

# Final Report: Knowledge Synthesis Grant

## Hydraulic Fracturing and Public Policy<sup>\*</sup>

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## Brief Summary and Key Messages

This knowledge synthesis explores policy pertaining to and regulation of hydraulic fracturing in the context of a continually evolving knowledge base. The technology itself has become quite contentious in Canada, with active development in western provinces, exploratory development in the north, and moratoria in the east. Our hope is that the research presented here will help improve public understanding of hydraulic fracturing, and lead to better public policy and regulation in Canada. We reviewed the academic literature, grey literature, and government and regulatory documents. Our findings reveal a number of key themes:

### Theme 1: More Research is Needed

Our literature review revealed that there is an active academic community exploring the scientific aspects of hydraulic fracturing, including environmental and human health impacts. Knowledge gaps have been identified, and a significant amount of work is going towards closing the gaps. In some cases, the research is leading to the discovery of additional knowledge gaps and areas for further research. This speaks to the difficulty of forming policy and regulations aimed at mitigating the negative effects of hydraulic fracturing in the presence of uncertainty about the size, scope and impact of those effects. Compounding this difficulty is that research into the socioeconomic effects has not progressed. We were unable to find research quantifying costs or benefits, or evaluating net benefits. This places politicians, policy-makers and the public at a significant disadvantage in evaluating whether the benefits of hydraulic fracturing justify the costs.

### Theme 2: Risk versus Reward

The different treatment of hydraulic fracturing across Canada has revealed differing perceptions of risk and different risk tolerances. Provinces with previous oil and gas development are more welcoming of hydraulic fracturing, in part due to already robust regulatory systems and experience with the tangible economic benefits of hydrocarbon development. Implicit in this decision is a choice that the benefits justify the costs. In contrast, provinces and territories less familiar with oil and gas development convened review panels or strategic assessments of hydraulic fracturing to identify risk, costs and benefits. In many cases, the question of whether the risk is worth the reward has not been settled.

### Theme 3: Policy and Regulation: Limited Linkages to Science

In reviewing government and regulatory documents from across Canada, we discovered that there is limited or no reference to the relevant academic literature. The exception to this is the report produced by the Council of Canadian Academies evaluating shale gas in Canada, the government-initiated review panels of hydraulic fracturing in New Brunswick and Nova Scotia, and Quebec's strategic environmental assessment of shale gas. While regulation and government policy is undoubtedly based on scientific evidence, the lack of explicit link undermines the credibility of both.

### Theme 4: Public Trust and Confidence

Public discussion of hydraulic fracturing often characterises the technology as “good” or “bad”; many groups are vehemently opposed to its use because of perceived environmental costs and the uncertainty around the risks. In part, this opposition stems from a lack of confidence in policy and regulation, and is not surprising, given that our understanding of the consequences (good and bad) of hydraulic fracturing is evolving. The review panels are an important step in gaining and maintaining public trust and confidence, but continued communication to affected groups is also key.

## Executive Summary

Hydraulic fracturing is becoming an increasingly important component of both oil and gas extraction in Canada, used to produce natural gas and light oil from tight and shale reservoirs. Production from these reservoirs currently accounts for approximately half of Canada's natural gas and light oil production. The Canadian Association of Petroleum Producers has stated that in 2014, fracturing occurred in 60 per cent of wells drilled in Saskatchewan, 70 per cent of wells in Alberta and 90 per cent of wells in British Columbia. With little history of the widespread use of this technique, questions concerning the safety of hydraulic fracturing have been raised across the country. Common areas of concern include groundwater contamination, wastewater disposal, and induced seismicity. Regulatory approaches differ significantly across the country, and these differing approaches have been informed by multiple sources of information on hydraulic fracturing, including government review panels, environmental assessments and research from academia and non-government organizations.

The opposing regulatory approaches found across Canada arguably make it difficult for average Canadians to know what to think about the risks of hydraulic fracturing in their communities and provinces. One consequence is a public, often passionate, debate about the merits of hydraulic fracturing conducted in an arena with competing information, historical data and reference materials. Moreover, the continually evolving scientific literature on the risks, costs and benefits of hydraulic fracturing adds to the complexity of the issue. The opposing regulatory approaches also have a strong influence on investment and the distribution of economic activity and its associated benefits. It is becoming increasingly important to improve the knowledge and understanding the impact of widespread use of hydraulic fracturing on the range of public interest concerns from health and safety to market stability.

Our objective in this research is to synthesize the existing scientific information available and produce a synoptic overview of the issues and present these in the context of policy choices. We provide an objective summary of research to date, including academic literature, the grey literature, and regulatory and government documents. Based on this, we identify knowledge and policy gaps, and opine on why regulatory authorities and governments have been approving such a wide range of field practice and reporting, while reaching vastly different conclusions on the use of hydraulic fracturing.

The goal of this Knowledge Synthesis Grant report is to contribute insights to answering the question "What effects will the quest for energy and natural resources have on our society and our position on the world stage?" The research presented in this paper addresses the theme "What will be the cultural, environmental, economic, gender, political and social implications of the quest for and extraction, production and use of energy and natural resources in Canada?" and the subtheme "What could be the

cultural, social, economic and environmental impacts on different groups and communities of disruptive technologies for accessing and developing natural resources?”

## What We Discovered

Despite numerous government-commissioned reports on the environmental and socio-economic effects of hydraulic fracturing, and the growth of academic research over the past decade, there are substantial knowledge gaps. Major reviews have been provided by the Council of Canadian Academies (CCA), the Canadian Water Network (CWN), and review panels in Nova Scotia and New Brunswick. The most significant knowledge gaps related to hydraulic fracturing identified by the CCA, CWN and the two provincial review panels include a lack of baseline data, insufficient information on long-term cumulative effects, and a lack of region-specific information overall. Although a significant amount of additional research in both the academic and grey literature has been completed since the CCA report was released, these gaps continue to be emphasized. To a large extent, the new research is also unearthing new information that raises more questions than answers. For example, in many cases the research is leading to conflicting results for which explanations are sought. Results for one region raise questions about whether similar impacts are observable in others, and observations of negative environment and health outcomes with an insufficient understanding as to the causality of these outcomes.

As the complete study of hydraulic fracturing has many missing pieces, it is only logical that there will be consequent missing pieces in policy and regulation. Indeed, policy-makers and regulators are in a catch-22 situation: better understanding of the risks and costs of development requires both improved measurement and allowing further development, but it is difficult to effectively formulate policy and regulation without a fulsome understanding of risks, benefits and costs.

## Key Themes

### Theme 1: More Research is Needed

Our literature review revealed that there is an active academic community exploring the scientific aspects of hydraulic fracturing, including environmental and human health impacts. Knowledge gaps have been identified, and a significant amount of work is going towards closing the gaps. In some cases, the research is leading to the discovery of additional knowledge gaps and areas for further research. This speaks to the difficulty of forming policy and regulations aimed at mitigating the negative effects of hydraulic fracturing in the presence of uncertainty about the size, scope and impact of those effects. Compounding this difficulty is that research into the socioeconomic effects has not progressed. We were unable to find research quantifying costs or benefits, or evaluating net benefits. This places politicians, policy-makers and the public at a significant disadvantage in evaluating whether the benefits of hydraulic fracturing justify the costs.

## Theme 2: Risk versus Reward

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