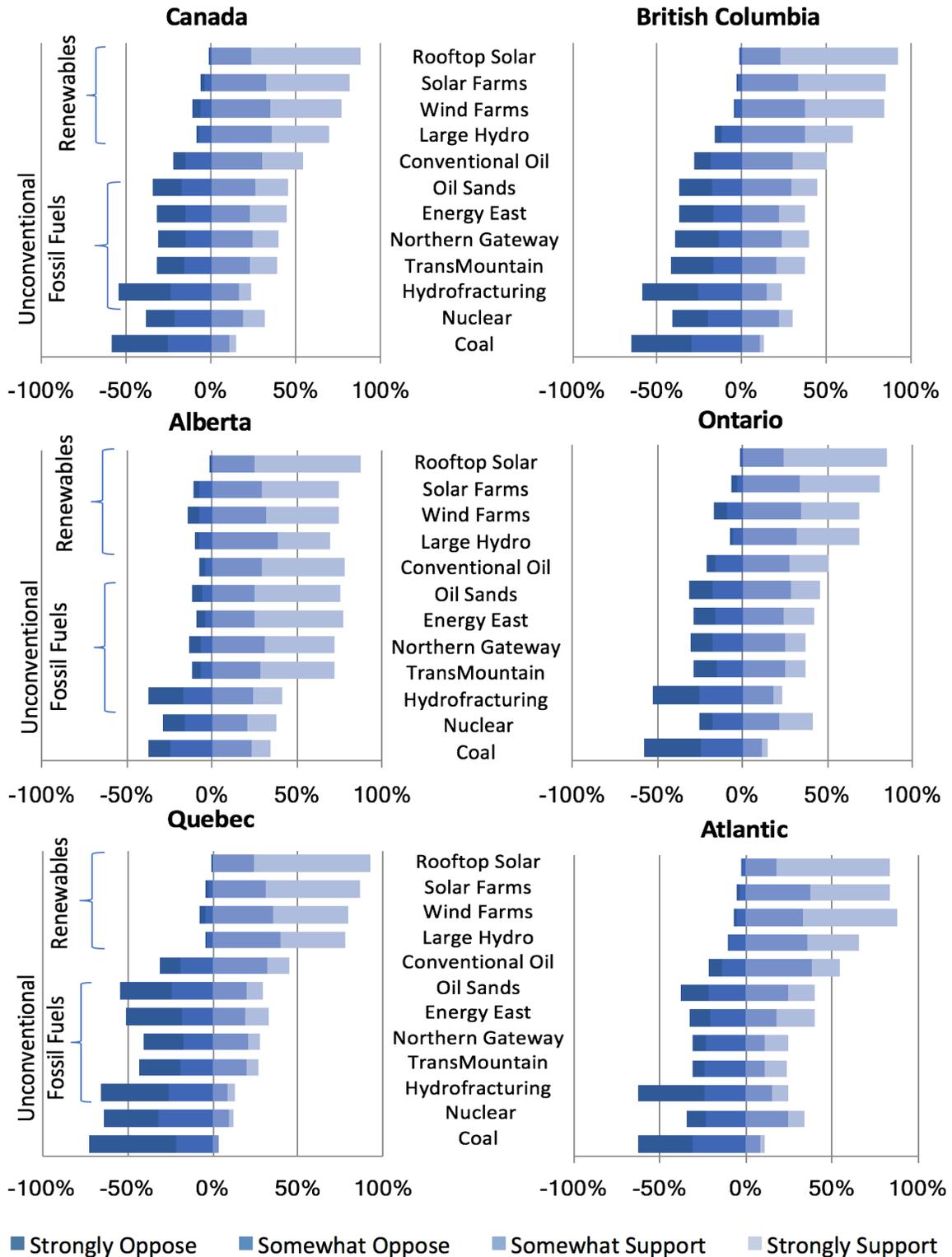


Figure 1: Regional comparison of fossil fuel and renewable energy acceptance (Canada, n=1158; British Columbia, n=294; Alberta, n=305; Ontario, n=407, Quebec, n=259; Atlantic, n=73).

3.2. Comparing regional acceptance of unconventional fossil fuels

To explore research objective 2 and related hypotheses, regional acceptance of Canadian unconventional fossil fuels and conventional oil are compared in Figures 2 and 3. To denote significant differences in mean acceptance levels, these figures use a “connecting letters” report, on the right-hand side of the figure. Any provinces denoted with the same letter, the “connecting letter”, are not significantly different from one another. Provinces that do not have a connecting letter are significantly different from one another. In some cases, letters overlap, where a region is not-significantly different than two or more other regions.

To illustrate, the top two columns of the histogram in Figure 2 show acceptance levels in Alberta and Ontario, respectively. Alberta is denoted with the letter ‘a’, and Ontario is denoted with the letter ‘b’. The different letters for each province show that mean acceptance levels in Alberta are significantly higher than those in Ontario. One row down, British Columbia is denoted with the letters ‘bc’. This shows that British Columbia has significantly lower acceptance than Alberta (letter ‘a’), but not significant different from Ontario (letter ‘b’), or Quebec (denoted below by the letter ‘c’).

Regional differences in acceptance are apparent across major Canadian regions (Figure 2). Alberta has significantly higher acceptance of all unconventional fossil fuels and conventional oil than all other regions, which is consistent with hypothesis 3. Quebec has the lowest levels of acceptance for all six fossil fuel development types, which is consistent with hypothesis 4. British Columbia has the next lowest acceptance levels for all six fossil fuel development types, where mean acceptance levels are not significantly different from Quebec in all cases except for oil sands. This finding is also mainly consistent with hypothesis 4.

Conventional oil and unconventional fossil fuels, except for oil sands, have the same patterns of significant differences across regions. This pattern shows that Alberta has the highest acceptance, followed by Ontario and British Columbia (which are not significantly different), followed by Quebec (which is not significantly different from British Columbia). For oil sands, Alberta has the highest acceptance, followed by Ontario and

British Columbia, which are not significantly different, followed by Quebec, which has significantly lower acceptance than all other regions (Figure 2).

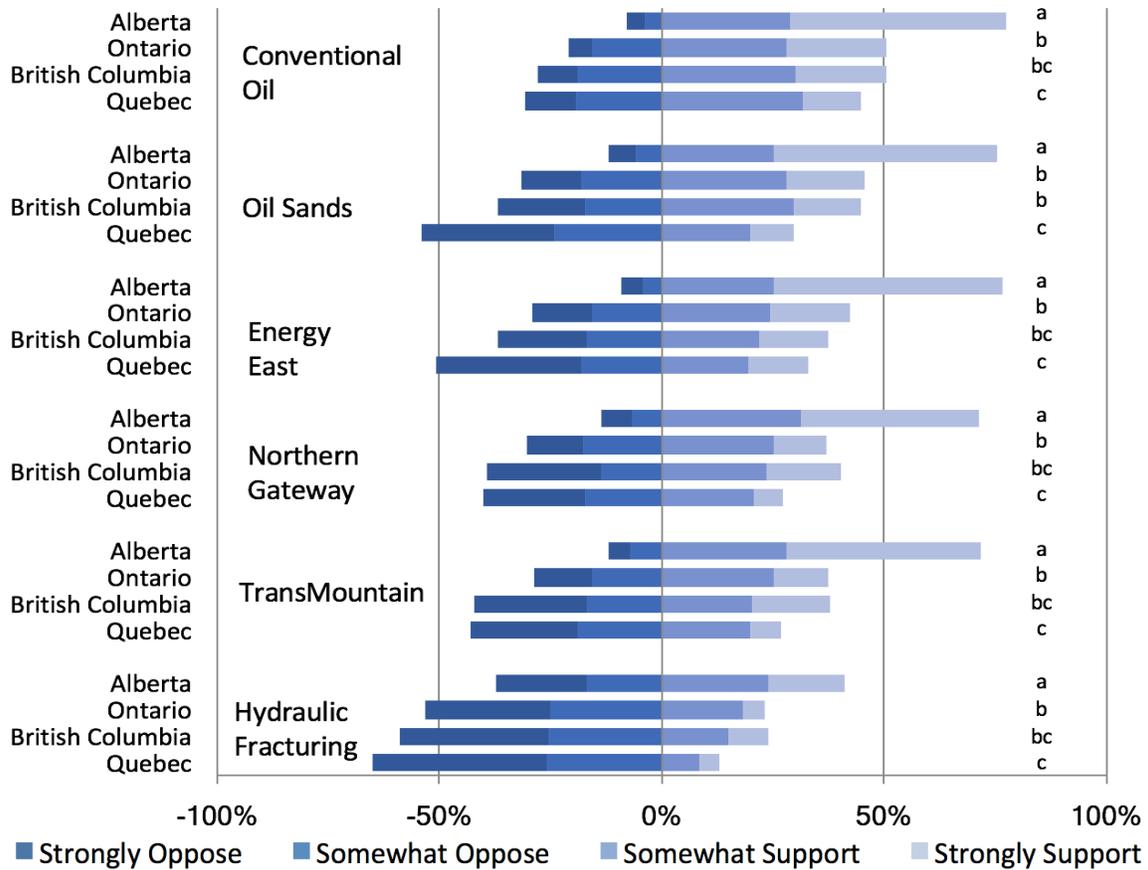


Figure 2: Comparison of unconventional fossil fuel development and conventional oil acceptance among Canadian Regions (British Columbia, n=294; Alberta, n=305; Ontario, n=407, Quebec, n=259; Atlantic=73). Connecting letters denote means that are not significantly different within each group (p<0.05, one-way ANOVA with Tukey post-hoc test).

Comparing acceptance for conventional oil and unconventional fossil fuels within each province shows that, apart from in Alberta, conventional oil has significantly higher acceptance than most or all (in the case of Quebec) of the unconventional fossil fuels (Figure 3). This finding aligns with expectations from hypothesis 5. Hydraulic fracturing has significantly lower acceptance than all other development types within every province, as expected from hypothesis 6. Contrary to expectations from hypothesis 7, acceptance levels for each of the three pipelines are not significantly different within any of the provinces. Another notable finding is that oil sands acceptance in all regions is not significantly different than any of the three pipelines (Figure 3).

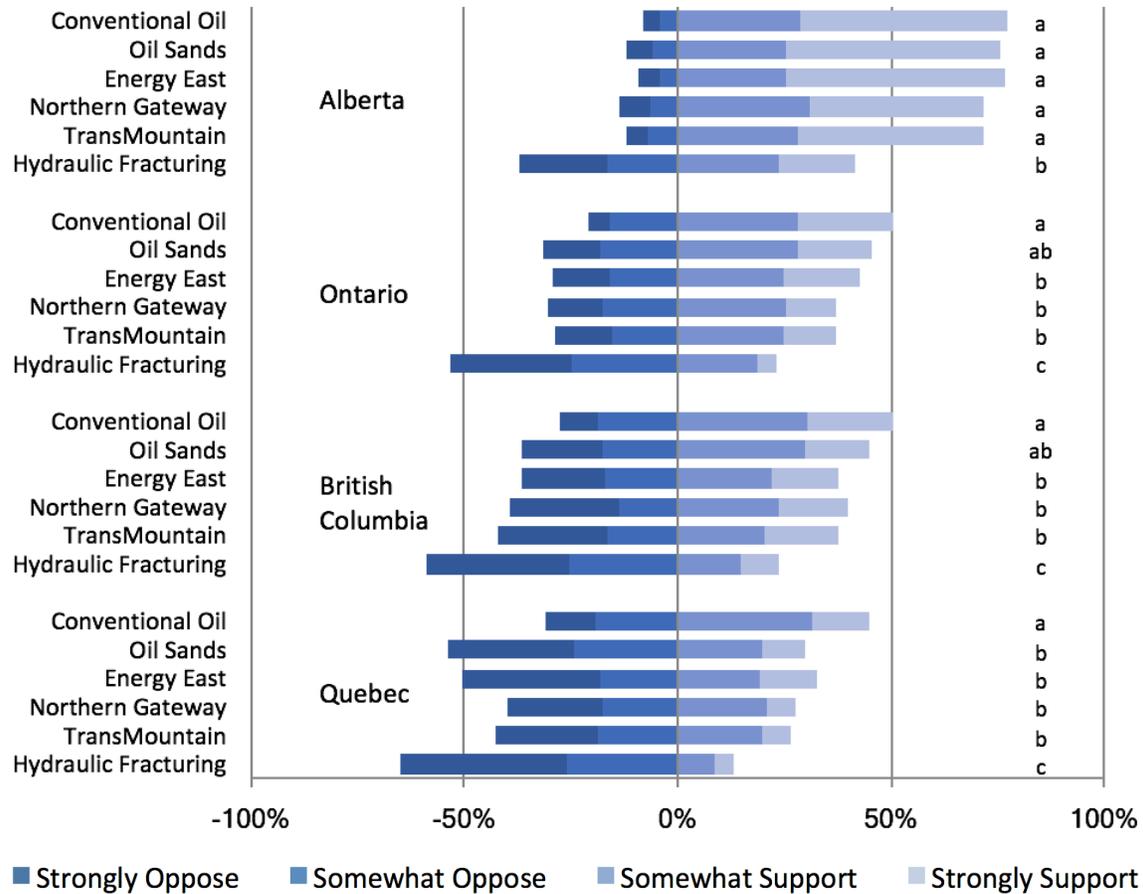


Figure 3: Comparison of unconventional fossil fuel development and conventional oil acceptance within Canadian regions (British Columbia, n=294; Alberta, n=305; Ontario, n=407, Quebec, n=259; Atlantic=73). Connecting letters denote means that are not significantly different within each group (p<0.05, one-way ANOVA with Tukey post-hoc test).

3.3. Regional comparison of perceptions of benefits, costs, and risks

Regional perceptions of benefits, costs, and risks of unconventional fossil fuel developments are compared in Figure 4. Citizens across Canadian regions see unconventional fossil fuel development as good for provincial and Canadian economies, with significantly higher perceptions of economic benefits being observed in Alberta as expected from hypothesis 8. For example, Alberta’s perceptions of unconventional fossil fuel developments benefitting the Canadian economy ranges from 65% for hydraulic fracturing to 84% for Energy East Pipeline. In all cases, Alberta’s perceptions of economic benefits are higher than all other regions. Perceptions about provincial

economic impacts vary by region. Outside of Alberta, the majority of respondents who think there is an impact on their provincial economy perceive those impacts to be a benefit. Examining pipelines specifically, respondents have significantly higher perception of provincial economic benefits where an oil sands pipeline crosses a respective jurisdiction. For example, 65% of British Columbians perceive provincial benefits from Northern Gateway and Trans Mountain Pipeline, but only 27% of British Columbians perceive provincial benefits from Energy East pipeline.

Also in alignment with hypotheses 8, respondents in Alberta are significantly more likely to believe that energy prices will decrease because of unconventional fossil fuel development. Between 24% and 35% of Albertan respondent believed that these developments would decrease energy prices. In all other regions, 23% of respondents or less believed unconventional fossil fuel developments would decrease energy prices. Across all regions, between 49% and 70% citizens indicated that they were either unsure, or believed unconventional fossil fuel developments had no effect on energy prices (Figure 4).

Many respondents believe that unconventional fossil fuel developments are bad for environmental quality (28% to 70%), bad for health quality of nearby residents (19% to 67%), and causing increases in greenhouse gas emissions (21% to 55%; Figure 4). Perceptions of environmental and health risks in Alberta are significantly less than other regions, which aligns with hypothesis 9. In Alberta, between 20% and 47% of respondents perceive decreases in environment and health quality across all development types. In comparison, between 41% and 70% of respondents in all other regions perceive decreases in environment and health quality across all developments. In almost all cases, Quebec had stronger perceptions of environment and health impacts than all other regions. Exceptions include where environmental impact perceptions were not different than British Columbia for hydraulic fracturing and Northern Gateway and Trans Mountain Pipelines. Perceptions of environment and health impacts in Ontario and British Columbia were not different for any of the unconventional fossil fuels (Figure 4).

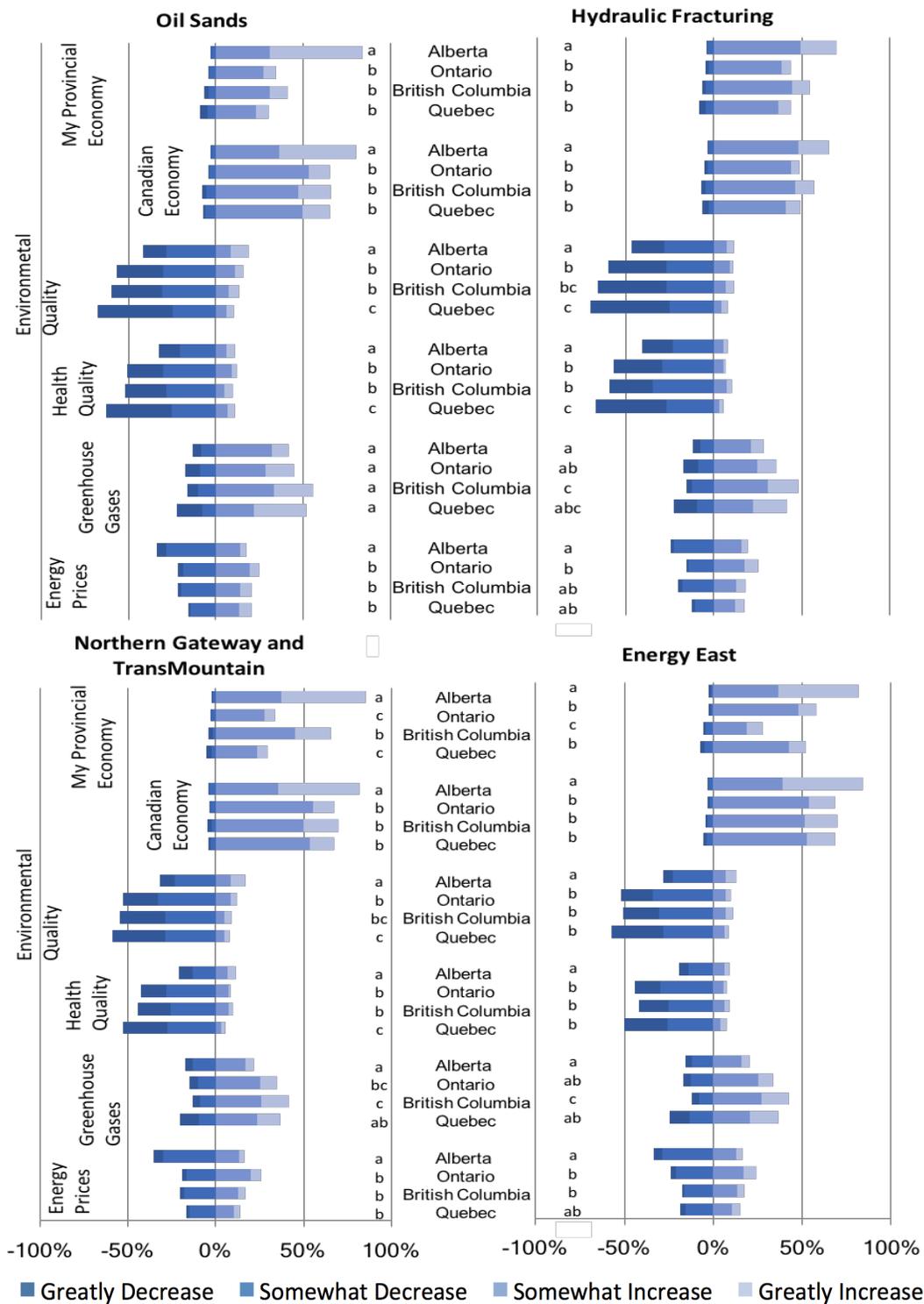


Figure 4: Regional comparison of perceptions of benefits and costs of unconventional fossil fuel developments (British Columbia, n=294; Alberta, n=305; Ontario, n=407, Quebec, n=259; Atlantic=73). Connecting letters denote means that are not significantly different within each group (p<0.05, one-way ANOVA with Tukey post-hoc test)

3.4. Factors of citizen acceptance

Research objective 4 is best assessed using a multiple regression model, which can isolate the relationships between energy project acceptance and a given factor, while controlling for others. Table 6 summarizes the hypothesized effects and findings. The regression model R-squares range from 0.384 for conventional oil to 0.476 for oil sands, indicating that the model explains about 38% to 48% of the variability in acceptance of conventional oil and unconventional fossil fuels—which is a fairly strong fit for social science analyses of survey data.

Biospheric and altruistic values have a significant negative effect on acceptance of all fossil fuel developments (confirming hypothesis 10; Table 6). Egoistic and traditional values have both a significant positive influence on acceptance of all unconventional fossil fuels, each with one exception (mostly confirming hypotheses 11 and 12). Egoistic values did not affect acceptance of conventional oil, and traditional values did not affect acceptance of hydraulic fracturing (Table 6).

Environmental concern and climate concern are both strong and consistent predictors of opposition to fossil fuel developments (confirming hypotheses 13 and 14; Table 6). Unexpectedly, trust in federal and provincial energy regulators has inconsistent impacts on acceptance, depending on the unconventional fossil fuel and project actor specified (not confirming hypotheses 15 and 16, respectively; Table 6). Specifically, trust in federal agencies had a significant positive effect only for Energy East and Northern Gateway pipeline, with non-significant effects for all other fossil fuel development types. Trust in provincial agencies had no significant influence on any of the fossil fuel developments (hypothesis 16). Trust in oil companies, however, is consistently a strong predictor of support for fossil fuel developments (confirming hypothesis 17; Table 6). Proximity to conventional oil or unconventional fossil fuels did not affect citizen acceptance of fossil fuel developments as expected (not confirming hypothesis 18; Table 6).

Examining socio-demographics, higher income and age are associated with higher acceptance of unconventional fossil fuels, with one exception, where age was not significantly associated with acceptance of hydraulic fracturing (mostly confirming hypotheses 19 and confirming hypotheses 21, respectively; Table 6). Female

respondents did not have stronger opposition to fossil fuel developments as expected (hypothesis 20), except for Trans Mountain and Energy East pipeline where female respondents showed stronger opposition (hypothesis 20). Education did not have a significant relationship with the acceptance of fossil fuel developments as expected (not confirming hypothesis 22), except for the case of oil sands development, where opposition was associated with higher education.

Alberta was expected to have significantly more acceptance than other Canadian regions, even when accounting for variability in the other factors thought to influence acceptance. The results here show that residing in Alberta still predicts significantly higher acceptance for fossil fuels developments (hypothesis 23), with the exceptions of hydraulic fracturing and conventional oil. For hydraulic fracturing, Quebec is the only region that is associated with significantly more opposition when compared to Alberta. All other regions show no significant regional difference from Alberta. The implication is that, once the factors in these regressions are controlled for, the regional differences in hydraulic fracturing acceptance are mostly eliminated. For conventional oil, Saskatchewan/Manitoba and Atlantic regions are not significantly different than Alberta (Table 6).

Table 6: Multiple regression analyses on factors that influence acceptance of fossil fuel developments in Canada (Beta coefficient reported, where asterisk indicates *p*-values significant at *0.1, **0.05, *0.01).**

Predictor Variable	Conv. Oil	Oil sands	Hydraulic fracturing	Northern Gateway	Trans Mountain	Energy East	Hypoth. Effect (hypothesis number)	Hypothesis supported
Values								
Biospheric/altruistic	-.068**	-.111***	-.101***	-.081***	-.068***	-.106***	- ⁽¹⁰⁾	Yes
Egoistic	.020	.082***	.084***	.105***	.075***	.064***	+ ⁽¹¹⁾	Yes (one exception)
Traditional	.062**	.101***	.033	.060**	.048*	.078***	+ ⁽¹²⁾	Yes (one exception)
Environmental Concern								
Environmental concern	-.160***	-.162***	-.229***	-.178***	-.193***	-.187***	- ⁽¹³⁾	Yes
Less climate concern	.099***	.116***	.086***	.113***	.075***	.048*	+ ⁽¹⁴⁾	Yes
Trust								
Federal Agency Trust	.017	.038	.032	.052	.064*	.106***	+ ⁽¹⁵⁾	No (two exceptions)
Provincial Agency Trust	-.006	-.035	-.022	.022	-.004	-.020	+ ⁽¹⁶⁾	No, no effect
Oil Company Trust	.274***	.361***	.336***	.307***	.325***	.289***	+ ⁽¹⁷⁾	Yes
Proximity								
	.006	-.006	-.023	-.006	.008	-.016	+ ⁽¹⁸⁾	No, no effect
Socio-demographics								
Age	.249***	.098***	-.028	.151***	.150***	.182***	+ ⁽¹⁹⁾	Yes (one exception)
Sex (female)	-.026	.017	-.015	.003	-.049**	-.086***	- ⁽²⁰⁾	No (two exceptions)
Income	.082***	.052**	.048**	.112***	.098***	.066***	+ ⁽²¹⁾	Yes
Education	-.015	-.059***	-.008	-.034	-.021	-.009	+ ⁽²²⁾	No effect (one exception)
Region (relative to Alberta)								
British Columbia	-.115***	-.127***	-.032	-.140***	-.180***	-.202***	- ⁽²³⁾	Yes (one exception)
Saskatchewan/Manitoba	-.019	-.055***	-.004	-.057***	-.078***	-.063***	- ⁽²³⁾	Yes (two exceptions)
Ontario	-.092***	-.113***	-.019	-.116***	-.137***	-.158***	- ⁽²³⁾	Yes (one exception)
Quebec	-.123***	-.193***	-.048*	-.138***	-.178***	-.237***	- ⁽²³⁾	Yes
Atlantic provinces	-.029	-.051**	-.001	-.037*	-.057***	-.054**	- ⁽²³⁾	Yes
Model R²	.384	.476	.382	.450	.462	.472		

Chapter 4.

Discussion

4.1. Main findings

This paper explores citizen acceptance of five prominent unconventional fossil fuel developments in Canada: oil sands, the Northern Gateway Pipeline, the Trans Mountain Pipeline, the Energy East Pipeline, and hydraulic fracturing. The research agenda of this study consists of four main research objectives. In this research, acceptance is defined as general evaluations that convey the extent to which people favour (or disfavor) energy developments (adapted from Perlaviciute and Steg, 2015). First, I compare Canadian acceptance of a wide-variety of energy developments, including fossil fuels, renewable energy, and nuclear energy among regions in Canada. Second, I compare regional acceptance for conventional oil and unconventional fossil fuel developments. Third, I compare perceptions of costs and benefits of unconventional fossil fuel developments by Canadian region. Last, I explore the factors that are expected to influence acceptance of unconventional fossil fuel and conventional oil development across Canada, including values, environmental concern, trust, proximity, socio-demographics, and regional effects.

Using a nationally representative survey of Canadian citizens, results of research objective 1 show that oil sands and pipeline developments tend to have lower acceptance than renewable energy and conventional oil, but more acceptance than nuclear and coal. An important distinction among unconventional energy development types is that oil sands and oil sands pipeline developments show very similar acceptance within all Canadian regions, while hydraulic fracturing is less accepted than these developments in each region. Looking across the spectrum of energy types, renewable energy and conventional oil have higher acceptance than oil sands related development, except in Alberta, where oil sands developments and renewables are evaluated similarly. Nuclear power and coal power have less acceptance than oil sands and pipeline development, except in Ontario and Atlantic-Canada where nuclear is evaluated more favorably. In aggregate, roughly half of Canadians support conventional oil and oil sands related development, and roughly a quarter of Canadians do not.

High acceptance of conventional oil and oil sands related development in Alberta was expected from the public opinion polls reviewed (Abacus 2016, Abacus, 2017). Low acceptance of hydraulic fracturing in all regions (defined as less than 25% support and greater than 50% opposition), was not specifically anticipated by reviewing the limited polling information available (Insights West, 2013), though I did expect that hydraulic fracturing acceptance would be lower in comparison to other unconventional fossil fuel developments. Low acceptance levels for hydraulic fracturing indicate citizen acceptance of this technology may be unique relative to the other unconventional fossil fuels studied. The results here do not provide significant insight into what attributes or impacts of hydraulic fracturing might make it less accepted. For example, patterns of cost and benefits perceptions for hydraulic fracturing found in research objective 3 follow roughly the same patterns as all other unconventional fossil fuels; that is, hydraulic fracturing is perceived by many citizens as generally good for the economy and bad for environment and health. Hydraulic fracturing also follows the same patterns as other unconventional fossil fuels in the multiple regression analysis (research objective 4), with three main differences. Traditional values, age, and regional effects (except for Quebec) are not associated with acceptance of hydraulic fracturing, as they are for other fossil fuel developments. It is not clear from the results of this study why these factors differ for hydraulic fracturing.

Compared to the other unconventional fossil fuels studied, one unique attribute of hydraulic fracturing is that it may be less understood by the public (Boudet et al., 2014), despite the efforts of the survey to provide sufficient information. Some studies suggest that experience and knowledge of an energy technology can influence acceptance (Huijts et al, 2012). In Canada, most hydraulic fracturing development has occurred in British Columbia and Alberta (Rivard et al., 2014), so I anticipate that these provinces would have relatively higher knowledge and experiences with the technology and associated developments. Whether these provinces have had predominantly positive or negative experience with the technology is an important differentiator (Huijts et al., 2012), which is likely to be specific to the developments found in each respective region. As a result, further studies on citizen acceptance of hydraulic fracturing which examine a broader range of potential impacts or reasons for differing perceptions may be merited.

Results from research objective 2 and 3 show that acceptance levels and perceptions of costs and benefits of fossil fuel developments are strongly varied among

Canadian regions. Acceptance for unconventional fossil fuel developments is consistently higher among respondents in Alberta (the province where most fossil fuel development occurs), who are more likely to perceive economic benefits and less likely to perceive environmental and social costs. Opposition tends to be higher in British Columbia and Quebec, where respondents perceived less economic benefits and stronger environment and health impacts when compared to Alberta. These findings were expected from the public opinion polls and literature reviewed (Abacus 2016, Abacus 2017, Axsen, 2012). Analysis of these perceptions suggest that the environment vs. economy dichotomy present in the media related to unconventional fossil fuels (Dusyk et al., 2018) also appears prominently in the findings of this study. The overall picture shows a country that has strong regional variation in its acceptance and perceptions of unconventional fossil fuels, especially in comparing Alberta with Quebec and British Columbia.

Contrary to my expectations, acceptance levels for oil sands pipelines are not different within any Canadian region, regardless of whether that pipeline crosses a respondent's home province. Oil sands acceptance levels are also not different from pipeline acceptance in any region. For pipelines, these findings suggest that acceptance of these projects may go beyond concerns that are associated only with one's home province, such as provincially relevant environmental spills or regional health impacts, for example. Citizen perceptions of costs and risks findings also support this assertion, where respondents have similar perceptions of environmental and health impacts of all pipelines, regardless of location. If respondents were prioritizing more localized or provincial impacts when considering their acceptance, I would expect heightened perceptions of costs and risks for nearby projects leading to differing levels of acceptance. Results of this study suggest that this is not the case. The findings here suggest that people may be forming opinions about oil sands pipelines that may prioritize broader national or globally related concerns.

Results from research objective 4 are useful in developing an understanding of factors that are associated with support and opposition of unconventional fossil fuel developments. Here, regression analyses indicate similar patterns of fossil fuel development acceptance across the full sample: biospheric and altruistic values and environmental concern predict higher acceptance, and egoistic and traditional values and trust in oil and gas companies predict lower acceptance. Residing in Alberta, older

age, and higher income also tends to predict higher acceptance. Inconsistent or no effect on acceptance were found for proximity, trust in provincial or federal regulatory agencies, sex, or education level.

The effect of values on acceptance of fossil fuel developments aligns with prior research (Axsen, 2014). Conventional oil and hydraulic fracturing, however, each have one exception, showing non-significant relationships with egoistic and traditional values, respectively. The difference between conventional oil and unconventional fossil fuels might be explained by unconventional fossil fuels being linked more strongly associated with egoistic values, possibly due to the consistent portrayal of economic growth associated with these resources in the media (Dusyk, 2016). In contrast, conventional oil benefits might have weaker ties to the egoistic value orientation, possibly with less strong perceptions of ties to wealth and economic growth. Considering the lack of association between traditional values and hydraulic fracturing acceptance, hydraulic fracturing might be viewed as a nascent, poorly understood technology. This perception could explain the lack of association with traditional values, which are grounded in conformity and norms (Boudet et al., 2014; Schwartz, 1994). These findings further support the broader body of evidence suggesting that values have a particularly strong influence on acceptance of energy projects (Perlaviciute and Steg, 2015).

Environmental concern and belief in climate change and climate action are consistent predictors of opposition to conventional oil and unconventional fossil fuels, as expected from the literature reviewed (Axsen, 2014; Culley et al., Spence et al., 2010). Trust in oil companies was a strong and consistent predictor of support for unconventional fossil fuels, which also aligned with literature suggesting that project proponent trust conferred more support for energy developments (Aas et al., 2014; Brasier et al, 2013). Trust in both provincial and federal regulators, however, did not have a consistent significant influence on increasing acceptance of unconventional fossil fuel projects, which was unexpected from the literature reviewed (Kim et al., 2014; Whitfield et al., 2009). One potential explanation for these findings is that the question used on the survey to ask about trust in regulators may have been too general. The question was phrased "*in assessing projects mentioned in the survey...*", which might have lacked sufficient cues for respondents to answer meaningfully about unconventional fossil fuel developments. Future research on the association of

acceptance of these developments and trust of regulators would be helpful to clarify and strengthen the evidence for or against these potential associations.

In contrast to prior unconventional fossil fuel studies (Boudet et. al, 2016, Gravelle and Lachapelle, 2015), proximity results from this study did not show that respondents are more or less supportive of nearby projects. This could be due to, as suggested from research objective 3 results, respondents viewing unconventional fossil fuels from a predominantly national or global lens. Another possibility for this difference could be methodological choices of this study, for example, respondent having difficulty answering the question “Are any of the following energy projects located within 50 km of your primary residence?” This survey question would be challenging to answer if respondents could not recall each development type based on information provided, or if respondents did not have relatively accurate awareness of their home’s proximity to these developments.

When accounting for variability from all the above factors, Albertan respondents have significantly higher acceptance compared to other regions in most cases. These findings aligned with the polls and literature reviewed (Abacus, 2016, Abacus, 2017; EKOS, 2016; Axsen 2014). Hydraulic fracturing and conventional oil were the exceptions for this variable. Results here suggest that for most unconventional fossil fuels (aside from hydraulic fracturing), there is likely a combination of factors that are somehow associated with a respondent’s province of residence, which are not accounted for in the regression model. The theoretical lens of this work was founded in contextual and psychological factors identified in previous energy acceptance research (e.g. Perlaviciute and Steg, 2014; Huijts et al., 2012), but the model used did not explain all the variability in acceptance (nor was is expected to). Future research could approach unconventional fossil fuel acceptance studies using alternative theoretical lenses, to attempt to develop empirical support for additional factors or theoretical approaches that could help to discern the potential causes of the noted regional effects.

4.2. Limitations and further research

There are several limitations of this study related to the sampling methodology and the scope of the research objectives. Regarding sampling methodology, using an internet survey administered by a market research firm limits the sampling to those with

respondents with access to and knowledge of computers, as well as those respondents who are registered to participate in Leger Marketing surveys. Leger's use of multiple methods for respondent recruitment and routine quality control checks, however, is likely to partially mitigate the bias from targeting only those with internet access. Additionally, the present study only measures acceptance in one way, using stated support or opposition to a survey question. Prior research suggests that this type of measurement does not fully represent all facets of an individual's overall acceptance for an energy project (e.g. Batel et al., 2013; Upham et al., 2015). The objectives of this study were reasonably addressed using the chosen definition of acceptance, though further research could construct a survey instrument to assess a more disaggregated or nuanced view of acceptance, if these measures aligned with research interests.

With respect to the scope of the research objectives chosen, the literature indicates additional factors which were not included in the scope of this study which may influence citizen acceptance of energy developments, such as pre-existing knowledge and experience, perceptions of procedural and distributive fairness, affective imagery and "top-of-mind" associations, behavioral control, personal and social norms, and place-attachment and place-identity (Huijts et al. 2012; Perlaviciute and Steg, 2014). Though comprehensive models have helped to advance the body of knowledge about energy acceptance, testing a comprehensive framework was not the explicit intention of this research. The factors examined here contribute meaningfully to the broader base of knowledge on energy acceptance. Lastly, the results of this study generalize Canada-wide and provincial acceptance of energy development, yet due to sampling restrictions, representative samples were not collected from Canadian territories.

Further research could examine and clarify elements of this study in greater detail, such as further multiple regression analysis or use of different theoretical approaches to explore what makes hydraulic fracturing unique among unconventional fossil fuels, qualitative research studies to help determine why trust in regulators does not influence acceptance, or investigation into how proximity affects acceptance of unconventional fossil fuels in Canada using novel methods (e.g. like Gravelle and Lachapelle, 2015). Additionally, further studies could explore elements of acceptance not captured by stated support or opposition, such as stated intention to act or reported behaviors (e.g. signing petitions, attending meetings, protesting) to help predict which

unconventional fossil fuel projects may face relatively more active forms of support or opposition.

4.3. Conclusions and policy implications

This study provided a unique assessment of citizen acceptance of unconventional fossil fuels in Canada, which had not previously been studied in aggregate, providing further insight to the growing body of literature on public acceptance of energy developments. Findings of this study show the relative acceptance of unconventional fossil fuels in the broader context of major energy types in Canada, and show the regional differences acceptance for unconventional fossil fuels that exist across the country. Additionally, this study improves understanding of key factors that predict support or opposition for unconventional fossil fuels.

Energy planners and policy-makers in Canada have the challenge of developing energy projects despite regional barriers of and low citizen acceptance that may exist for any particular project. Development of oil sands pipelines represents a somewhat unique challenge in comparison to other unconventional fossil fuels. For example, development of regionally-placed resources such as oil sands, or oil and gas using hydraulic fracturing, are approved and regulated by the respective province of origin (AER, 2017) where provincial divides are likely to be a less relevant concern. In contrast, development of pipelines that cross provincial boundaries are a matter of federal jurisdiction, regulated by Canada's National Energy Board who makes decisions on these projects in the face of many competing provincial interests. Kinder Morgan's Trans Mountain pipeline, for instance, is federally approved yet faces continued strong controversy in British Columbia and other regions in Canada. Results of this study and prior work suggest that strong regional divides for unconventional fossil fuels developments will continue to exist into the future. Those with an interest in energy development should anticipate dealing with the potential consequences of continued public controversy and regional division.

Results from this project also suggest that perceptions of costs and benefits vary significantly across Canadian regions, so efforts to change the real or perceived benefits and risks of pipeline projects could potentially influence levels of acceptance in a region of interest (Perlaviciute and Steg, 2014). One possible suggestion is that economic

benefits of pipelines could be distributed in higher proportions to those bearing the risks of these types of projects, through benefit-sharing or similar types of agreements in provinces in which pipelines cross or terminate. Alternatively, efforts could be made to develop and disseminate information on risk mitigation measures in provinces that show high perceptions of risks, such as marine oil spill risk and mitigation in British Columbia, for example. Those with a stake in energy development, however, would benefit from recognizing the values that confer support or opposition to unconventional fossil fuel projects, and how these interact with citizen perceptions of costs and benefits. For example, increasing economic incentives may be less likely to have an impact on those with biospheric and altruistic values, who tend to prioritize well-being of others and environment (Perlaviciute and Steg, 2015). People with stronger biospheric and altruistic values are likely to be more influenced by actions or messaging related to environmental risk mitigation or well-being of Canadians across the country, for example. Those with egoistic values are likely to be more influenced by actions or messaging related to individual well-being, such as boosting local wealth or economic opportunities (Perlaviciute and Steg, 2015).

As controversy over unconventional fossil fuels and other new energy development continues to unfold, policy-makers can expect that decisions made about the future of energy development in the country may need to increasingly reflect the broader acceptance of Canadian citizens, especially where projects have meaningful impacts across multiple Canadian regions. Most Canadians, however, are not opposed to all types of energy development. Findings of this study could help to guide more nuanced national discussion on energy development, one which considers citizen acceptance as part of the broader context of overall acceptance, based elements of Wustenhagen's (2007) framework. Projects that have broader acceptance of citizens, in addition to support of other market, socio-political, and community elements of acceptance, are likely to have the greatest chance for success in the complex and multifaceted realm of energy development.

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Appendix: Survey Instrument

PUBLIC CONSENT FORM

Title of Study: Social Acceptance of Unconventional Fossil Fuels

Welcome to our **Canadian Energy Survey**. This study is being conducted by researchers at Simon Fraser University and is funded by the Social Science and Humanities Research Council of Canada. On the following pages we will provide information about the survey and ask you to review our participant consent form. This consent form outlines your rights as a participant in the survey.

STUDY TEAM

The survey is being conducted by Todd Brunner, Master's candidate, under supervision of the principal investigator Dr. Jonn Axsen at the School of Resource and Environmental Management, Simon Fraser University, Burnaby, B.C. Any questions concerning the nature or purpose of this survey prior to your participation can be directed to the contact listed below. This study will be used as part of a Master's degree project, which will be publicly available through the Simon Fraser University library.

Todd Brunner: [...]

Participating in this research is your choice and is voluntary. If you decide to take part, you can change your mind at any time and leave the study at any time. Refusal to participate or withdrawal/dropout after agreeing to participate will not have an adverse effect or consequences on participants.

ABOUT THIS RESEARCH

This research is aimed at learning more about Canadians' awareness, opinions and behaviours related to the ways that we produce electricity and develop energy projects throughout the country. Your participation will help inform the academic community, social researchers, and policymakers.

The survey will take about **thirty minutes** to complete and includes questions on the following:

- A. Your overall thoughts on energy
- B. Your opinions on oil
- C. Your opinions on renewable and nuclear energy
- D. Your opinions on natural gas
- E. Your values and perspectives
- F. Your personal details

Please DO NOT use your internet browser's "Back" button during the survey - it may impact the accuracy of your responses and you will have to restart the section you were working on. Simply answer each question to the best of your ability and continue with the rest of the survey.

If you quit the survey before it is complete, you will have to start over when you return. There is no time limit for completing the survey so you can take a break at any time; however, just make sure that you keep your browser open and DO NOT CLOSE the survey.

CONFIDENTIALITY AND RISKS

You have the right to know about the procedures and risks of the research study. There is minimal risk to participating in this study. Our study is designed to keep your personal information confidential. You will be assigned a participant number, so your name and contact information will not be associated with your responses. A breach of confidentiality is unlikely, but in the case that such a breach occurs, it would be extremely difficult to match your information with your data. Data from this survey will be stored on password-protected servers for five years at Simon Fraser University. Your responses will be analyzed in aggregate; you will not be identifiable in the results we release. We do not believe that the data we collect from you during this survey will put you at any risk. Please note that Internet is not considered to be a confidential medium for information exchange.

COMPENSATION

For your participation, you will be compensated with \$ 3.50 or 7 Air Miles

STUDY RESULTS

The results of this study will be reported in a graduate project available through the Simon Fraser University library and may also be published in journal articles, books and media outlets.

QUESTIONS ABOUT THE STUDY?

Any questions about this survey can be directed to Todd Brunner at [...]

Concerns or complaints may also be directed to Dr. Jeff Toward, Director of the Office of Research Ethics at Simon Fraser University, at [...] or [...].

For your reference, the file number for this study is: 2016s0063

AGREEMENT

1. I agree to be surveyed for the purposes of the project named above.
2. The purpose and nature of the survey have been explained to me.
3. I have had a chance to ask questions concerning the purpose and nature of the survey, the project, and, where applicable, my questions have been answered to my satisfaction.
4. I understand that taking part in this study is entirely voluntary. It is my right to decline to answer any questions and to choose not to complete the survey.
5. I understand that there are minimal risks associated with my participation in this survey.
6. My name will not be used in the project; rather, a number will be used to identify all respondents. The use of a secure and encrypted web server will increase confidentiality of my identity.
7. I understand that I can obtain the study results in the form of a public report and academic paper from Todd Brunner (via email tbrunner@sfu.ca).

I HAVE READ THIS CONSENT FORM. I HAVE HAD A CHANCE TO ASK QUESTIONS CONCERNING ANY AREAS THAT I DID NOT UNDERSTAND. BY CLICKING THE "I AGREE TO ALL THE ABOVE TERMS" BUTTON, I AM CONSENTING TO PARTICIPATE IN THIS STUDY.

I AGREE TO ALL THE TERMS ABOVE

I DO NOT AGREE TO THESE TERMS*

By not agreeing to all the terms above you have indicated that you do not want to proceed with the survey. Is this correct?

- Yes
- No

Thank you for your interest in the survey. Your session will now be terminated.

Section A: Energy Technologies

In the first section of the survey, we would like to learn more about your opinions related to the ways that we generate electricity in Canada.

1. What is your **primary** province/territory of residence?

<input type="radio"/>	Alberta
<input type="radio"/>	British Columbia
<input type="radio"/>	Saskatchewan
<input type="radio"/>	Manitoba
<input type="radio"/>	Ontario
<input type="radio"/>	Quebec
<input type="radio"/>	New Brunswick
<input type="radio"/>	Nova Scotia
<input type="radio"/>	Prince Edward Island
<input type="radio"/>	Newfoundland and Labrador
<input type="radio"/>	Yukon
<input type="radio"/>	Northwest Territories
<input type="radio"/>	Nunavut
<input type="radio"/>	Outside of Canada

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2. Which of the following do you think is the **single most important issue** facing Canada today?

<input type="radio"/>	Health care
<input type="radio"/>	Climate change (global warming)
<input type="radio"/>	Government spending
<input type="radio"/>	Crime
<input type="radio"/>	Education
<input type="radio"/>	Seniors issues and needs
<input type="radio"/>	Aboriginal rights
<input type="radio"/>	Taxes
<input type="radio"/>	Environmental issues (air and water quality, biodiversity loss, etc.)
<input type="radio"/>	Energy security
<input type="radio"/>	Jobs and the economy

----- END OF PAGE -----

3. How **familiar** are you with the following ways that electricity can be made?

	Not at all familiar	A little familiar	Moderately familiar	Very familiar
Wind power (from wind farms)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wave power	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Not at all familiar	A little familiar	Moderately familiar	Very familiar
Solar power (from solar farms)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nuclear power	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Natural gas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Solar power (from rooftop solar panels)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tidal power	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coal power	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Run-of-river hydroelectric power	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Large hydroelectric power (hydroelectric dams)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Geothermal energy (<i>capturing heat from below the Earth's surface</i>).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Biomass (<i>burning fast-growing, non-food plants for energy</i>).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Diesel generation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

4. Based on what you know, **how much do you support or oppose** the following ways that electricity can be made?

It is okay if you are not familiar with any of the terms used below; simply select "I don't know".

	Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
Wind power (from wind farms)	<input type="radio"/>					
Wave power	<input type="radio"/>					
Solar power (from solar farms)	<input type="radio"/>					
Nuclear power	<input type="radio"/>					
Natural gas	<input type="radio"/>					
Solar power (from rooftop solar panels)	<input type="radio"/>					
Tidal power	<input type="radio"/>					
Coal power	<input type="radio"/>					
Run-of-river hydroelectric power	<input type="radio"/>					
Large hydroelectric power (hydroelectric dams)	<input type="radio"/>					
Geothermal	<input type="radio"/>					

	Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
energy (<i>capturing heat from below the Earth's surface</i>).						
Biomass (<i>burning fast-growing, non-food plants for energy</i>).	<input type="radio"/>					
Diesel generation	<input type="radio"/>					

----- END OF PAGE -----

In the following sections, we would like to ask some more questions about your views on several specific types of energy, including fossil fuels, nuclear energy and renewable forms of energy.

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Section B: Oil

In this section, we would like to learn more about your opinions related to different types of oil production in Canada.

5. How **familiar** are you with the following types of oil production in Canada?

	Not at all familiar	A little familiar	Moderately familiar	Very familiar
Conventional crude oil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Oil sands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Offshore oil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

The next few questions will ask your opinion on three types of oil production: conventional crude oil, oil sands, and offshore oil.

Before answering these, please read the following information about conventional crude oil in Canada.

Conventional Crude Oil

Conventional crude oil is produced in British Columbia, Alberta, Saskatchewan, Manitoba, Yukon, and the Northwest Territories. Typically, conventional crude oil is accessed through drilling of deep underground wells. The term “conventional” means that oil from these wells flows freely to the surface, or can be raised to the surface using a mechanical pump.

Accessing “conventional oil” does not require specialized processes, such as those used for “unconventional” sources like oil sands or shale oil.

Conventional crude oil accounts for roughly one third of the country's current oil production. The Canadian Association of Petroleum Producers forecasts that conventional crude oil production rates will decrease over the next 15 years.



Figure: Canada's main region of conventional crude oil production (adapted from E Pluribus Anthony / Wikimedia Commons / Public Domain; retrieved from https://en.wikipedia.org/wiki/File:Political_map_of_Canada.png)

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6. Based on what you know, **how much do you support or oppose continued development of conventional crude oil projects in Canada?**

Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
<input type="radio"/>					

----- END OF PAGE -----

Before answering the next question, please read the following information about offshore oil in Eastern Canada.

Eastern Canadian Offshore Oil

Offshore oil drilling allows companies to access oil that is buried deep under the ocean floor. Offshore oil projects in Eastern Canada are mainly located off the coast of Newfoundland and Labrador.

Offshore oil from Eastern Canada currently accounts for a small percentage (6%) of Canada's total oil production. The Canadian Association of Petroleum Producers forecasts that Eastern offshore oil production will decrease by over half of its current rate in the next 15 years. Oil and gas companies are currently considering new projects off the west coast of Newfoundland and east coast of Nova Scotia.

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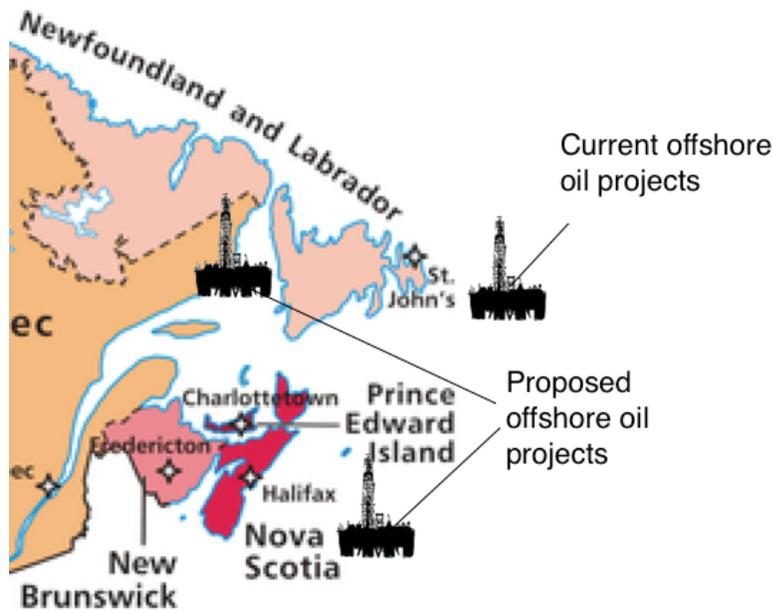


Figure: Current and proposed Eastern Canadian offshore oil projects (adapted from E Pluribus Anthony / Wikimedia Commons / Public Domain; retrieved from https://en.wikipedia.org/wiki/File:Political_map_of_Canada.png)

7. Based on what you know, **how much do you support or oppose continued offshore oil development** in Eastern Canada?

Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
<input type="radio"/>					

----- END OF PAGE -----

Before answering the next question, please read the following information about offshore oil in the Canadian Arctic.

Arctic Offshore Oil

The Canadian Arctic region, off the coast of the Northwest Territories near Inuvik, also has offshore oil and gas deposits. Some exploration in the Arctic occurred in the 1970's and 1980's, but oil and gas production was very limited at this time. Oil and gas companies have recently considered new drilling in the Arctic. To date, this exploration has not occurred.



Figure: Canadian Arctic offshore oil deposits (adapted from E Pluribus Anthony / Wikimedia Commons / Public Domain; retrieved from https://en.wikipedia.org/wiki/File:Political_map_of_Canada.png)

----- END OF PAGE -----

8. Based on what you know, **how much do you support or oppose exploring for offshore oil** in the Canadian Arctic?

Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
<input type="radio"/>					

----- END OF PAGE -----

Before answering the next question, please read the following information about offshore on Canada's west coast.

Western Canadian Offshore Oil

Offshore oil and gas deposits also exist off the west coast of British Columbia. Exploration for oil in this region was considered in the past, but has been prohibited by the federal government since 1972.



Figure: British Columbia offshore oil deposits (adapted from E Pluribus Anthony / Wikimedia Commons / Public Domain; retrieved from https://en.wikipedia.org/wiki/File:Political_map_of_Canada.png)

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9. Based on what you know, **how much do you support or oppose offshore oil exploration** off the coast of British Columbia?

Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
<input type="radio"/>					

----- END OF PAGE -----

Before answering the next questions, please read the following information about oil sands development in Canada.

Oil Sands

The Canadian oil sands are large deposits of oil located mainly in northern Alberta. These deposits are found as a mixture of sand, clay, water and an extra-thick type of oil known as bitumen.

Oil sands deposits in Alberta lie underneath a land area about twice the size of New Brunswick (roughly 140,000 km²). A small portion of this area can be recovered using open-pit mining (3%). The remaining area has oil deposits that are recovered using procedures to heat the oil so that it can be pumped to the surface.

Oil sands currently account for over half of Canada's total oil production, and these deposits represent the vast majority (97%) of Canada's remaining oil reserves (the total that can be

potentially extracted in the future). The Canadian Association of Petroleum Producers forecasts that production from the oil sands will double over the next 15 years.



Figure: Canadian oil sands regions (adapted from E Pluribus Anthony / Wikimedia Commons / Public Domain; retrieved from https://en.wikipedia.org/wiki/File:Political_map_of_Canada.png)

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10. Based on what you know, **how much do you support or oppose continued development of the oil sands** in Canada?

Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
<input type="radio"/>					

----- END OF PAGE -----

11. [LOGIC] You have indicated that you have not made up your mind on continued development of the oil sands. Even though you may be unsure or have a neutral opinion, **which way are you leaning?**

To oppose continued development of oil sands	To support continued development of oil sands
<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

12. [LOGIC] How likely are you to take the following actions to **support continued development of the oil sands?**

If you have already taken this action, please select “I have already done this.”

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter supporting oil sands development	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

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13. [LOGIC] How likely are you to take the following actions to **oppose continued development of the oil sands?**

If you have already taken this action, please select “I have already done this.”

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter opposing oil sands development	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

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14. Which of the following statements is closest to your opinion on the **future of the oil sands?**

<input type="radio"/>	Canada should expand the oil sands.
<input type="radio"/>	Canada should keep the oil sands about the same size .
<input type="radio"/>	Canada should decrease activity in the oil sands.
<input type="radio"/>	Canada should shut down the oil sands.
<input type="radio"/>	I don't know.

----- END OF PAGE -----

15. What effect do you think **continued development of the oil sands** will have on the following:

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know
Job creation	<input type="radio"/>					
My province's economic development	<input type="radio"/>					
Canada's economic development	<input type="radio"/>					
Local environmental quality near the pipelines	<input type="radio"/>					
Health quality of residents near the pipelines	<input type="radio"/>					
Greenhouse gas (climate warming) emissions	<input type="radio"/>					
Prices you pay for energy	<input type="radio"/>					

----- END OF PAGE -----

Section C: Pipelines

There are currently several proposals to construct pipelines in Canada, which would transport oil across certain parts of the country. In this section, we would like to get your opinion on some of these pipeline proposals.

16. How **familiar** are you with the following pipelines that are proposed to transport oil in Canada?

	Not at all familiar	A little familiar	Moderately familiar	Very familiar
Northern Gateway	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Pipeline				
Trans Mountain Pipeline	○	○	○	○
Energy East Pipeline	○	○	○	○

----- END OF PAGE -----

Before answering the next question(s), please read the following information about proposed pipelines in Canada.

Northern Gateway Pipeline (Proposal)

The Northern Gateway Pipeline Project is a proposed ‘twin’ pipeline from the Edmonton area (Alberta) to the northern coast of BC. The pipeline would have the capacity to transport large volumes of oil from Alberta’s oil sands to a marine shipping terminal for export (525,000 barrels per day; enough to fill roughly 33 Olympic-size swimming pools).

In 2014, the Federal Government (The National Energy Board) recommended approval for the Northern Gateway Pipeline application, subject to conditions and further consultation with communities along the planned route. Construction of the pipeline has not started.

Trans Mountain Pipeline (Proposal)

The Trans Mountain Pipeline Project proposes to expand an oil sands pipeline system from the Edmonton area (Alberta) to Vancouver, British Columbia. The project is expected to triple the transportation capacity in the pipeline (from 300,000 barrels of crude oil per day to 890,000 barrels per day; enough to fill roughly 56 Olympic-size swimming pools). Oil would be collected at a marine terminal and exported.

In May 2016, The Federal Government (The National Energy Board) recommended approval for the Trans Mountain Pipeline application, subject to conditions and further consultation with communities along the planned route. Construction of the pipeline has not started.



Figure: Proposed Northern Gateway and Trans Mountain Pipeline route maps (adapted from E Pluribus Anthony / Wikimedia Commons / Public Domain; retrieved from https://en.wikipedia.org/wiki/File:Political_map_of_Canada.png)

----- END OF PAGE -----

17. Based on what you know, **how much do you support or oppose** the following pipeline proposals?

	Strongly Oppose	Somewhat Oppose	Neutral	Somewhat support	Strongly support	I don't know
Northern Gateway Pipeline	<input type="radio"/>					
Trans Mountain Pipeline	<input type="radio"/>					

----- END OF PAGE -----

18. You have indicated that you have not made up your mind on the [Northern Gateway or Trans Mountain] pipeline proposal(s). Even though you may be undecided or have a neutral opinion, **which way are you leaning?**

	To oppose the pipeline	To support the pipeline
Northern Gateway Pipeline	<input type="radio"/>	<input type="radio"/>
Trans Mountain Pipeline	<input type="radio"/>	<input type="radio"/>

19. [LOGIC] You have indicated that you have not made up your mind on the Northern Gateway and/or Trans Mountain pipeline proposals. Even though you may be undecided or have a neutral opinion, **which way are you leaning?**

	To oppose the pipeline	To support the pipeline
Northern Gateway Pipeline	<input type="radio"/>	<input type="radio"/>
Trans Mountain Pipeline	<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

20. [LOGIC] How likely are you to take the following **actions to support the [Northern Gateway and/or Trans Mountain] pipeline proposal(s)?**

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter of support for the pipeline(s)	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

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21. [LOGIC] How likely are you to take the following **actions to oppose the [Northern Gateway and/or Trans Mountain] pipeline proposal(s)?**

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter opposing the pipeline(s)	<input type="radio"/>	<input type="radio"/>				
Write a letter to a	<input type="radio"/>	<input type="radio"/>				

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
newspaper or online publication						
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

----- END OF PAGE -----

22. What effect do you think **the Northern Gateway and Trans Mountain pipelines** will have on the following:

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know
Job creation	<input type="radio"/>					
My province's economic development	<input type="radio"/>					
Canada's economic development	<input type="radio"/>					
Local environmental quality near the pipelines	<input type="radio"/>					
Health quality of residents near the pipelines	<input type="radio"/>					
Greenhouse gas (climate warming) emissions	<input type="radio"/>					
Prices you pay for energy	<input type="radio"/>					

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Before answering the next question(s), please read the following information about the Energy East Pipeline.

Energy East Pipeline (Proposal)

The Energy East Pipeline Project is a proposed crude oil pipeline from Hardisty, Alberta (near Edmonton) to Saint John, New Brunswick. The project proposes construction of new pipeline and repurposing of existing pipeline along the planned route. The proposed pipeline would have the capacity to transport large volumes of crude oil from Alberta's oil sands to refineries and shipping terminals in eastern Canada (1,100,000 barrels per day; enough to fill roughly 70 Olympic-size swimming pools). Oil from this pipeline would be refined domestically or exported.

The Energy East Pipeline application is currently under review by the Federal Government (The National Energy Board). No decision date for approval or denial has been announced.



Figure: Energy East pipeline route map (adapted from E Pluribus Anthony / Wikimedia Commons / Public Domain; retrieved from https://en.wikipedia.org/wiki/File:Political_map_of_Canada.png)

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23. Based on what you know, **how much do you support or oppose the Energy East Pipeline proposal?**

Strongly Oppose	Somewhat Oppose	Neutral	Somewhat support	Strongly support	I don't know
<input type="radio"/>					

----- END OF PAGE -----

24. [LOGIC] You have indicated that you have not made up your mind on the Energy East pipeline proposal. Even though you may be undecided or have a neutral opinion, **which way are you leaning?**

To oppose the pipeline	To support the pipeline
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<input type="radio"/>	<input type="radio"/>
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25. [LOGIC] How likely are you to take the following **actions to support the Energy East pipeline proposal?**

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter of support for the pipeline(s)	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

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26. [LOGIC] How likely are you to take the following **actions to oppose the Energy East pipeline proposal?**

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter opposing the pipeline(s)	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public	<input type="radio"/>	<input type="radio"/>				

demonstration						
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27. What effect do you think **the Energy East pipeline** will have on the following:

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know
Job creation	<input type="radio"/>					
My province's economic development	<input type="radio"/>					
Canada's economic development	<input type="radio"/>					
Local environmental quality near the pipelines	<input type="radio"/>					
Health quality of residents near the pipelines	<input type="radio"/>					
Greenhouse gas (climate warming) emissions	<input type="radio"/>					
Prices you pay for energy	<input type="radio"/>					

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Section D: Renewables and Nuclear Energy

In this section, we would like to get your opinion on different types of renewable energy sources, including energy produced from solar and wind sources and hydroelectric dams. Depending on where you live, we may also ask about your opinion on nuclear energy.

28. How **familiar** are you with the following types of renewable energy?

	Not at all familiar	A little familiar	Moderately familiar	Very familiar
Solar power (from solar farms)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wind power (from wind farms)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Large hydroelectric power (hydroelectric dams)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

Before answering the next question(s), please read the following information about solar power.

Solar power (from solar farms)

Solar power describes technologies that can generate heat or electricity from sunlight. The two main ways to generate solar power are called ‘solar thermal’ (the direct heating of air, water or other heat carrying substance to generate electricity) and ‘solar photovoltaic’ (solar panels used to generate electricity).

Solar power projects can range greatly in size. **Here we are referring to large industrial solar ‘farms’**. The largest solar farms in Canada are located in southern Ontario. Each of these large solar farms can provide enough electricity to power up to 17,000 homes.

In total, solar power currently provides a relatively small amount of all the electricity generated in Canada (less than 0.1%). Ontario has the most installed solar power capacity of any province (1% of their total capacity). There is potential for more solar development throughout Canada.

Figure: A solar photovoltaic farm in Ontario (*figure removed from Appendix*)

----- END OF PAGE -----

29. Based on what you know, **how much do you support or oppose development of solar farms** in your province or territory?

Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
<input type="radio"/>					

----- END OF PAGE -----

30. [LOGIC] You have indicated that you have not made up your mind on development of solar farms in your province or territory. Even though you may be unsure or have a neutral opinion, **which way are you leaning?**

To oppose solar farms	To support solar farms
<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

31. [LOGIC] How likely are you to take the following actions to **support development of solar farms** in your province or territory?

If you have already taken this action, please select “I have already done this.”

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter of support for solar farms	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online	<input type="radio"/>	<input type="radio"/>				

publication						
Give a donation to a public interest group	<input type="radio"/>					
Attend or participate in a public meeting	<input type="radio"/>					
Participate in a government consultation process	<input type="radio"/>					
Participate in a public demonstration	<input type="radio"/>					

----- END OF PAGE -----

32. [LOGIC] How likely are you to take the following actions to **oppose development of solar farms** in your province or territory?

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter opposing solar farms	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

----- END OF PAGE -----

33. What effect do you think **development of solar farms** in your province or territory will have on the following:

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know
Job creation	<input type="radio"/>					
My province's economic development	<input type="radio"/>					
Canada's economic development	<input type="radio"/>					

Local environmental quality near the pipelines	<input type="radio"/>					
Health quality of residents near the pipelines	<input type="radio"/>					
Greenhouse gas (climate warming) emissions	<input type="radio"/>					
Prices you pay for energy	<input type="radio"/>					

----- END OF PAGE -----

Before answering the next question(s), please read the following information about wind power.

Wind power (wind farms)

Wind power is the conversion of wind movement into electricity using turbines and a generator. Wind turbines may be used individually but are often installed in groups, which are known as wind farms, and they can be located in windy areas on land or offshore in coastal areas.

Currently, wind power supplies about 1.5% of annual Canadian electricity production. Ontario, Quebec and Alberta have the most installed wind power in Canada, however every province utilizes wind energy to some extent. Further wind resources could be expanded throughout Canada.

Figure: A wind farm in Alberta (*figure removed from Appendix*)

----- END OF PAGE -----

34. Based on what you know, **how much do you support or oppose development of wind farms** in your province or territory?

Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
<input type="radio"/>					

----- END OF PAGE -----

35. [LOGIC] You have indicated that you have not made up your mind on development of wind farms in your province or territory. Even though you may be unsure or have a neutral opinion, **which way are you leaning?**

To oppose wind farms	To support wind farms
<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

36. [LOGIC] How likely are you to take the following actions to **support development of wind farms** in your province or territory?

If you have already taken this action, please select “I have already done this.”

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter of support for wind farms	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

----- END OF PAGE -----

37. [LOGIC] How likely are you to take the following actions to **oppose development of wind farms** in your province or territory?

If you have already taken this action, please select “I have already done this.”

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter opposing wind farms	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

----- END OF PAGE -----

38. What effect do you think **development of wind farms** in your province or territory will have on the following:

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know
Job creation	<input type="radio"/>					
My province's economic development	<input type="radio"/>					
Canada's economic development	<input type="radio"/>					
Local environmental quality near the pipelines	<input type="radio"/>					
Health quality of residents near the pipelines	<input type="radio"/>					
Greenhouse gas (climate warming) emissions	<input type="radio"/>					
Prices you pay for energy	<input type="radio"/>					

----- END OF PAGE -----

Before answering the next question(s), please read the following information about large hydroelectric power.

Large hydroelectric power

Large hydroelectric power facilities (sometimes called large hydropower) generate electricity by converting the movement of water from a reservoir into electricity using a turbine and a generator. To create a hydroelectric reservoir, large rivers are blocked with a concrete dam structure. Water from these reservoirs is then released through the dam structure, which spins a turbine and generates electricity.

Currently, large hydroelectric facilities supply about 60% of annual Canadian electricity production. Hydroelectricity has been used in some parts of Canada for over 100 years. British Columbia, Yukon Territory, Manitoba, Quebec and Newfoundland and Labrador have the most hydropower capacity. The potential for expansion still exists in these provinces and many other Canadian regions.

Figure: A large hydroelectric facility in British Columbia (*figure removed from Appendix*)

----- END OF PAGE -----

39. Based on what you know, **how much do you support or oppose development of large hydroelectric facilities** in your province or territory?

Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
<input type="radio"/>					

----- END OF PAGE -----

40. [LOGIC] You have indicated that you have not made up your mind on development of large hydroelectric facilities in your province or territory. Even though you may be unsure or have a neutral opinion, **which way are you leaning?**

To oppose large hydroelectric power	To support large hydroelectric power
<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

41. [LOGIC] How likely are you to take the following actions to **support development of large hydroelectric facilities** in your province or territory?

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter support for large hydroelectric power	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

----- END OF PAGE -----

42. [LOGIC] How likely are you to take the following actions to **oppose development of large hydroelectric facilities** in your province or territory?

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter opposing large hydroelectric power	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

----- END OF PAGE -----

43. What effect do you think development of **large hydroelectric facilities** in your province or territory will have on the following:

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know
Job creation	<input type="radio"/>					
My province's economic development	<input type="radio"/>					
Canada's economic development	<input type="radio"/>					
Local environmental quality near the pipelines	<input type="radio"/>					
Health quality of residents near the pipelines	<input type="radio"/>					
Greenhouse gas (climate warming) emissions	<input type="radio"/>					
Prices you pay for energy	<input type="radio"/>					

----- END OF PAGE -----

[LOGIC] As a resident of British Columbia, we would now like to get your opinion on the development of the Site C hydroelectric facility.

44. How **familiar** are you with the Site C Hydroelectric facility?

Not at all familiar	A little familiar	Moderately familiar	Very familiar
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

Before answering the next question(s), please read the following information about the Site C Hydroelectric Facility.

The Site C Hydroelectric Facility is a large hydroelectric generating station on the Peace River in northeast British Columbia. The project is currently under construction and will produce enough electricity to power roughly 400,000 homes in British Columbia (5,100 gigawatt hours of electricity each year).

Overall, the reservoir created after construction of the dam is expected to flood over 60 square km of farmed and forested land. The entire reservoir is expected to be 83 km long and 2-3 times the current width of the river

Figure: Site C Hydroelectric Facility location, near Fort St. John, BC (*figure removed from Appendix*)

----- END OF PAGE -----

45. Based on what you know, **how much do you support or oppose development of the Site C Hydroelectric Facility?**

Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
<input type="radio"/>					

----- END OF PAGE -----

46. [LOGIC] You have indicated that you have not made up your mind on development of the Site C Hydroelectric Facility. Even though you may be unsure or have a neutral opinion about the Site C Facility, **which way are you leaning?**

To oppose the Site C Hydroelectric Facility	To support the Site C Hydroelectric Facility
<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

47. [LOGIC] How likely are you to take the following **actions to support development of the Site C Hydroelectric Facility?**

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter of support for Site C	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

----- END OF PAGE -----

48. [LOGIC] How likely are you to take the following **actions to oppose development of the Site C Hydroelectric Facility?**

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter opposing Site C	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

----- END OF PAGE -----

49. What effect do you think **development of the Site C hydroelectric facility** will have on the following:

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know
Job creation	<input type="radio"/>					
My province's	<input type="radio"/>					

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know
economic development						
Canada's economic development	<input type="radio"/>					
Local environmental quality near the pipelines	<input type="radio"/>					
Health quality of residents near the pipelines	<input type="radio"/>					
Greenhouse gas (climate warming) emissions	<input type="radio"/>					
Prices you pay for energy	<input type="radio"/>					

----- END OF PAGE -----

[LOGIC] As a resident of [Maritime province: NS, NB, NL, PEI], we would now like to get your opinion on the development of the Lower Churchill Hydroelectric project.

50. How **familiar** are you with the Lower Churchill Hydroelectric Project?

Not at all familiar	A little familiar	Moderately familiar	Very familiar
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

The Lower Churchill Hydroelectric Project is an electricity generating facility on the Churchill River in Labrador consisting of two phases. Phase One of the project (known as Muskrat Falls) is currently under construction. Construction of Phase Two of the project (known as Gull Island) is planned for three years after completion of Phase One. If both phases are completed, the project will produce enough electricity for 1.4 million homes (17,600 gigawatt hours of electricity each year).

The reservoir created after construction of Phase One is expected to be approximately 59 km long (101 square kilometers in size) and will flood roughly 41 square kilometers of land. The reservoir for Phase Two is expected to be 232 km long and will flood roughly 85 square kilometers of land.

Figure: location of the Lower Churchill Hydroelectric Project (*figure removed from Appendix*)

----- END OF PAGE -----

51. Based on what you know, **how much do you support or oppose development of the Lower Churchill Hydroelectric Project?**

Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
<input type="radio"/>					

----- END OF PAGE -----

52. [LOGIC] You have indicated that you have not made up your mind on development of the Lower Churchill Hydroelectric Project. Even though you may be unsure or have a neutral opinion about the project, **which way are you leaning?**

To oppose the Lower Churchill Hydroelectric Project	To support the Lower Churchill Hydroelectric Project
<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

53. [LOGIC] How likely are you to take the following **actions to support development of the Lower Churchill Hydroelectric Project?**

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter of support for Lower Churchill Hydroelectric project	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

----- END OF PAGE -----

54. [LOGIC] How likely are you to take the following **actions to oppose development of the Lower Churchill Hydroelectric Project?**

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter opposing the Lower Churchill Hydroelectric project	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

----- END OF PAGE -----

55. What effect do you think **the Lower Churchill Hydroelectric Project** will have on the following:

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know
Job creation	<input type="radio"/>					
My province's economic development	<input type="radio"/>					
Canada's economic development	<input type="radio"/>					
Local environmental quality near the pipelines	<input type="radio"/>					
Health quality of residents near the pipelines	<input type="radio"/>					
Greenhouse gas (climate warming) emissions	<input type="radio"/>					
Prices you pay for energy	<input type="radio"/>					

----- END OF PAGE -----

[LOGIC] As a resident of Ontario, we would now like to get your opinion on refurbishment of the Bruce Power Nuclear Power Facility.

56. How **familiar** are you with the refurbishment of the Bruce Power Nuclear Power Facility?

Not at all familiar	A little familiar	Moderately familiar	Very familiar
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The Bruce Power nuclear power plant is an electricity generating facility located in Tiverton, Ontario. The facility operates eight nuclear reactors that generate over 30% of Ontario’s electricity supply. Starting in 2020, Bruce Power proposes to refurbish (rebuild and restore) six of the eight nuclear reactors to prolong the facility’s operating life until 2060. The refurbishment requires Bruce Power to invest roughly \$13 billion in the project.

Figure: Bruce Nuclear Power Facility Location, Tiverton, Ontario (*figure removed from Appendix*)

----- END OF PAGE -----

57. Based on what you know, **how much do you support or oppose refurbishment of the Bruce Power Nuclear Power Facility?**

Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don’t know
<input type="radio"/>					

----- END OF PAGE -----

58. [LOGIC] You have indicated that you have not made up your mind on refurbishment of the Bruce Power Nuclear Power Facility. Even though you may be unsure or have a neutral opinion about the project, **which way are you leaning?**

To oppose refurbishment of the Bruce Nuclear Power Facility	To support refurbishment of the Bruce Nuclear Power Facility
<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

59. [LOGIC] How likely are you to take the following **actions to support refurbishment of the Bruce Power Nuclear Power Facility?**

If you have already taken this action, please select “I have already done this.”

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don’t know
Sign a petition/letter of support for refurbishment of the Bruce Power Nuclear	<input type="radio"/>	<input type="radio"/>				

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Power Facility						
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

----- END OF PAGE -----

60. [LOGIC] How likely are you to take the following **actions to oppose refurbishment of the Bruce Power Nuclear Power Facility?**

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter opposing the refurbishment of the Bruce Power Nuclear Power Facility	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

----- END OF PAGE -----

61. What effect do you think **refurbishment of the Bruce Power Nuclear Power Facility** will have on the following:

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know
Job creation	<input type="radio"/>					
My province's economic development	<input type="radio"/>					
Canada's economic development	<input type="radio"/>					
Local environmental quality near the pipelines	<input type="radio"/>					
Health quality of residents near the pipelines	<input type="radio"/>					
Greenhouse gas (climate warming) emissions	<input type="radio"/>					
Prices you pay for energy	<input type="radio"/>					

----- END OF PAGE -----

Section E: Hydraulic Fracturing

In this section, we would like to get your opinion on hydraulic fracturing.

62. How **familiar** are you with hydraulic fracturing (also known as “fracking”)?

Not at all familiar	A little familiar	Moderately familiar	Very familiar
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

Please read the following information about hydraulic fracturing.

Hydraulic fracturing (also called “fracking”) is a specialized process used to extract oil and gas. The first step in the process is drilling a deep underground well horizontally into a rock formation that contains natural gas and oil. Mixtures of sand, water, and a small amount of chemicals are then pumped into the underground rock at a very high pressure. This process creates cracks in the rock, letting the oil and gas escape into the gas well. In general, the process gives companies the ability to develop oil and gas reserves that were previously considered inaccessible.

Hydraulic fracturing is currently allowed in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, the Northwest Territories and Yukon Territory. Hydraulic fracturing is prohibited in Quebec, New Brunswick, Nova Scotia and Newfoundland and Labrador due to uncertainties about the process.

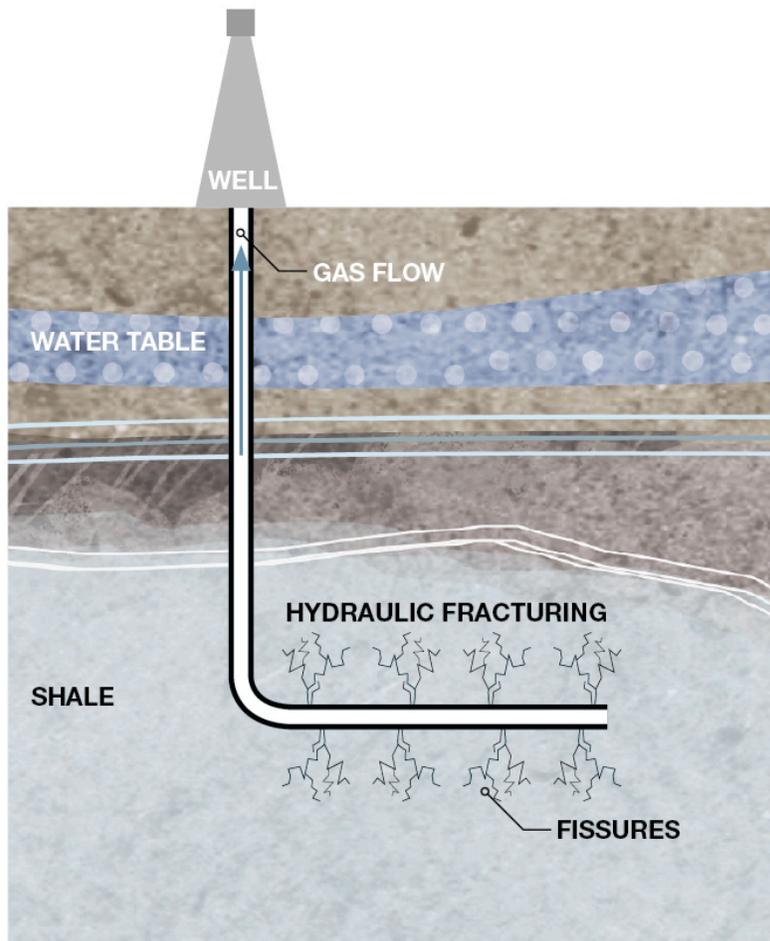


Figure: Diagram of a hydraulic fracturing operation (*Immediate Media Company, 2018; Image retrieved June 2016 from <http://www.sciencefocus.com/blog/how-it-works-shale-gas-fracking>, subject to fair dealing for research purposes*)

----- END OF PAGE -----

63. Based on what you know, **how much do you support or oppose using hydraulic fracturing to extract oil and gas** in your province or territory?

Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
<input type="radio"/>					

----- END OF PAGE -----

64. [LOGIC] You have indicated that you have not made up your mind on the use of hydraulic fracturing. Even though you may be unsure or have a neutral opinion, **which way are you leaning?**

To oppose hydraulic fracturing	To support hydraulic fracturing
--------------------------------	---------------------------------

○	○
---	---

----- END OF PAGE -----

65. [LOGIC] How likely are you to take the following **actions to support using hydraulic fracturing** to extract oil and gas in your province or territory?

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter of support for hydraulic fracturing	○	○	○	○	○	○
Write a letter to a newspaper or online publication	○	○	○	○	○	○
Give a donation to a public interest group	○	○	○	○	○	○
Attend or participate in a public meeting	○	○	○	○	○	○
Participate in a government consultation process	○	○	○	○	○	○
Participate in a public demonstration	○	○	○	○	○	○

----- END OF PAGE -----

66. [LOGIC] How likely are you to take the following **actions to oppose using hydraulic fracturing** to extract oil and gas in your province or territory?

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter opposing hydraulic fracturing	○	○	○	○	○	○
Write a letter to a newspaper or online publication	○	○	○	○	○	○
Give a donation to a public interest group	○	○	○	○	○	○
Attend or participate in a public meeting	○	○	○	○	○	○
Participate in a government consultation process	○	○	○	○	○	○
Participate in a public demonstration	○	○	○	○	○	○

----- END OF PAGE -----

67. What effect do you think **hydraulic fracturing** has on the following:

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know
Job creation	<input type="radio"/>					
My province's economic development	<input type="radio"/>					
Canada's economic development	<input type="radio"/>					
Local environmental quality near the pipelines	<input type="radio"/>					
Health quality of residents near the pipelines	<input type="radio"/>					
Greenhouse gas (climate warming) emissions	<input type="radio"/>					
Prices you pay for energy	<input type="radio"/>					

----- END OF PAGE -----

Section F: Liquefied Natural Gas (LNG)

[LOGIC: residents of NB, NS, PEI, NL, BC] In this section, we would like to get your opinion on liquefied natural gas (LNG) development in Canada.

68. How **familiar** are you with liquefied natural gas (LNG)?

Not at all familiar	A little familiar	Moderately familiar	Very Familiar
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

Please read the following information about liquefied natural gas.

The term “liquefied natural gas” describes natural gas that has been cooled to -160 degrees Celsius, which converts the gas to a liquid form. This cooling process compresses the gas, which allows it to be stored and transported.

Producing and shipping liquefied natural gas requires four main processes. First, the gas is extracted from conventional or hydraulically fractured wells in nearby gas-producing regions.

Second, the gas is cooled and compressed at storage facilities. Third, the gas is transported using a specialized tanker ship. Lastly, the gas is put back into storage, and eventually reheated so it can be used as fuel for a variety of purposes.

In Canada, sixteen new LNG export terminals are currently proposed in British Columbia, and two export terminals are proposed in Nova Scotia. The liquefied gas will be transported to overseas markets. To date, construction has not started on any of these terminals.

[LOGIC] Figure: Locations for select LNG projects proposed in BC, or NS, NB, NL, PEI
(figure removed from Appendix)

----- END OF PAGE -----

69. [LOGIC] Based on what you know, **how much do you support or oppose developing the liquefied natural gas (LNG) industry** (gas extraction, transportation, cooling and storage, and export by tanker) in your region?

Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support	I don't know
<input type="radio"/>					

----- END OF PAGE -----

70. [LOGIC] You have indicated that you have not made up your mind on the liquefied natural gas (LNG) industry. Even though you may be unsure or have a neutral opinion about the LNG industry, **which way are you leaning?**

To oppose the LNG industry	To support the LNG industry
<input type="radio"/>	<input type="radio"/>

----- END OF PAGE -----

71. [LOGIC] How likely are you to take the following **actions to support development of the liquefied natural gas (LNG) industry** in your region?

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter of support for the LNG industry	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

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72. [LOGIC] How likely are you to take the following **actions to oppose development of the liquefied natural gas (LNG) industry** in your region?

If you have already taken this action, please select "I have already done this."

	Definitely not	Unlikely	Somewhat likely	Very likely	I have already done this	I don't know
Sign a petition/letter of opposition for the LNG industry	<input type="radio"/>	<input type="radio"/>				
Write a letter to a newspaper or online publication	<input type="radio"/>	<input type="radio"/>				
Give a donation to a public interest group	<input type="radio"/>	<input type="radio"/>				
Attend or participate in a public meeting	<input type="radio"/>	<input type="radio"/>				
Participate in a government consultation process	<input type="radio"/>	<input type="radio"/>				
Participate in a public demonstration	<input type="radio"/>	<input type="radio"/>				

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73. What effect do you think development of the **liquefied natural gas (LNG) industry** in your region will have on the following:

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know
Job creation	<input type="radio"/>					
My province's economic development	<input type="radio"/>					
Canada's economic development	<input type="radio"/>					
Local environmental quality near the	<input type="radio"/>					

	Greatly decrease	Somewhat decrease	No change	Somewhat increase	Greatly increase	I don't know
pipelines						
Health quality of residents near the pipelines	<input type="radio"/>					
Greenhouse gas (climate warming) emissions	<input type="radio"/>					
Prices you pay for energy	<input type="radio"/>					

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Section G: Values, Views and Activities

In this section, we would like to hear a little more about your proximity to different energy projects in your region, in addition to asking some important questions about your views, values and activities.

74. Are any of the following energy projects **located within 50 km** of your primary residence?

	Yes, I live within 50km of this existing or proposed project	No, I do not live within 50km of this existing or proposed project	Unsure
Proposed projects			
A bitumen pipeline (Northern Gateway, Trans Mountain or Energy East)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A Liquefied Natural Gas (LNG) operation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Existing projects			
A solar farm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A wind farm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A large hydroelectric facility (dam)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A nuclear power generating facility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A conventional oil well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A hydraulically fractured oil or gas well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A conventional oil pipeline	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
An oil sands extraction operation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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75. [LOGIC] In assessing the different energy projects mentioned in this survey, please indicate **your level of trust** in each of the following organizations?

Please select “I don’t know” if you are not familiar with any of the organizations or not sure about your level of trust in them.

	Very low	Low	Medium	High	Very high	I don't know
Federal government environmental agencies (Canadian Ministry of Environment and Climate Change, National Energy Board)	<input type="radio"/>					
Provincial government environmental agency (Ministry of Environment in your home province/territory)	<input type="radio"/>					
Scientists employed by government	<input type="radio"/>					
Oil and gas companies	<input type="radio"/>					
Oil sands pipeline companies	<input type="radio"/>					
[LOGIC] Tanker companies (involved in marine shipping of oil and liquefied natural gas products)	<input type="radio"/>					
[LOGIC] Natural gas cooling and storage facility operators	<input type="radio"/>					
[LOGIC] Bruce Power	<input type="radio"/>					
Renewable energy companies	<input type="radio"/>					
Your electric utility (the company that provides you with electricity in your home province/territory)	<input type="radio"/>					
Nuclear energy companies	<input type="radio"/>					
Scientists employed by industry	<input type="radio"/>					
Non-profit environmental groups, such as David Suzuki Foundation, Greenpeace, and the Pembina Institute	<input type="radio"/>					
Scientists employed by environmental groups	<input type="radio"/>					
Academic journals and magazines	<input type="radio"/>					
Scientists employed by universities	<input type="radio"/>					
Mass media (non-academic journals, magazines, newspapers)	<input type="radio"/>					

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76. How often do you turn to the following media sources to keep up with current news and world events?

	Less than once a month	About once a month	Several times a month	About once a week	Several times a week	Every day

Television (traditional or online)	<input type="radio"/>					
Radio (traditional or online)	<input type="radio"/>					
Newspaper (print or online)	<input type="radio"/>					
Internet-only sources (i.e. blogs)	<input type="radio"/>					

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77. How often do you read the following national newspapers to keep up with current news and world events?

	Less than once a month	About once a month	Several times a month	About once a week	Several times a week	Every day
The Globe and Mail	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The National Post	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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78. [LOGIC: residents of AB] How often do you read the following local newspapers to keep up with current news and world events?

	Less than once a month	About once a month	Several times a month	About once a week	Several times a week	Every day
The Calgary Herald	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Edmonton Sun	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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79. [LOGIC: residents of BC] How often do you read the following newspapers to keep up with current news and world events?

	Less than once a month	About once a month	Several times a month	About once a week	Several times a week	Every day
The Vancouver Sun	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Province	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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80. How frequently do you engage in the following activities?

Think about how often you engaged in these activities or how much time you devoted to these activities over the past year.

	Never	Rarely	Occasionally	Frequently	Very Frequently
Thinking about protecting the environment.	<input type="radio"/>				
Trying to help the environment through daily actions.	<input type="radio"/>				
Attending environmental meetings.	<input type="radio"/>				
Engaging in environmental conservation activities.	<input type="radio"/>				
Promoting environmental conservation (talking to people about the environment).	<input type="radio"/>				

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81. Please indicate your level of agreement with the following statements.

	Strongly disagree	Somewhat disagree	Undecided / neutral	Somewhat agree	Strongly agree
When humans interfere with nature, it often produces disastrous consequences.	<input type="radio"/>				
The so-called “ecological crises” facing humankind has been greatly exaggerated.	<input type="radio"/>				
The balance of nature is very delicate and easily upset.	<input type="radio"/>				
Humans are severely abusing the environment.	<input type="radio"/>				
Humans have the right to modify the natural environment to suit their needs.	<input type="radio"/>				
If things continue on their present course, we will soon experience a major ecological catastrophe.	<input type="radio"/>				
Plants and animals have as much right as humans to exist.	<input type="radio"/>				
Humans were meant to rule over the rest of nature.	<input type="radio"/>				

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82. Consider each set of the values below and indicate how important they are as a principle in your life.

	Not important	A little important	Somewhat important	Very important

	at all			
Family security, safety for loved ones	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Honouring parents and elders, showing respect	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Self-discipline, self-restraint, resistance to temptation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respecting the Earth, harmony with other species	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Protecting the environment, preserving nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unity with nature, fitting into nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social justice, correcting injustice, care for the weak	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Equality, equal opportunity for all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A world at peace, free of war and conflict	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Influential, having impact on people and events	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Authority, the right to lead or command	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wealth, material possessions, money	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A varied life, filled with challenge, novelty, and change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
An exciting life, stimulating experiences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Curious, interested in everything, exploring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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83. How much do you feel you know about climate change (global warming)?

<input type="radio"/>	Nothing
<input type="radio"/>	A little
<input type="radio"/>	Some
<input type="radio"/>	A lot

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84. Which of the following statements is closest to your opinion on climate change (global warming)?

<input type="radio"/>	It is a serious problem, and immediate action is necessary
<input type="radio"/>	It could be a serious problem, and we should take some action now
<input type="radio"/>	More research is needed before action is taken
<input type="radio"/>	It is not a problem and does not require any action
<input type="radio"/>	I don't know anything about this issue

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Section H: Your Details

Lastly, we would like to collect some important socio-demographic details from you. The information collected here will be used only for descriptive/statistical purposes.

85. Please indicate your age group.

This information will be used for statistical purposes only.

<input type="radio"/>	19
<input type="radio"/>	20 to 24
<input type="radio"/>	25 to 34
<input type="radio"/>	35 to 44
<input type="radio"/>	45 to 54
<input type="radio"/>	55 to 64
<input type="radio"/>	65 to 74
<input type="radio"/>	75 or older

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86. Please indicate your sex:

This information will be used for statistical purposes only.

Note: As indicated by Statistics Canada, transgender, transsexual, and intersex Canadians should indicate the sex (male or female) with which they most associate themselves.

<input type="radio"/>	Male
<input type="radio"/>	Female
<input type="radio"/>	Prefer not to disclose

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87. Please indicate the highest level of education you have completed.

This information will be used for statistical purposes only.

<input type="radio"/>	Grade school or some high school
<input type="radio"/>	High school graduate
<input type="radio"/>	Some university/college
<input type="radio"/>	University/college graduate
<input type="radio"/>	Some graduate school
<input type="radio"/>	Masters, doctoral, or professional degree

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88. What pre-tax income category does your household fit into?

This information will be used for statistical purposes only.

<input type="radio"/>	Less than \$10,000
<input type="radio"/>	\$10,000 to \$19,999
<input type="radio"/>	\$20,000 to \$29,999
<input type="radio"/>	\$30,000 to \$39,999
<input type="radio"/>	\$40,000 to \$49,999
<input type="radio"/>	\$50,000 to \$59,999
<input type="radio"/>	\$60,000 to \$69,999
<input type="radio"/>	\$70,000 to \$79,999
<input type="radio"/>	\$80,000 to \$89,999
<input type="radio"/>	\$90,000 to \$99,999
<input type="radio"/>	\$100,000 to \$124,999
<input type="radio"/>	\$125,000 to \$150,000
<input type="radio"/>	Greater than \$150,000
<input type="radio"/>	I prefer not to answer

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89. Are you associated with, or do you support, one of the following federal political parties?

This information will be used for statistical purposes only.

<input type="radio"/>	Conservative Party
<input type="radio"/>	Liberal Party
<input type="radio"/>	Bloq Quebequois
<input type="radio"/>	New Democrat Party
<input type="radio"/>	Green Party
<input type="radio"/>	Other
<input type="radio"/>	No/undecided

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90. Please respond to the following statements about any connection you may have to the oil and gas industry in Canada.

This information will be used for statistical purposes only.

	Yes	No	I don't know
I work for a business associated with the oil and gas industry in	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Canada			
Someone in my family, or a close friend, works for a business associated with the oil and gas industry in Canada	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The oil and gas industry has a significant presence in my community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I, or someone in my family, has an oil and gas well or pipeline on their property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have investments related to the oil and gas industry in Canada	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Thank you for completing the survey. Your participation has helped the academic community, energy researchers, businesses, policymakers and consumers.

If you have any final comments, please enter them in the box below.