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THE EFFECTIVENESS OF FRACKING DISCLOSURE REGIMES IN CANADA¹

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THE EFFECTIVENESS OF FRACKING DISCLOSURE REGIMES IN CANADA

Key Messages

In response to the rapid adoption of hydraulic fracturing and horizontal drilling (collectively, “fracking technology”) over the past few decades, some provincial governments have developed legislation and regulations to delimit, monitor and safeguard fracking practices. Among these rules are guidelines requiring fracking companies (“operators”) to disclose a wide array of fracking-related information to the regulators that oversee these activities. This information serves several purposes, and has the potential to provide the public with timely and useful information regarding the activities that take place in their communities and potential harms that may result.

In this report, we provide an analysis of existing disclosure regimes in the four Canadian provinces where fracking is actively taking place: Alberta, British Columbia, Manitoba and Saskatchewan. We assess the effectiveness of these disclosure practices, benchmarked against current theoretical and empirical scientific knowledge. Our analysis yields four main conclusions, summarized below.

In Some Provinces, Regulation Provides a Good Basis for Public Disclosure

Alberta and British Columbia, the provinces with the greatest fracking activity, have strong legislative structures that require operators to disclose information to regulatory bodies. Subsequent reports to the public are based on this information. Moreover, websites currently in use such as BCOGC.ca, AER.ca and Fracfocus.ca provide good infrastructure in terms of accessibility. However, even in Alberta and British Columbia, disclosure regarding some fracking-related issues has not received specific regulatory attention, and in Manitoba and Saskatchewan, relevant regulations are almost non-existent.

Legislation Specifying Public Disclosure of Information Related to Hydraulic Fracturing is Minimal

The vast majority of current relevant legislation covers operator-to-regulator disclosure, and not regulator-to-public disclosure. In fact, only two regulatory provisions (both in British Columbia) require the Oil and Gas Commission to report directly to the public on fracking-related risks. Although various provincial websites enable public inquiry into additional issues, the Canadian public largely lacks regular, legally mandated reporting on fracking issues.

Information that is Disclosed to the Public is Difficult for Ordinary Citizens to Access and Comprehend

Although websites currently in use such as AER.ca, BCOGC.ca and Fracfocus.ca provide good infrastructure for public disclosure, an additional layer of processing is required to make data easily accessible. At the same time, possibly one of the most conspicuous pitfalls of disclosure systems is the overuse of scientific jargon or language that is otherwise obscure for potential users. We found that almost none of the information that is currently available to the public has been disclosed in a manner that is meaningful to non-specialists.

Public Disclosure and Access Should be Promoted Despite Scientific Uncertainty

Regulation related to public disclosure need not necessarily depend on the status of ongoing scientific endeavours to unveil the actual risks that fracking poses. Rather, we recommend that decision-makers and public policy leaders adopt a precautionary approach that provides greater public awareness while scientific certainty is being pursued

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EXECUTIVE SUMMARY

Hydraulic fracturing (commonly known as “fracking”) is a technology employed in the production of oil and gas from shale. Over the last decade, many thousands of wells have been drilled worldwide; in Canada they currently dot the landscape of four provinces, with exploratory wells drilled in several others. Potentially, existing reserves in the country can provide a significant portion of Canada’s future energy demands. At the same time, fracking is associated with an array of environmental impacts such as water consumption and contamination, induced seismicity, noise and air pollution, and others. Because fracking technology has been widely employed for only a decade, many of its potential environmental impacts are still unknown or uncertain.

Regulators in Canada and elsewhere employ an array of policy tools to ensure that extractive activities, both traditional and emergent, are conducted within accepted guidelines. Regulators primarily rely on tools such as permitting processes and ongoing inspection and monitoring. In addition, certain provinces have also established legislation and put in place disclosure channels that provide some data about ongoing fracking activity. Overall, however, it is unclear whether the policies and platforms currently employed in Canada contribute to meaningfully informing residents about local fracking activity.

In this study, we analyzed the entirety of existing disclosure regimes in Canada that are salient to fracking. Our goal was to aid regulators in developing effective public disclosure policy by identifying the strengths and weaknesses of current legislative frameworks and their attendant channels of provision. Our findings, we believe, might be particularly beneficial at the current, nascent stage of right-to-know policy development.

Our research design employed the following methodology: First, we reviewed extant literature on what makes public disclosure effective, and alternatively, what are the common obstacles that hinder its success. Based on this review, we developed a theoretical model according to which effective information disclosure hinges both on the content that is provided as well as on how it is provided. Specifically, according to this model, the comprehensibility of information and its granularity are important for determining the quality of the content, and accessibility and timeliness are important for determining the effectiveness of information provision channels.

We then used these criteria to inform our assessment of current regulatory regimes in each of the four provinces where fracking is conducted commercially: Alberta, British Columbia, Manitoba and Saskatchewan. In particular, we focused our attention on four key environmental impact issue areas related to fracking activity: water consumption, water contamination, inducement of seismic activity and potential damage to the quality of life of nearby communities. Mapping the current disclosure regimes in each of the active provinces along these issues allowed us to produce a general assessment of effectiveness. As a final step, we shared our findings with the relevant regulatory agencies in the four provinces analyzed, and integrated their responses into our report.

Our analysis yielded four main conclusions:

1. In Some Provinces, Regulation Provides a Good Basis for Public Disclosure

In Alberta and British Columbia, the legislative framework that moderates operator-regulator disclosure provides a solid foundation upon which subsequent regulator-public disclosure can be constructed. The law in these provinces mandates operators to provide a fairly detailed account of water consumption, water contamination (in terms of fluid composition) and induced seismicity. Other issues, such as fluid disposal and quality of life effects, however, do not receive comparable regulatory attention. By contrast, in Manitoba and Saskatchewan relevant regulation is almost non-existent. Because public disclosure relies almost solely on information held by the government, this clearly hinders the prospects of encouraging the public in these regions to be well-informed about fracking related risks.

2. Legislation Specifying Public Disclosure of Information Related to Hydraulic Fracturing is Minimal

There are currently only two regulatory provisions in the entire country requiring the regulator to report directly to the public on fracking related risks, both of them in British Columbia. The rest of the information that is provided by operators is either subsequently submitted on a voluntarily basis through channels such as AER.ca, BCOGC.ca and Fracfocus.ca, or remains available only to the regulator. This state of affairs leaves the public largely devoid of consistent and legally mandated access to relevant information.

3. Information that is Disclosed to the Public is Difficult for Ordinary Citizens to Access and Comprehend

We emphasize that merely setting-up legislation related to public disclosure does not guarantee effectiveness. In particular, current disclosure practices are lacking in terms of both how the data are provided as well as their actual content. In terms of provision, although the various websites overall provide a good infrastructure, the data they contain could be offered in a more user-friendly format so as to promote accessibility. In terms of content, it is doubtful that the general public can easily understand the data in their current form. To this end we recommend, among other mechanisms, that regulators develop an ordinal scale of risks, for example one that is based on a color-scheme and on clear, non-technical language

4. Public Disclosure and Access Should be Promoted Despite Scientific Uncertainty

Finally, we stress the public's right to be aware of the potential risks imposed by fracking. Information provision should not be biased by the current state of scientific knowledge, nor should it await the results of ongoing or future studies designed to clarify the actual severity of hazards. We urge decision-makers and public policy leaders to adopt a precautionary approach, prioritizing the provision of at least rudimentary information about nascent concerns even before the attainment of full scientific consensus about their severity.

BACKGROUND

Research Question

In light of the potential risks posed by resource extraction to the natural environment as well as to public health, regulators in Canada and elsewhere are beginning to employ an array of policy tools to ensure that extractive activities, both conventional and unconventional, are conducted within accepted guidelines (Colton et al., 2016). The regulator's responsibility in this context is two-fold. First, it must ensure that industrial activity does not violate any current environmental and public health policies. To this end, provincial regulators primarily rely on tools such as permitting and ongoing inspection and monitoring. Second, regulators are responsible for ensuring that the public is well-informed of potential risks posed by this emerging industrial activity. In the context of fracking, this regulatory approach is still in its infancy; it has been only a few years since oil and gas operators in Alberta and British Columbia began to disclose the types and quantities of chemicals used for fracking through FracFocus.ca, a website patterned after a similar initiative in the United States. While an important step forward, this disclosure website has been the subject of ongoing academic debate (Dundon, Abkowitz, & Camp, 2015; Konschnik, Holden, & Shasteen, 2013). Overall, it remains unclear whether current disclosure regimes employed in Canada contribute to meaningful engagement with the public on the topic of fracking activity. The aim of our research was to shed light on this question.

Overall Methodology

To achieve our goal, we first synthesized studies in which researchers have empirically examined the mechanisms through which information disclosure regimes attain potency, as well as pitfalls that have prevented such policies from obtaining the expected results. Based on this theoretical review, we developed a new framework of criteria by which to assess the effectiveness of provincial regulatory disclosure regimes. During the second stage of the project, we mapped the rules and regulations pertaining to fracking-related information disclosure in each of Canada's active provinces, since most regulation occurs at this level rather than at the federal or municipal level. We focused on four issues: water consumption, water contamination, induced seismicity and quality of life. In the third and final stage, we used the criteria identified in the first phase to evaluate the extent to which disclosure channels mapped in the second phase can meaningfully contribute to informing the public about fracking activities and associated risks. Doing so enabled us to: (a) identify shortcomings of current disclosure policies, and (b) make recommendations on how these policies can be improved to facilitate a richer and more complete public understanding of oil and gas development, thereby promoting a more participative and empowered Canadian democracy.

PHASE 1: DEVELOPING AN ASSESSMENT FRAMEWORK

Having reviewed relevant extant literature, we decided to base our approach to defining disclosure effectiveness mainly on the work of Weil, Fung, Graham, and Fagotto (2006), which to our knowledge represents the most comprehensive and explicit attempt to tackle this topic both conceptually and empirically. Drawing mostly on March and Simon (1958) and related literature regarding the economics of decision-making, Weil et al. (2006) suggested that a public disclosure process can be deemed successful to the extent that its products can be incorporated within the decision-making routines of both the recipients and the disclosers in the process (i.e., the

public and the operators, respectively; see Figure 1). This view is engrained in the perception of public disclosure as an essentially iterative process, what the authors term “the action cycle” (p. 157).

Considering the limited scope of our research question, however, we decided to focus solely on the “user-side”² of the process, as we are interested mainly in how well the public is informed by current policies. We nevertheless explicitly recognize that any broader discussion of disclosure effectiveness should also account for the dynamics that take place on the operator-side of the process, particularly since disclosure is known to have a potentially positive effect on industry performance (Karkkainen, 2000).

Zooming in on the user-side of the process, we recognized two overarching categories of considerations that may affect how the public ends up responding to disclosed information. As shown in Figure 1, the first category includes cognitive considerations that generally involve the amount of effort required by users to make the information useful for decision-making purposes, often described in the literature as “information costs” (Bae, Wilcoxon & Popp, 2010). These may involve, for example, data interpretation and processing costs associated with making information compatible with issues of concern (Coase, 1937, 1960; Stephan, 2002). This essentially means that clear-cut, processed and accessible information might be prioritized over scientifically oriented data, even at the costs of richness and reliability.

Extending Weil et al.’s (2006) typology, we recognized an additional category that includes what we call psycho-social considerations (see Figure 1). Since these factors are somewhat less subject to regulation, at least in the context of fracking, they remain outside the scope of our discussion. Nevertheless, we briefly mention a few of these factors to emphasize their critical role in the success of the entire disclosure process. For example, the public may remain indifferent to information that is technically compatible with its needs due to a sense of helplessness and disbelief that such data can be acted upon. A variety of other psychological and sociological reasons, such as the public sense of environmental injustice (Stephan, 2002), the socio-economic status of a community (Delmas, Montes-Sancho, & Shimshack, 2010; Kalnins & Dowell, 2015) and the power of social interactions in it (Madajewicz et al., 2007) could also play a role.

Having delineated our general conceptual framework, we now provide a detailed account of the cognitive assessment criteria at the core of our discussion. We adopt some of these in their original form from Weil et al. (2006), and omit and broaden others as appropriate. In several cases, we use the U.S. Toxic Release Inventory (TRI) regulations³ found in the United States to exemplify our criteria because toxic release is similar to fracking in terms of its strong link to environmental regulations and public health. We also corroborate the original analysis with newer empirical evidence wherever possible.

² Weil et al. (2006) defined *user-embeddedness* of the data as the “degree to which information that is mandated in a disclosure system is integrated into the decision-making processes of a policy’s intended users...despite the challenges of bounded rationality” (p. 159).

³ Following the Bhopal disaster in 1985, the U.S. Congress established this publicly accessible database on toxic chemical releases under the right-to-know act and broadened it in 1990.

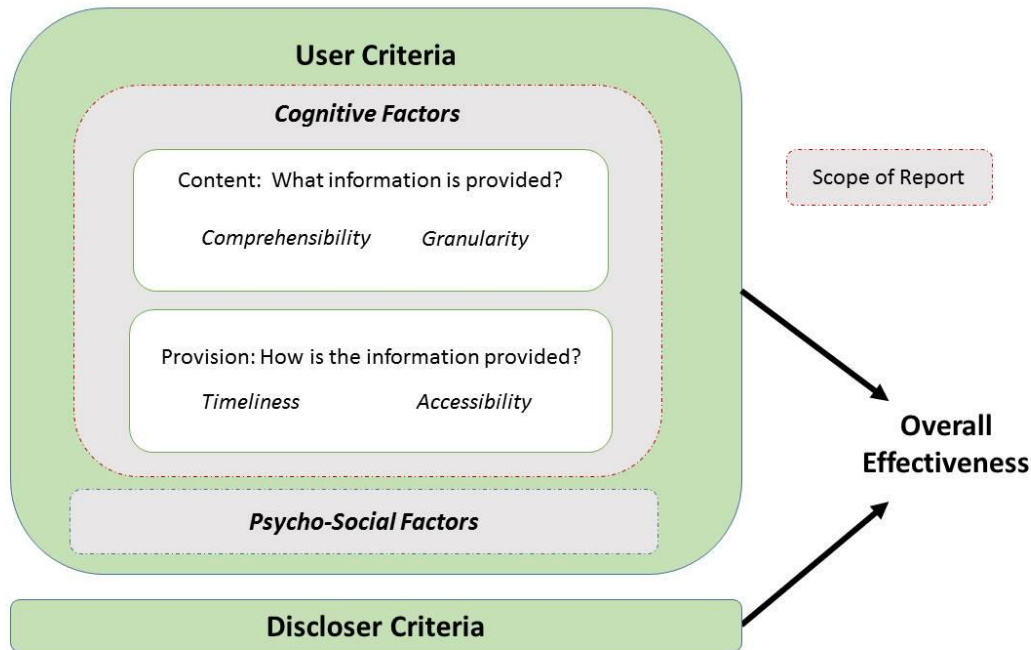


Figure 1. A theoretical framework for analyzing disclosure effectiveness.

User-side “Cognitive” Criteria of Disclosure Effectiveness

Within the category of “cognitive” factors shown in Figure 1, we differentiate content-related features from provision-related features of disclosure. Although the two categories are not entirely mutually exclusive, the former relates more to *what* is disclosed, whereas the latter emphasizes *how*. Elements in both categories are generally related to the amount of cognitive effort required by users to make information useful in decision-making processes.

Content Criteria

In this category, we include two factors that relate directly to the actual information that is being disclosed rather than to its availability: comprehensibility and granularity.

Comprehensibility

Comprehensibility can be thought of as the relative ease with which one can understand the impact represented by the disclosed “information unit.” For example, risk from air pollution can be disclosed to the public in terms of tons of emissions per region per unit of time (relatively hard to comprehend), or in terms of the estimated number of related deaths per year (relatively easy to comprehend).

According to Weil et al. (2006), *comprehensibility* relates to the meaningfulness of the disclosed information to its target audience. Despite its employment of highly professional language, financial reporting is deemed comprehensible to the extent that it matches the professional skills of its audiences (i.e., accountants and

investors) (Weil et al., 2006). The TRI data, on the other hand, are problematic because the tonnage figures pose a challenge to non-experts when attempting to translate them into actual health risks, thereby requiring the assistance of intermediaries (Bae et al., 2010).

Unlike the TRI example, other contexts show that comprehensibility is attainable when information involves public health risks. In an empirical study on reactions of residents in Bangladesh to information about unsafe arsenic levels in their wells, Madajewicz et al. (2007) found that disclosed information successfully increased the probability of residents moving within 1 year of disclosure by almost 40%. The researchers went door-to-door and verbally provided clear information to residents about the safety of their wells in terms of being above or below a certain threshold. Although such a campaign may seem inefficient, the researchers noted that similar rates of effectiveness are expected from media campaigns that provide information in a similar manner, yet much less expensively.

Granularity

Granularity can be thought of as representing the level of impact of disclosed information unit. For example, tons of emitted pollutants may be reported per factory (highly granular), as in the TRI (Bae et al., 2010), or alternatively, per region or province (less granular).

We differentiated *spatial granularity* (i.e., per factory, per region, etc.) from *temporal granularity* (i.e., per month, per year, etc.). For example, with regards to spatial granularity of pollution reporting, rather than reporting per source of pollution (air, water, land, etc.), the Indonesian PROPER⁴ environmental regulatory program (Lee, 2010) aggregates each firm's performance related to various sources of pollution using an ordinal colour scheme that provides an overall impression. Top practitioners receive gold or green grades, whereas under-performers receive red or black grades. Similarly, restaurant hygiene ratings rely on A–C letter grades to summarize relevant criteria (Weil et al., 2006).

Temporal granularity needs may differ for the same information depending on the target audience. For example, potential property buyers who are trying to decide whether to move to an area affected by industrial activity might be interested in monthly or yearly air quality data (e.g., how often the air quality is dangerous throughout the year, on average). However, current residents require much more refined data pertaining to the specific days and even hours when outdoor activities are not recommended.

In terms of fostering effectiveness, Weil et al. (2006) recommended matching the granularity of the data to the aggregation capabilities of its users. For instance, the TRI “per factory” format is deemed ineffective, as it greatly increases users’ information costs, to the point of risking “information overload” by forcing them to process large amounts of data, even if they are merely interested in simple cross-sectional cuts (Bae et al., 2010). By contrast, the A–C hygiene rating functions as a useful heuristic for consumers who are generally uninterested in the specifics of any grade breakdown. Nonetheless, a high-level aggregation does not guarantee success: the PROPER colour scheme, for example, has actually failed to engage local communities, largely because of their general indifference to environmental considerations (Lee, 2010).

⁴ Program for Pollution Control, Evaluation and Rating

Provision Criteria

This category includes various aspects of the disclosure process that relate to the availability and accessibility of disclosed information.

Timeliness

The timing of disclosure is another crucial aspect determining its overall effectiveness (Weil et al., 2006). While the previously discussed criterion of temporal granularity refers to the level of aggregation of information over time, timeliness refers to when information is released to the public relative to an event. To use the example of air quality, timeliness means the extent to which disclosure is compatible with a decision deadline. For instance, a weekend report that air quality is going to be dangerously low next week generally allows enough time for residents to make informed decisions, whereas daily reports may not allow enough preparation time. A good example for time-incompatible data is the disclosure of workplace hazards in some U.S. industries only after employees have accepted job offers (Weil et al., 2006). Timeliness is largely determined by how long it takes for data to be made available. For instance, China's air quality network (World Air Quality Index, 2016) provides real-time data and is generally viewed as timely.

Accessibility

Information should also be compatible with where users make their decisions. A salient example is whether data are available solely in printed form or also online. For instance, potential buyers of property whose quality of life might be affected by air pollutants may be better informed through government and real estate websites than by hard-copy information, which typically can only be obtained by visiting a bureau. Likewise, window stickers on cars that inform potential buyers about fuel economy and signs in restaurants about hygiene ratings are highly accessible because they are readily available to customers where they make their decisions (Weil et al., 2006).

PHASE 2: MAPPING CURRENT REGIMES

Scope of Work

Provinces and Issue Areas Covered

Since the beginning of the fracking "revolution" (Cahoy, Gehman, & Lei; 2013), thousands of wells have been drilled and fractured across North America. In Canada, hydraulic fracturing is currently being used by companies in four provinces: Alberta (Government of Alberta, 2015), British Columbia (Government of British Columbia, 2013), Manitoba (DEL Communications, 2014) and Saskatchewan (Herald, 2015). Exploratory wells have been drilled, and licenses issued in several others, including the Northwest Territories (Council of Canadians, 2013).

While the severity of risks related to fracking remains contested, likely impacts include water consumption (AER, 2011), water contamination (Jackson et al., 2013; Warner, Christie, Jackson, & Vengosh, 2013), induced seismicity (Davies, Foulger, Bindley, & Styles, 2013; Rutqvist, Rinaldi, Cappa, & Moridis, 2013), and other stressors that can impact physical and mental health (Adgate, Goldstein, & McKenzie, 2014; Colborn, Kwiatkowski,

Schultz, & Machran, 2011). These issue areas reflect the top concerns related to fracking according to interviews and recent independent research (Hays and Shonkoff, 2016).

Reports on fracking technology have almost universally advocated increased monitoring and data collection to better assess these risks (British Geological Society, 2016; Myers, 2012; Rahm & Riha, 2014). In response to these concerns, New Brunswick (Government of New Brunswick, 2014), Quebec (Vendeville, 2014), Nova Scotia (Government of Nova Scotia, 2014), and the Yukon (Yukon Legislative Assembly, 2015) have placed moratoriums on fracking operations while more research is conducted.

Therefore, in the following analysis, we describe public disclosure regimes for information related to fracking only in the jurisdictions that currently allow the use of this technology: Alberta, British Columbia, Manitoba and Saskatchewan. Our analysis focuses on the following issues: (a) water consumption; (b) water contamination; (c) induced seismicity; and (d) quality of life.

Water Consumption

Fracking operations consume little water relative to Canada's total annual water flows (Council of Canadian Academics, 2014; Canadian Water Network, 2015; Goss et al., 2015). However, this consumption often occurs over a short period of time—generally weeks or months—potentially impacting water supply, particularly in “low-flow” areas during peak times of the year (Council of Canadian Academics, 2014; Canadian Water Network, 2015; Goss et al., 2015). Some provinces have begun to address water consumption concerns related to fracking by requiring operators to submit fracturing fluid reports, which contain information about the volume of water injected at each stage of fracking (AER, 2012; BCOGC, 2012). By either cross-referencing this information with the type of water license held by the operator, or requiring this information to be provided directly, regulators are able to determine the water sources used and can track water consumption by fracking operations across the province.

Water Contamination

Fracking operations have the potential to contaminate ground and surface water sources in two primary ways: (a) when fracturing fluid composed of water, sand and other chemicals enters ground water sources through improperly cased (i.e., sealed) wells; or (b) when “flowback fluid” that returns to the surface is not properly treated or disposed of in deep waste disposal wells or stored in above-surface ponds. Some provinces have begun to address water contamination by the former process by requiring operators to submit fracturing fluid reports, which contain information about the composition of the fracturing fluid injected into wells, including chemicals and proppants used (AER, 2012; BCOGC, 2012).⁵ Saskatchewan has addressed risks associated with the latter process by requiring operators to submit flowback fluid disposal reports to the regulator (SEMPDB, 2000).

⁵ Note that chemical components are sometimes considered to be confidential business information or “trade secrets” according to federal legislation. In such cases, operators may request an exemption from disclosing this information to the regulators, in accordance with the *Hazardous Material Information Review Act* (BCOGC, 2012).

Induced Seismicity

The process of injecting fluids into oil and gas wells at high pressure has been found to induce seismic activity, although it is not well understood how (Weber, 2016). While these earthquakes are generally small, a number of large earthquakes have resulted from fracking operations (BCOGC, 2015). In order to address this issue, Alberta now requires operators to monitor and report seismic activity of a particular magnitude within a certain distance from fracking operations in a particular area (AER, 2015); British Columbia simply asks operators to report seismic activity near fracking operations, but does not require active monitoring (Government of British Columbia, 2010). The federal government also operates a series of seismic monitoring systems across the country, sometimes in conjunction with provincial bodies (NRC, 2016).

Quality of Life

Oil and gas operations, including fracking related activities can cause temporary quality of life disturbances for those residing nearby, including noise pollution created by drilling and equipment, decreased air quality from increased industrial activity and decreased water quality from contamination caused by chemicals found in fracking fluids and improper disposal of flowback fluid (Ernst & Young, 2014). Some provinces require operators to monitor noise, air and water pollution near drilling operations, although this is generally done through general legislation that does not differentiate among noise, air and water pollution arising from general drilling operations and fracking operations, specifically (AER, 2007). Both the federal government and provincial governments also jointly monitor these types of disturbances through a system of air and water monitoring stations located across the provinces.

Additional Scope Conditions

While examining the disclosure regimes related to these issue areas in Alberta, British Columbia, Manitoba and Saskatchewan, we were primarily concerned with information generally accessible to the public as a whole. In some cases, information is released to specific groups (e.g., nearby residents) as part of general consultation and notification requirements, and not in order to satisfy public disclosure requirements. For example, with regard to oil and gas operation applications and permits, it is likely that information about planned fracking operations would be disclosed only to specific groups as part of consultation and notification requirements. However, as it is not possible to comprehensively survey the information disclosed through this process, we excluded it from our methodology.

Relatedly, we only captured regulations that require operators to disclose information to regulators or regulators to disclose information to the public *proactively*. That is, it is certainly possible—in fact likely—that regulators can request additional information about fracking operations from operators, and that the public may request additional information about fracking operations from regulators through access to information requests. Again, as it is not possible to comprehensively survey the information available through this reactive process, we excluded it from our methodology.

Further, we were only concerned with regulations or reporting requirements explicitly or exclusively related to hydraulic fracturing, as opposed to general regulations or reporting requirements under which fracking would likely be subsumed. For example, we were interested in specific fracturing fluid disposal reporting requirements, but not general oil and gas waste regulations that do not differentiate between general oil waste

disposal and flowback fluid disposal. In such cases, there is no way for the public to differentiate between information related specifically to hydraulic fracturing, and that related to general oil and gas operations.

Additionally, and in conjunction to the previous scope condition, we only examined regulations requiring operators to disclose information about the identified issue areas, and the portion of that information the regulator discloses to the public. In many cases, the provinces, in conjunction with the federal government and municipalities, monitor issues including seismic activity, water and air quality. Again, in such cases there is no way to differentiate between monitoring related to fracking, and that related to other health and environmental monitoring.

Provincial Oil and Gas Regulation in Canada

Regulatory Regimes

In Canada, provinces have primary jurisdiction over natural resources. This means that provincial governments (as opposed to the federal government) are responsible for governing natural resource extraction, including oil and gas development, through provincial acts and regulations. Whereas acts concerning oil and gas development establish general legal frameworks within which development must proceed, regulations are more specific in nature and are designed to administer, operationalize and implement aspects of these general frameworks.

In Alberta and British Columbia, the provincial legislatures may pass regulation pertaining to oil and gas activity, but have also delegated responsibility for creating regulations designed to administer, operationalize and implement all aspects of acts related to oil and gas development to single, independent regulatory bodies (Government of Alberta, 2012; Government of British Columbia, 2008). Conversely, in Manitoba and Saskatchewan, different government ministries are responsible for creating regulations designed to administer, operationalize and implement different aspects of acts related to oil and gas development.

Table 1: Oil and Gas Regulatory Regimes in Surveyed Provinces

Province	Regulatory Regime	Drilling	Water Use	Environment
Alberta	Single regulator	Alberta Energy Regulator		
British Columbia	Single regulator	British Columbia Oil and Gas Commission		
Manitoba	Multiple regulators	Manitoba Mineral Resources	Manitoba Water Stewardship	Manitoba Conservation and Water Stewardship
Saskatchewan	Multiple regulators	Saskatchewan Ministry of the Economy	Saskatchewan Water Security Agency	Saskatchewan Ministry of the Environment

Oil and Gas Information Disclosure

Despite different regulatory regimes, public information disclosure related to oil and gas operations occurs through the same two-step process across the surveyed provinces. This two-step information disclosure process is applicable

to all aspects of oil and gas operations, including fracking, and centrally involves operators, designated regulatory bodies or government ministries (“regulators”), and the public. It occurs as follows:

1. *Operator-to-regulator*: Operators disclose information about aspects of operations to regulators in accordance with requirements found in regulations.
2. *Regulator-to-public*: Regulators disclose information received from operators to the public either in accordance with requirements found in regulations, or voluntarily.

As this process suggests, regulators act as intermediaries between operators and the public. They create regulations that require operators to disclose information about aspects of fracking operations in accordance with acts related to oil and gas development, and then determine which information received from operators to disclose to the public. In some cases, regulations include provisions that require the regulators to disclose this information to the public; in others, regulators do so voluntarily.

Methodology

Data Collection

Drawing on the theoretical framework developed in the previous section, we performed a high-level survey of the oil and gas regulatory regimes and broad information disclosure processes found in Alberta, British Columbia, Manitoba and Saskatchewan. We then designed a research methodology to identify information disclosure requirements related to fracking operations that reflect the differing regulatory regimes and the two-step information disclosure process.

Addressing the first (i.e., operator-regulator) step in information disclosure process, we systematically examined: (a) acts related to oil and gas development enacted by provincial governments in the surveyed provinces, and (b) regulations designed to administer, operationalize and implement these acts for provisions requiring operators to disclose information about aspects of fracking operations. Search terms included *frac-* combined with *report*, *submit*, *disclos-*, or *inform-*.

Addressing the second (i.e., regulator-to-public) step in the information disclosure process, we repeated the methodology adopted for the first step, but examined acts and regulations for provisions requiring regulators to disclose information about aspects of fracking operations. To identify which information related to fracking operations regulators disclose voluntarily, we then comprehensively examined regulator websites for public reports, information tools and databases for information related to fracking.

Data Aggregation

After identifying relevant acts and regulation, we constructed detailed tables noting the process and type of disclosure requirement for each of the identified issue areas in each of the surveyed jurisdictions. The organization of these tables corresponds to the two phases of disclosure (i.e., operator-to-regulator and regulator-to-public), as well as the theoretical framework developed in the first phase. We excluded “accessibility” from the first phase of disclosure, as the system used by operators to disclose information to the regulator was irrelevant to our ultimate focus on public disclosure. We also added a column titled “source of requirement,” which specifies the origin of the

focal regulation item (for instance, the *Oil and Gas Activities Act General Regulation*). In the next section, we present these tables and include brief explanations of each according to the covered jurisdictions.

Findings

Alberta

In Alberta, the Alberta Energy Regulator (AER) is the regulatory body responsible for creating regulations designed to administer, operationalize and implement all aspects of acts related to oil and gas development. A specific section of *Directive 059: Well Drilling and Completion Data Filing Requirements* requires operators to regularly report on fracking activities (including water consumption and fracturing fluid composition) to the AER, but not directly to the public. After gathering this information, the AER decides which information to disclose to the public.⁶ As is shown in Table 2, this disclosure occurs exclusively on a voluntary basis, including for fracturing fluid composition.⁷

British Columbia

In British Columbia, the BC Oil and Gas Commission (BCOGC) is the regulatory body responsible for creating regulations designed to administer, operationalize and implement all aspects of acts related to oil and gas development. The *Oil and Gas Activities Act Drilling and Production Regulation* requires operators to disclose information related to fracking activities (again, including water consumption and fracturing fluid composition) to the BCOGC.⁸ After gathering this information, the BCOGC decides which information to disclose to the public. As shown in Table 3, the BCOGC discloses a range of information related to fracking to the public on a voluntary basis, and according to regulation, is required to do so for water consumption and fracturing fluid composition (Government of British Columbia, 2010a).

⁶ In Alberta, the AER has stated that “non-compliant” events related to general oil and waste containment, treatment and disposal, and quality of life are reported online on the compliance dashboard website. However, there were no returns on a search of “frac-” under “compliance and enforcement,” which makes it unclear whether a “non-compliant event” was related to hydraulic fracturing. Moreover, from an information disclosure perspective, there is a significant difference between disclosing both compliant and non-compliant events, and just non-compliant events. In our opinion, if regulators are not disclosing both compliant and non-compliant events they are not reporting at all.

⁷ In Alberta, section 12.150 of the *Oil and Gas Conservation Rules* requires the AER to “make available to the public...information regarding hydraulic fracturing fluids used in operations at any well.” However, the wording of this provision suggests that the regulator must make this information available to the public through access to information requests, not that the regulator must publish that information proactively. Based on this interpretation, proactive disclosure of fracturing fluid reports by the AER (via FracFocus), is classified as voluntary. Conversely, proactive disclosure of fracturing fluid reports by the BCOGC (via FracFocus) in British Columbia is classified as legally required, as regulation states the Commission “must publish [fracturing fluid records] as soon as practicable after receiving those records and reports.”

⁸ Note that while operators are required to report measured seismic activity of a particular magnitude to the regulator, there are no actual regulations that require operators to measure seismic activity in the first place.

Table 2: Fracking Disclosure in Alberta

Issue Area	Operator-to-Regulator				Regulator-to-Public				
	Source of Requirement	Content		Provision	Source of Requirement	Content		Provision	
		Comprehensibility	Granularity	Timeliness		Comprehensibility	Granularity	Timeliness	Accessibility
Water Consumption	<i>Directive 059: Well Drilling and Completion Data Filing Requirements 2.4; 4.3.2</i>	Volume of water injected by operator for fracking	By well (per fracture stage)	Within 30 days of conclusion of operations	Voluntary	Volume of water injected by operator for fracking	By well (total)	By discretion (in practice, immediately)	Online (FracFocus Website)
Water Contamination									
<i>Fracturing Fluid Composition</i>	<i>Directive 059: Well Drilling and Completion Data Filing Requirements 2.4; 4.3.1</i>	Percent composition by mass of fracturing ingredients	By well (per fracture stage)	Within 30 days of conclusion of operations	Voluntary	Percent composition by mass of fracturing ingredients	By well (total)	By discretion (in practice, immediately)	Online (FracFocus Website)
<i>Fracturing Fluid Disposal</i>	There are no regulations that require operators to report and disclose information related to fracturing fluid containment, treatment and disposal specifically. Instead, fracturing fluid constitutes "oil and gas waste", and reporting and disclosure requirements are found in general regulation, including <i>Directive 050: Drilling Waste Management</i> , <i>Directive 055: Storage Requirements for the Upstream Petroleum Industry</i> , and <i>Directive 058: Oilfield Waste Management Requirements of the Upstream Petroleum Industry</i> .								
Induced Seismicity	<i>Subsurface Order No. 2 (2(b)(c)(e))</i>	Magnitude of seismic event	By event of magnitude 2 or greater within 5 kilometers of fracking operations	Immediately	Voluntary	Magnitude of seismic event	By event of magnitude 2 or greater within 5 kilometers of fracking operations	By discretion (in practice, immediately)	Online (Compliance Dashboard Website)
Quality of Life									
<i>Noise Pollution</i>	There are no regulations that require operators to report and disclose information related to noise pollution caused by fracking operations specifically. Instead, noise pollution reporting and disclosure requirements are found under general regulation for all drilling activity, specifically <i>Directive 038: Noise Control</i> .								
<i>Air Pollution</i>	There are no regulations that require operators to report and disclose information related to air quality around fracking operations specifically. Instead, air quality, including near all types of drilling activity is monitored by various national, provincial and municipal bodies.								
<i>Water Quality</i>	There are no regulations that require operators to report and disclose information related to water quality near fracking operations specifically. Instead, water quality, including near all types of oil and gas operations, is monitored by various national, provincial and municipal bodies.								

Table 3. Fracking Disclosure in British Columbia

Issue Area	Operator-to-Regulator				Regulator-to-Public				
	Source of Requirement	Content		Provision	Source of Requirement	Content		Provision	
		Comprehensibility	Granularity	Timeliness		Comprehensibility	Granularity	Timeliness	Accessibility
Water Consumption	<i>Oil and Gas Activities Act Drilling and Production Regulation 37(1); 37(2)</i>	Volume of water injected by operator for hydraulic fracturing	By well (per fracture)	Within 30 days of completion of well operations	<i>Oil and Gas Activities Act General Regulation 17.1(1)(a); 17.1(2)</i>	Volume of water injected by operator for hydraulic fracturing	By well (per fracture)	As soon as practical upon receipt (in practice, immediately)	Online (FracFocus Website)
					Voluntary	Volume of water injected by all operators	By province/ license type/water basin (per year)	By discretion	Online (BCOGC Website)
Water Contamination									
<i>Fracturing Fluid Composition</i>	<i>Oil and Gas Activities Act Drilling and Production Regulation 37(1); 37(2)</i>	Percent composition by mass of fracturing ingredients	By well (per fracture)	Within 30 days of completion of well operations	<i>Oil and Gas Activities Act General Regulation 17.1(1)(a); 17.1(2)</i>	Percent composition by mass of fracturing ingredients	By well (per fracture)	As soon as practical upon receipt (in practice, immediately)	Online (FracFocus Website)
<i>Fracturing Fluid Disposal</i>	There are no regulations that require operators to report and disclose information related to fracturing fluid containment, treatment and disposal specifically. Instead, fracturing fluid constitutes “oil and gas waste,” and reporting and disclosure requirements are found in general regulation, such as the <i>Oil and Gas Waste Regulation</i> .								
Induced Seismicity	<i>Oil and Gas Activities Act Drilling and Production Regulation 21.1(1)</i>	Magnitude of seismic event	By event of magnitude 4 or greater within 3 kilometres of fracking operations	Immediately	Voluntary	Magnitude of seismic event	By event of magnitude 4 or greater within 3 kilometres of fracking operations	By discretion	Online (BCOGC Website)
Quality of Life									
<i>Noise Pollution</i>	There are no regulations that require operators to report and disclose information related to noise pollution caused by fracking operations specifically. Instead, noise pollution reporting and disclosure requirements are found under general guidelines for all drilling activity, specifically the <i>British Columbia Noise Control Best Practices Guidelines</i> .								
<i>Air Pollution</i>	There are no regulations that require operators to report and disclose information related to air quality around fracking operations specifically. Instead, air quality, including near all types of drilling activity, is monitored by various national, provincial and municipal bodies.								
<i>Water Quality</i>	The BCOGC requires water quality testing on a case-by-case basis through licensing conditions. No information is available on the specific content of these conditions, including the granularity and comprehensibility of the content that operators must provide to the commission, nor the proactivity or timeliness of its disclosure.								

Manitoba

Unlike in Alberta and British Columbia, where all aspects of oil and gas activities are regulated by a single body, in Manitoba oil and gas development is regulated by several different bodies. The Petroleum Branch of Manitoba Mineral Resources (PBMMR) is the central body responsible for administering energy resource legislation (including the *Oil and Gas Act*) and creating regulations designed to administer, operationalize and implement specific aspects of acts related to oil and gas development. Other ministries address water use and environmental standards related to oil and gas development. Unlike in Alberta and British Columbia, there are no specific hydraulic fracturing-related regulations or provisions found in general legislation. Given the absence of any provisions related explicitly to hydraulic fracturing, it is unclear what information about hydraulic fracturing, if any, operators are required to disclose to the PBMMR. It does not appear that the PBMMR discloses any information to the public on a voluntary basis, nor is it required to do so by applicable legislation or regulation.

Saskatchewan

As in Manitoba, oil and gas development is regulated by several different bodies in Saskatchewan. The Petroleum and Natural Gas Division (PNGD) of the Ministry of Energy and Resources is the central body authorized to administer the *Oil and Gas Conservation Act* and create regulations designed to administer, operationalize and implement specific aspects of acts related to oil and gas development. Other ministries address water consumption and environmental standards related to oil and gas development. Saskatchewan has only one directive related explicitly to hydraulic fracturing and the issue of fracturing fluid disposal. *Information Guideline GL 2000-01: Saskatchewan Hydraulic Fracturing Fluids and Propping Agents Containment and Disposal Guidelines* requires operators to report on fracturing fluid disposal to the PNGD.⁹ The PNGD does not voluntarily disclose information gathered from operators on fracturing fluid disposal to the public, nor is required to do so by applicable legislation or regulation.

⁹ It is unclear if operators are required to disclose fracturing fluid composition in accordance with this regulation, and if so, where this requirement comes from. According to correspondence with one employee of the regulator in Saskatchewan (see Appendix), operators are not required to submit fracturing fluid composition information. However, according to correspondence with another employee, operators are required to provide the regulator “with fluid disclosure documentation.” It is unclear what information is included as part of “fluid disclosure documentation.” For example, one employee stated that operators are required to disclose the volume of water injected for fracking, but Form A-2 only includes volume of flowback water. The timeliness of the disclosure of fracturing fluid disposal is also unclear. According to 1.1 of *Information Guideline GL 2000-01*, “operators are required to submit Form A-2: Notification Of Flowback Fluid And Frac Sand Disposal no later than 48 hours after the disposal of the flowback fluid and/or frac sand.” However, one employee of the regulator stated that operators are required to submit the Form A-2 within 30 days of treatment.

Table 4: Fracking Disclosure in Manitoba

Issue Area	Operator-to-Regulator				Regulator-to-Public				
	Source of Requirement	Content		Provision	Source of Requirement	Content		Provision	
		Comprehensibility	Granularity	Timeliness		Comprehensibility	Granularity	Timeliness	Accessibility
Water Consumption	There are no regulations that require operators to report and disclose information related to water consumption by fracking operations. As a result, regulators have no information to disclose to the public.								
Water Contamination									
Fracturing Fluid Composition	There are no regulations that require operators to report and disclose information related to fracturing fluid composition. As a result, regulators have no information to disclose to the public.								
Fracturing Fluid Disposal	There are no regulations that require operators to report and disclose information related to fracturing fluid containment, treatment and disposal specifically. Instead, fracturing fluid constitutes "oil and gas waste," and reporting and disclosure requirements are found in general regulation applicable to all oil and gas activities.								
Induced Seismicity	There are no regulations that require operators to monitor and report on induced seismicity near fracking operations. Instead, national and provincial governmental bodies operate seismic monitoring stations across the province and report on seismic events.								
Quality of Life									
Noise Pollution	There are no regulations that require operators to report and disclose information related to noise pollution caused by fracking operations specifically. Instead, noise pollution reporting and disclosure requirements are found under general regulation for all drilling activity.								
Air Pollution	There are no regulations that require operators to report and disclose information related to air quality around fracking operations specifically. Instead, air quality, including near all types of drilling activity is monitored by various national, provincial and municipal bodies.								
Water Quality	There are no regulations that require operators to report and disclose information related to water quality near fracking operations specifically. Instead, water quality, including near all types of oil and gas operations, is monitored by various national, provincial and municipal bodies.								

Table 5: Fracking Disclosure in Saskatchewan

Issue Area	Operator-to-Regulator				Regulator-to-Public				
	Source of Requirement	Content		Provision	Source of Requirement	Content		Provision	
		Comprehensibility	Granularity	Timeliness		Comprehensibility	Granularity	Timeliness	Accessibility
Water Consumption	There are no regulations that require operators to report and disclose information related to water consumption by fracking operations. As a result, regulators have no information to disclose to the public.								
Water Contamination									
Fracturing Fluid Composition	There are no regulations that require operators to report and disclose information related to fracturing fluid composition. As a result, regulators have no information to disclose to the public.								
Fracturing Fluid Disposal	Information Guideline GL 2000-01: Saskatchewan Hydraulic Fracturing Fluids and Propping Agents Containment and Disposal Guidelines 1.1	Method of containment, disposal and treatment of flowback fluid and fracturing sand	By well (per fracture stage)	Within 48 hours of disposal	There are no specific regulations that require regulator-to public disclosure of information about fracturing fluid disposal.				
Induced Seismicity	There are no regulations that require operators to monitor and report on induced seismicity near fracking operations. Instead, national and provincial governmental bodies operate seismic monitoring stations across the province, and report on seismic events.								
Quality of Life									
Noise Pollution	There are no regulations that require operators to report and disclose information related to noise pollution caused by fracking operations specifically. Instead, noise pollution reporting and disclosure requirements are found under general regulation for all drilling activity.								
Air Pollution	There are no regulations that require operators to report and disclose information related to air quality around fracking operations specifically. Instead, air quality, including near all types of drilling activity is monitored by various national, provincial and municipal bodies.								
Water Quality	There are no regulations that require operators to report and disclose information related to water quality near fracking operations specifically. Instead, water quality, including near all types of oil and gas operations, is monitored by various national, provincial and municipal bodies.								

PHASE 3: ASSESSMENT AND SUMMARY

In this section, we synthesize our findings from the previous phases with extant theory and empirical evidence in order to assess the effectiveness of public information disclosure related to fracking in Canada. Specifically, we examine which aspects of the disclosure regime, if any, are effective, using the criteria identified in the first phase of this report. We include suggestions as to how to improve the effectiveness of public information disclosure regimes in the context of fracking operations.

To recap, we identified that information disclosure related to fracking in Canada occurs in a two- step process: first, operators report to a regulatory body (e.g., the BCOGC); and second, the regulator discloses aspects of this information to the public, most often via a website or online database (e.g., FracFocus.ca). Although we focus on the second step, we begin by commenting on operator-to-regulator disclosure, as we recognize that this is the sole source of information on which regulators can draw to provide to the public.

Operator-to-Regulator Disclosure

Level of Regulation Varies by Province

While we refrained from evaluating the effectiveness of existing operator-to-regulator disclosure, as it is outside the scope of our work, we did identify that where current regulation does exist, it seems to enable information processed to satisfy the needs and capacities of the public. By this logic, we found regulations related to operator-to-regulator disclosure of fracking information to be satisfactory in Alberta and British Columbia and lacking in Manitoba and Saskatchewan.

However, even in Alberta and British Columbia, additional fracking-specific regulation requiring operators to monitor and disclose information related to, for example, air and noise pollution near fracking operations could improve the comprehensiveness of information ultimately provided to the public by the regulators. In Manitoba and Saskatchewan additional work is necessary to establish operator-to-regulator disclosure practices that form the foundation for public information disclosure.

Regulator-to-Public Disclosure

Overall Lack of Regulation

When we examined the framework surrounding the dynamics of regulator-to-public disclosure, we found a general lack of specific legislation requiring regulators to publicly disclose information they receive from operators. In fact, only two such pieces of legislation exist, and both are found in British Columbia (see Table 3). The first step towards improving effectiveness would be to more forcefully regulate the proactive disclosure of this information to the public. This will ensure that the public does not need to rely on voluntary initiatives, such as access to information requests, in order to be aware of any issues related to fracking. To this end, provinces should begin an orderly process of identifying which information is most pertinent to the public based on the relative salience of each of the identified issue areas. However, we also recognize that for some issues (e.g., air and water pollution), existing disclosure regulations that are not specific to fracking may be sufficient to the extent that the public is indifferent to the specific sources of pollution.

Public Disclosure Should Consider Public Capacities

We found the information that is publicly disclosed by regulators, whether involuntarily or voluntarily (see Tables 2 and 3, for example), to be largely incompatible with the needs and capacities of ordinary citizens. We stress that whereas the regulators' information needs relate mostly to inspecting and controlling the industry, members of the public require information that will allow them to make informed health-related decisions (Weil et al., 2006). In accordance with our theoretical framework, we suggest ways to improve the effectiveness of regulator-to-public information disclosure in terms of provision (specifically, accessibility and timeliness) and content (specifically, granularity and comprehensibility). We also provide an example of a best practice that satisfies all four of these criteria and could be used as a model for public disclosure of fracking information.

Provision: Accessibility

Fine-grained information should be freely disclosed to enable interested individuals and organizations to generate analyses based on their own needs and risk perceptions. These “data dumps” will be largely unintelligible in their raw form but will allow super-users to synthesize them in various formats. Of course, these data should be provided in easily portable bulk format, rather than as assemblages of files that necessitate individual human coding. We support the use of websites such as FracFocus.ca, BCOGC.ca, AER.ca and other online resources, which reduce users' information costs compared to requesting information either through access to information requests or in person.

Provision: Timeliness

Timeliness should be specified in regulations, as there is currently insufficient specificity regarding how promptly regulators must make information accessible to the public.

Content: Granularity

In parallel with the provision of raw data, provincial authorities should also aggregate data for direct public consumption. For example, instead of reporting fracturing fluid composition or water consumption for fracking operations by well, data could be aggregated perhaps by region and annually. We do recognize this exists in British Columbia for water consumption by fracking operations, and we applaud the regulator for implementing this best practice. We nevertheless stress that high-level aggregation is no panacea, as it comes at the expense of flexibility in further processing. As with other aspects of public disclosure, an appropriate balance must be consciously sought.

Content: Comprehensibility

In terms of comprehensibility, even an aggregated form of presentation may leave users who wish to be informed on health-related risks frustrated. For example, data pertaining to water consumption could be presented in a more comprehensible manner, such as by using an overall local water availability risk index or perhaps merely through comparisons to past water extraction volumes. Content should be provided in a format that does not require technical expertise to process. To summarize, authorities must recognize that simply making data available online is

not enough. Provisions that will facilitate flexible processing and transformation into meaningful information must be established as well.

Best Practice

The World Air Quality Index (2016) website (www.waqi.info) is a good example of a best practice that satisfies all four criteria. In terms of accessibility, albeit not downloadable, the data are made readily available using a simple online point-and-click interface. In terms of timeliness, the data are posted online within hours. In terms of granularity, the data are provided by city for hundreds of cities around the world. Finally, in terms of comprehensibility, the website provides not only simple assessments based on color schemes and one-word verbal adjectives (e.g., “good,” “moderate,” “unhealthy,” etc.), but also provides richer and more scientific data pertaining to temperature, pressure and humidity. In short, www.waqi.info adopts the perspective of the average user, making it highly effective in informing the public about air related health risks. We recommend similar design principles for public disclosure on fracking.

Increase Disclosure Despite Scientific Uncertainty

Finally, we stress that as is typical with environmental contexts, there is a need to improve public disclosure of fracking-related information *before* the severity of environmental and health impacts have been fully identified. The public has a fundamental right to be informed of potential risks (Benneer & Olmstead, 2008; Florini, 2007; Gupta, 2008), regardless of whether indisputable scientific links have been found. We therefore suggest adopting a precautionary approach that promotes public awareness even in the absence of scientific certainty. We realize, however, that the less clarity there is on any given environmental issue, the more obscure public disclosure of related information is likely to become. Under our limited scope, we cannot suggest any clear solution to this dilemma; we suffice by making it explicit.

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APPENDIX: REGULATOR RESPONSES

We sent the final draft of this report to regulators in each of the four provinces in April 2016 for review and feedback. By May 13, 2016, we had received a response from the regulators in Alberta and Saskatchewan, which appear below. Our findings are generally in accord with these responses. Where we stood corrected, we modified our draft report and these corrections appear in the final report. Where we disagreed with the commentary, we noted the discrepancies in footnotes. We thank the regulators in Alberta and Saskatchewan for their efforts.

Alberta Energy Regulator

April 29, 2016

Joel Gehman, Assistant Professor

University of Alberta

E-mail: jgehman@ualberta.ca

Re: Academic Survey of hydraulic fracturing related information disclosure practices in Canada

Dear Professor Gehman,

Thank you for the opportunity to review the draft report. This research helps to advance the conversation and provides valuable information to the AER as it improves public disclosure practices.

Your report comes at an opportune time because the AER is in the midst of efforts to publicly disclose more information related to hydraulic fracturing. As part of the 2016-2019 strategic plan the AER is targeting public disclosure of all water use by industry source, including hydraulic fracturing.

The AER is also working closely with the British Columbia Oil and Gas Commission to harmonize hydraulic fracturing incident reporting. In addition, a number of AER projects such as the New Activity Life-Cycle Approach (NALA) and Area Based Regulation (ABR) are seeking innovative ways to disclose information to stakeholders.

In your initial inquiry, you had asked for the AER to review the report and verify that the AER's hydraulic fracturing disclosure practices were portrayed accurately. That review is now complete. During the review, AER staff noted that the scope of the research precluded the inclusion of many on-going AER disclosure practices related to hydraulic fracturing activities. The AER considers these to be key components of overall public disclosure, and some of the relevant practices are discussed below:

- Public disclosure of any hydraulic fracturing activities non-compliant with any AER requirements. This information is disclosed on the AER's Compliance Dashboard.
- Disclosure of hydraulic fracturing information on a per-request basis e.g., information product orders, tour reports, or freedom of information requests. This disclosure is mandated by legislation governing the AER.
- The AER's regulatory change report provides a weekly disclosure of any regulatory initiatives being considered by the AER including those related to hydraulic fracturing.
- The AER's Public Notice of Application Tool and the AER's Public Decision Tool provide web based access to information on energy applications, including those related to hydraulic fracturing. This disclosure is mandated by legislation governing the AER.
- The AER has also produced a number reports on the risks associated with hydraulic fracturing. Efforts to enhance the scientific knowledge are essential complements to any disclosure programs. The AER makes this information accessible to lay audiences (See AER Youtube Video on Drilling and Hydraulic Fracturing in Alberta).

In addition to the above disclosure practices, AER reviewers also noted a few factual errors that we recommend correcting before submitting the final paper:

- The summary table on Fracturing Disclosure in Alberta (see page 18 of the report) references incorrect information. These errors have been highlighted on the attached excel spreadsheet.
- On page 16 the report refers to the AER as the “Commission” this should be corrected to appropriately to reference the AER i.e., the Regulator.
- On page 10, the report conveys that regulators determine disclosure of water by “cross referencing” fracturing fluid reports. This is not the case at the AER, rather operators are required to disclose water sources during application and permitting process.

The AER was also asked to comment on the report’s conclusions and recommendations. Generally the AER is supportive of the conclusions reached by the report authors. However, the AER believes the information in this letter indicates that the AER’s disclosure practices are more expansive and robust than the scope of the academic report suggests.

We thank you again for providing us the opportunity to review the draft the report. If you would like to discuss the AER’s review, please contact Benn Proctor (AER Regulatory Analysts) at 403-297-3526.

Sincerely,

Kevin Parks, Ph.D., P. Geol.

Chief Geologist and VP Reserves and Resources

Attachments: “AER comments on Gehman Report Table 3” (Excel Spreadsheet)

Saskatchewan Ministry of the Economy

April 29th 2016

From: "Easterby, Chad ECON" <Chad.Easterby@gov.sk.ca>
Date: April 29, 2016 at 4:35:06 PM EDT
To: "samuel.ruderman@mail.mcgill.ca" <samuel.ruderman@mail.mcgill.ca>
Cc: "Westerman, Debby ECON" <Debby.Westerman@gov.sk.ca>, "Schmidt, Thomas ECON" <Thomas.Schmidt@gov.sk.ca>
Subject: RE: Academic survey of fracking related information disclosure practices in Canada

Sam,

Saskatchewan has been safely fracking oil and gas wells for over 60 years, with no reported or known issues. While we do not have formal legislation specially for hydraulic fracturing, as it is considered a well treatment, we do, however, have requirements for well treatments including fractured wells.

The Oil and Gas Conservation Regulations, 2012, do not specify hydraulic fracturing for all upstream operations in Saskatchewan; it does cover problems associated with damage caused by hydraulic fracturing. The operator will promptly repair or abandon the well to the satisfaction of the minister, if the repair or abandonment is reasonably necessary to prevent wasteful operations, to protect human health, public safety, property or the environment, or to prevent fire or explosion. Once completed the operator must notify us of any repair work, or if the well has been abandoned. The regulations also cover ground water protection, through proper casing and cementing design, which is a condition of each approved well licence.

Surface water protection is covered by our flow-back guideline, Guideline GL 2000-01: Saskatchewan Hydraulic Fracturing Fluids and Propping Agents Containment and Disposal Guideline. It provides strong flow-back handling, containment, and regulatory disposal guidelines and has been enforced since 2000. All flow-back fluids are captured in a fully closed loop system and the captured flow-back fluids are then disposed of through approved waste management facilities to prevent surface and groundwater contamination. The guideline is accompanied by an A-2 Form: Notification of Flow-back Fluid and Frac Sand Disposal, which must be completed and submitted to the ministry into the online data submission system known as IRIS, within 30 days of the well treatment occurring¹⁰. A detailed fracture treatment report, along with fluid disclosure documentation, is also required within 30 days of the well treatment, and if requested, the operator shall submit further reports and records of the treatment.

All well completion documents are available to the public to review, if requested, as long as the well is past the confidentiality period of 30 days for wells contained within a defined pool, or one year for wells located outside of a defined pool. Access to all non-confidential documentation contained within the well files can be requested through the PNG Service Desk. There is a fee for service; however, academic institutions can acquire a Business Associate ID (BA ID) to access this information from ECON's online data submission site IRIS.

Thank you for this opportunity to address the issues of fracking disclosure in Saskatchewan.

Sincerely,

Chad Easterby
Engineer, Enhanced Oil Recovery
Resource Management Branch

¹⁰ To the best of our interpretation, and according to 1.1 of *GL 2000-01*, "operators are required to submit Form A-2: Notification of Flowback Fluid and Frac Sand Disposal no later than 48 hours after the disposal of the flowback fluid and/or frac sand."

Ministry of the Economy
1000 - 2103 11th Ave
Regina, Saskatchewan, S4P 3Z8
Ph: (306) 787-2600
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Informal email inquiry during research phase:

April 12th 2016
From: "[employee]" <[\[employee.name\]@gov.sk.ca](mailto:[employee.name]@gov.sk.ca)>
Date: April 12, 2016 at 10:05:33 AM EDT
To: Samuel Ruderman <samuel.ruderman@mail.mcgill.ca>
Subject: RE: Frac Report

Hi Samuel,
The current frac reports that are being submitted do contain the water volumes for injection used. And yes that is correct that we are not requiring industry to submit the frac fluid composition.
[employee]