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RESEARCH ARTICLE/ÉTUDE ORIGINALE

Explaining Variation in Oil Sands Pipeline Projects

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Abstract

While the vast majority of oil pipeline projects in Canada have been successfully built, several mega oil sands projects within and passing through Canada have been cancelled or significantly delayed. This article explains why these delays and cancellations have occurred. A systematic cross-case analysis is used to provide insight into the changing politics of oil sands pipelines. Qualitative comparative analysis (QCA) is used to identify combinations of causal conditions that co-occur across cases of proposed new oil pipelines and pipeline expansion projects. The pipeline projects were proposed to the federal regulator—the National Energy Board—between 2006 and 2014. The QCA reveals that social mobilization and major regulatory barrier(s) are necessary conditions in explaining variation in pipeline project outcomes. The analysis of sufficiency reveals more complex configurations of conditions. This article contributes to the literature on the politics of oil sands pipelines by using a comparative approach to identify the impacts of socio-political and legal dynamics that have emerged around pipelines in the last 15 years.

Résumé

Cet article explique les raisons pour lesquelles plusieurs propositions récentes de méga-pipelines à l'intérieur du Canada et passant à travers le pays ont été annulées ou considérablement retardées. Alors que la grande majorité des projets d'oléoducs ont été construits avec succès, plusieurs mégaprojets de sables bitumineux ont été mis de côté ou ont subi des retards importants. L'aperçu donné ici s'appuie sur une analyse croisée systématique et offre un regard sur la politique changeante des pipelines de sables bitumineux. Notre article utilise l'analyse qualitative comparative (AQC) pour identifier les combinaisons de conditions causales qui coexistent entre les cas de propositions de nouveaux oléoducs et de projets d'expansion. Ces projets ont été proposés à l'organisme de réglementation fédéral - l'Office national de l'énergie - entre 2006 et 2014. L'AQC révèle que la mobilisation sociale et les principaux obstacles réglementaires sont des conditions nécessaires pour expliquer la variation des résultats des projets d'oléoducs. L'analyse de la suffisance révèle des configurations de conditions plus complexes. L'article contribue à la littérature sur la politique des pipelines de sables bitumineux en utilisant une approche comparative pour identifier les impacts des dynamiques sociopolitiques et juridiques qui ont émergé au cours des 15 dernières années.

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Mots-clés : politique contentieuse; réglementation de l'énergie; sables bitumineux; oléoducs; analyse qualitative comparative

Pipelines in Canada have had a long and, at times, political history since their initial development in the 1950s. However, oil pipeline infrastructure enjoyed a low profile since the boom of Alberta's oil sands production in the mid-2000s, until around 2010. During this period, several oil pipelines were built relatively expeditiously to keep pace with the increased supply and demand for oil. Although some projects attracted legal challenges or sometimes the odd protest, the regulatory process was largely seen as efficient and predictable by proponents. The nature of pipeline politics in North America has changed significantly and rapidly in the last decade. In recent years, proposed oil sands pipelines have received intense scrutiny from a variety of actors. Oil pipelines, in particular, have attracted significant attention in relation to the issue of climate change, as well as other issues such as spill risks, environmental impacts, socio-economic concerns and infringement on legal rights.

Oil pipelines in North America are now often much more challenging to build due to a host of new socio-political and legal dynamics. Notably, several recent major oil sands pipeline projects within and passing through Canada have been cancelled or significantly delayed. Since 2015, no federally regulated oil sands pipelines have been completed. One oil pipeline project has been cancelled—the Northern Gateway Pipelines (NGP) project—and three projects have been significantly delayed: the Keystone XL Pipeline (KXL), Trans Mountain Expansion Project (TMEP) and the Line 3 Replacement Program (L3R). These three projects have been approved by the federal energy regulator but have not yet been built and face significant delays. This article thus asks: why are some pipelines built while others are cancelled or face significant delays and uncertainty?

This article examines 12 oil pipelines and 6 pipeline capacity expansion projects in and through Canada that have been proposed to the National Energy Board (NEB) since 2006.[1] Through qualitative comparative analysis (QCA), I identify sets of causal conditions that co-occur across cases. QCA can be usefully applied to cases where interactions between conditions and outcomes are not well understood. QCA is part of a broader set-theoretic approach that attempts to model causal relations of necessity and sufficiency (Schneider and Wagemann, 2012: 8).

QCA is well suited to studying pipeline infrastructure because it is a case-based approach that allows for comparative analysis. Infrastructure studies are often either single cases that are rich in detail but do not contribute to patterns that determine outcomes of multiple infrastructure projects or they are large-N studies that identify a pattern but lack the context and richness of case analysis needed to fully explain this trend (Gerrits and Verweij, 2018). QCA strikes a balance by combining insights from case analysis with some level of generalization (Rihoux et al., 2011: 12).

This article contributes to the emerging literature on the politics of oil sands pipelines. Canadian oil sands pipeline campaigns have been overlooked, as

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evidenced in a recent survey of activism against the fossil fuel industry (Cheon and Urpelainen, 2018: 189). Much of the literature on oil sands pipelines is found in legal and constitutional studies (see Bankes, 2018; Lucas and Thompson, 2016; van de Biezenbos, 2019) or is about resistance to specific projects (Bowles and MacPhail, 2017, 2018; Bowles and Veltmeyer, 2014; Veltmeyer and Bowles, 2014; McCreary and Milligan, 2014) or socio-political acceptance of specific projects (Dusyk et al., 2018; Gravelle and Lachapelle, 2015; Gunster and Neubauer, 2019; Wood and Thistlethwaite, 2018). Until recently, this literature has typically focussed on single case studies (exceptions are Hoberg, 2013, 2018; Urquhart, 2019). Missing from this literature is a comparative perspective that identifies common causal conditions across cases. This article addresses this gap by drawing on insights from multiple cases. The article builds on, and adds nuance to, Hoberg's (2013) political risk analysis of oil sands pipeline projects. This article is unique in its focus on pipeline project outcomes.

The article proceeds as follows: Section I provides empirical context for the wave of oil pipeline projects proposed since the mid-2000s. Section II provides theoretical context, drawing on infrastructure studies, social movement and public policy literatures, in order to highlight causal factors relevant for the QCA. Section III outlines the QCA methodology and describes the outcome condition and five causal conditions used in the analysis. Sections IV and V present and discuss the results of the analysis.

I. Oil Pipeline Development in North America

North America's network of oil pipelines began developing in the 1950s. Today several oil transmission pipelines—those that transport oil long distances—connect Canada and the United States, including TransCanada's Keystone Pipeline System and Enbridge's Mainline System. The NEB regulates transmission pipelines that cross provincial or international borders (Canada, National Energy Board, 2019). Beginning in the mid-2000s, the oil industry proposed a series of mega pipelines to transport heavy oil from the Alberta oil sands to export markets. In this section, I briefly review how and why this happened.

Most of Canada's oil exports come from unconventional production in Alberta, as a result of the development of the oil sands. In the early 2000s, the possibilities for the industry were great. Production of heavy oil was rising steeply due to a confluence of favourable economic circumstances, technological innovation and state support (Urquhart, 2018). In 2008, the "moderate growth case" of the Canadian Association of Petroleum Producers (CAPP) projected an increase in crude oil production from 2.7 million barrels per day in 2007 to almost 4.5 million barrels per day in 2020 (CAPP, 2008: i). In the more aggressive scenario "developed for pipeline planning purposes," production would rise to over 5 million barrels per day in 2020 (i).

Since the mid-1980s, the United States has sought increased access to Canadian oil. Canada's oil exports to the United States have increased steadily over the last four decades, with a dramatic rise since 2010. In 2014, Canada's oil exports surpassed those from the entire Organization of the Petroleum Exporting Countries (OPEC) (US Energy Information Administration, 2020a, 2020b). Today, around

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80 per cent of oil produced in Canada is exported to the United States (Canada, Natural Resources Canada, 2020). In short, supply and demand forecasts have been used by pipeline proponents to justify efforts to expand pipeline capacity.

The vast majority of oil from the oil sands is transported to one of five Petroleum Administration for Defense Districts (PADDs) in the United States. The bulk of this oil is sent to PADD 2 in Illinois and the surrounding region, where there is significant storage capacity, before moving to the Gulf Coast (Canada, National Energy Board, 2011; Lucas and Thompson, 2016). More recent pipeline proposals have sought to connect the Bakken Formation in the Midwest and western Canadian crude to eastern Canada. There has also been a push from the oil and gas industry in the last decade to build pipelines to tidewater in Canada on the eastern and western coasts.

In 2006, TransCanada proposed its largest oil pipeline, the Keystone, to transport crude oil to refineries in PADD 2. The same year, Enbridge applied for the first of a series of expansions to its mainline system, in order to supply markets in PADD 2 (Enbridge, 2005). Also in 2006, Kinder Morgan Canada—a subsidiary of Texas-based energy infrastructure company Kinder Morgan, which owns the largest network of gas pipelines in the United States—applied for the first expansion of the Trans Mountain pipeline (Kinder Morgan, 2015). Kinder Morgan had recently acquired the pipeline, which supplies terminals in British Columbia and refineries in Washington State, and proposed the Anchor Loop expansion through Jasper National Park and Mount Robson Provincial Park (Canada, National Energy Board, 2006).

In 2009 and 2010, TransCanada and Enbridge, respectively, applied to the NEB with the Keystone XL and Northern Gateway Pipelines projects. Both projects would lay new pipe where none had previously existed and both sought access to tidewater—Northern Gateway to the coast of northern British Columbia, and the KXL ultimately to the Gulf Coast. In 2011 and 2012, Enbridge proposed two more pipeline projects. In 2013, Kinder Morgan proposed a second expansion to the Trans Mountain project, the TMEP. At around the same time, TransCanada conceived of the Energy East project as a contingency to Keystone XL to carry diluted bitumen from Alberta to New Brunswick (McConaghy, 2017). The most recent oil pipeline application to the NEB, in November 2014, was to replace Enbridge's Line 3 pipeline—in operation since 1968—and restore its capacity in order to supply markets in PADD 2 and eastern Canada. The L3R project was born out of Enbridge's frustration with delays with the US Department of State's approval of a capacity expansion project for an existing line, the Alberta Clipper (Coburn, 2014).

In total, there have been 19 projects proposed to the NEB since 2006 to either construct a new oil transmission pipeline or expand the capacity of an existing line. All of these projects received either approval or a recommendation from the NEB, with the exception of one—the Energy East project—which was cancelled by the proponent before the NEB made a recommendation.[2] Of the projects approved by the NEB, 14 are currently in service, 1 was cancelled (Northern Gateway) and 3 have been significantly delayed and have not yet been built (KXL, TMEP and L3R). This situation is surprising for several reasons.

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First, all four projects that have not (yet) been built appear to have some degree of commercial support, given the existence of contracts or financing arrangements with companies that ship oil on the pipeline. They are also supported by the government of Alberta, although support from other governments has been project- and government-specific. Relatedly, pipeline proponents themselves are well resourced and are often supported by industry associations that lobby on their behalf (see, for example, Graham et al., 2019). Industry actors also make financial contributions to election campaigns and other political activities to garner political support for their projects, including pipelines (see, for example, Graham et al., 2017).

Second, only some of these proposals—including KXL and NGP—require new infrastructure; the L3R and TMEP take advantage of existing infrastructure. It is surprising that projects that can take advantage of existing infrastructure face significant challenges to being built. And third, we might expect countries that are highly dependent on the oil and gas sector—such as Canada—to have strong regulatory institutions designed to reduce transaction costs and increase predictability for project approval. While this might explain why projects are approved in Canada (indeed, it is very unusual for the NEB to reject a project), it does not explain why they are not built. It is less puzzling why projects that cross the border to the United States—the L3R and KXL projects—are recommended by the NEB but not yet built, as they require state-by-state approval, or even presidential approval, as in the case of KXL.[3] However, the outcomes of the NGP and TMEP projects are particularly surprising: the former was cancelled by the federal government after a federal court of appeal case revoked the project's certificate, and the latter was purchased by the same government after the proponent threatened to abandon the project.

II. Theoretical Context

At the core of QCA is an understanding that configurations of conditions, rather than any one condition, are likely to explain case outcomes. This section draws on scholarship on energy infrastructure from several literatures—including infrastructure management, social movements and public policy—to highlight causal factors relevant for the QCA.

Infrastructure management

New transmission pipelines are a type of megaproject. Megaprojects are large-scale, complex ventures that typically cost $1 billion or more (Flyvbjerg, 2017: 2). They also involve many actors and stakeholders, often with conflicting interests, which can create uncertainty for a project (Mok et al., 2015). Megaprojects in the oil and gas sector often face delays and cost overruns (EY, 2014). This fits with Flyvbjerg's "iron law" of megaprojects: "over budget, over time, under benefits, over and over again" (Flyvbjerg, 2017: 12; see also, Flyvbjerg, 2011). Several pipelines, in particular, have significant delays that range from at least a year (in the cases of the L3R and TMEP projects) to several years (in the case of the KXL pipeline). Delays cause both "cost overruns and benefit shortfalls" (Flyvbjerg, 2017: 10). Delays introduce uncertainty about the future of the project because they can

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compromise its financial viability. This concern is particularly acute for privately owned pipelines, which is the norm in North America, with the recent exception of the Trans Mountain Pipeline System (Makholm, 2012; Nace et al., 2019). For privately owned pipelines, the costs are either borne by the pipeline company or passed on to the companies that are shipping the oil products.

Contentious and supply-side politics

Contention around energy infrastructure projects is not new. Notable historical precedents include the anti-nuclear movement, which began in the 1960s and 1970s in several countries, including the United States, United Kingdom and Germany, and the anti-dam movement, which took place in several countries in the Global South beginning in the 1970s (Aldrich, 2010; McAdam et al., 2010; Mertha and Lowry, 2006). Beginning in the mid-2000s, a series of fossil fuel infrastructure project proposals appeared in countries that are significant producers and exporters of fossil fuels, including Canada and the United States. In response, a wave of contestation has emerged.

Scholars have applied concepts from the social movement literature to explain the increase in mobilization around energy infrastructure projects in the United States (see, for example, Cheon and Urpelainen, 2018; McAdam and Boudet, 2012). McAdam and Boudet (2012) study movement outcomes in 20 energy infrastructure projects (15 liquefied natural gas terminals, two nuclear projects, one wind farm, one hydroelectric and one cogeneration project). Using QCA, they develop a series of recipes to explain variation in mobilization and how social movements affect project outcomes. They find that mobilization, or lack thereof, is an important part of the causal recipes that explain project outcomes (McAdam and Boudet, 2012: 129). They find that the absence of mobilization was "more or less" sufficient to explain project approval (129). Once a project has been approved, in addition to mobilization, company assessments of the competitive viability of each project shaped the proponent's ultimate decision to build (120). Lastly, to explain project rejection, conflict between different layers of government, in addition to widespread opposition, explains six of seven cases (120).

Although McAdam and Boudet (2012) do not look at pipelines, their work suggests mobilization is an important causal condition in energy infrastructure projects. A range of actors often led by Indigenous peoples and nations and by environmental non-governmental organizations (NGOs) have launched sustained campaigns against several mega oil sands pipeline projects, beginning with the Keystone XL and Northern Gateway projects. A number of NGOs and communities also mobilized around a range of other socio-economic and environmental risks. Some portion of opposition to mega oil pipelines is driven by concerns about climate change. A subset of organizations that oppose these pipelines often advocates supply-side climate policy, which seeks to decrease global emissions by constraining the supply of fossil fuels (Piggot, 2017; see, for example, Rainforest Action Network et al., 2017). Cheon and Urpelainen (2018) compare four supply-side fossil fuel campaigns in the United States, including the KXL. They conclude that the campaign against the project raised "high barriers" for its completion and that without the campaign, it is highly unlikely

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that President Obama would have rejected the project or that Nebraska state politicians would have opposed the project so strongly (89).

Public policy

Public policy scholars have sought to understand how and why the scope of conflict changes regarding particular policy issues (Pralle, 2006; see also Hoberg and Phillips, 2011). Conflict surrounding the development of oil pipelines has been expanded by actors over a short period of time, which creates risk and uncertainty for pipeline projects. In the Canadian public policy literature, Hoberg (2013) identifies several variables to analyze the level of "political risk" associated with five major pipeline proposals in Canada: the KXL, NGP, TMEP, Energy East and the Line 9B Reversal projects. In each case, Hoberg looks at (1) the number of institutional veto points (for example, the existence of an authority to block a project's approval), (2) whether opposition groups have access to veto points, (3) whether the project can take advantage of existing infrastructure, (4) the salience of place-based, concentrated environmental risks and (5) the jurisdictional separation of risks and benefits (Hoberg, 2013: 374). At the time that Hoberg was writing, three projects were in the application stage (the KXL, NGP and Line 9B), one was proposed (the TMEP) and one was in the conceptual stage (the Energy East project). Hoberg's analysis suggests that of the five projects, the NGP and the TMEP projects faced the greatest number of political risks and the Line 9B and Energy East projects faced the fewest political risks, with Keystone XL in between (377). Hoberg's analytical framework is intended to describe political risk, not predict or explain proposal or project outcomes. However, there have been some unexpected outcomes, including the cancellation of the Energy East project, President Obama's rejection of the KXL project, and the federal government's purchase of the TMEP project. I revisit Hoberg's framework to test his claims.

III. Research Design

Why QCA?

This article aims to identify combinations of conditions that explain oil pipeline project outcomes. Qualitative comparative analysis, developed by Ragin (1987), is a method used to identify causal conditions that most often interact to produce an outcome (Fischer and Maggetti, 2017: 347). QCA has been used to explain a range of outcomes of policy processes (Fischer and Maggetti, 2017). QCA has been less commonly used in energy-related studies or in infrastructure studies, although notable exceptions exist in both fields (Gerrits and Verweij, 2018; Schmid and Bornemann, 2019). QCA is particularly well suited to studying pipeline infrastructure because it can capture complex causation (Gerrits and Verweij, 2018) in several important ways. First, QCA is premised on the idea that a combination of conditions—rather than a single condition—interact to produce an outcome (see Schneider and Wagemann, 2012: 78). Second, it can be used to model equifinality: cases where more than one pathway exists to an outcome. Third, it allows for the asymmetry of concepts and causal relationships: when the same conditions that explain the presence of an outcome do not necessarily also explain the absence of it.

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Case selection

Cases were selected based on three criteria. First, the cases selected are either new oil transmission pipelines or expansions to oil pipelines that run in and through Canada.[4] Given the integration of Canada's oil supply chain with the United States, just over half of the pipelines in this analysis cross the Canada–US border. While the regulatory process is more decentralized for oil pipelines in the United States, pipelines both in and through Canada are owned by the same companies and have similar ownership structures. Most of the pipelines in this analysis carry primarily heavy crude oil produced in the Athabasca oil sands in northeastern Alberta.

Second, all projects are regulated by the NEB. Canada has a centralized regulatory process for pipelines that connect a province with any other province or extend beyond the limits of a province or offshore area (National Energy Board Act, R.S.C. 1985: 4). This centralized process means that projects were subject to the same regulatory process, notwithstanding changes to that process.[5] All projects were recommended by the NEB. I exclude the Energy East project because TransCanada cancelled the project before the NEB had made a decision, though I include it in the robustness checks (see Part D in Supplementary Information). The only oil pipeline project that was cancelled after a NEB recommendation was the Northern Gateway project.

Third, project proponents filed applications for the projects between 2006 and 2014. The aforementioned wave of pipeline proposals emerged in the mid-2000s. The period in this analysis thus captures the most recent wave of megaprojects, which include the Northern Gateway Pipeline, the Keystone XL Pipeline and the Trans Mountain Expansion Project; these projects all received a recommendation from the NEB in 2010 or later. This period also captures the change whereby oil pipeline proposals garnered much more attention and opposition. There have not been any proposals for new transmission oil pipeline projects filed after 2014. Table 1 presents an overview of each of the 18 cases and their outcomes.[6]

Calibration

Values in QCA can be both crisp and fuzzy, and this analysis uses both. For crisp sets, each condition is assigned either 0 (that is, full non-membership in a set) or 1 (that is, full membership in a set). A second type of QCA uses fuzzy sets, which is more appropriate for concepts in social sciences that have fuzzy boundaries and cannot confidently be expressed as a dichotomy (Schneider and Wagemann, 2012: 3). Fuzzy sets thus require additional anchor points, the number of which is determined by the granularity of concepts or data (Ragin, 2009: 91). Values are determined using theoretical knowledge, empirical insights and obvious empirical breaks in the data. For a QCA with 18 cases, Marx and Dușa recommend a maximum of five causal conditions (2011: 114). I briefly describe the outcome condition and then each of the five causal conditions below. The expectation for all five causal conditions is that the absence of the condition is linked to a project being built without significant delay (that is, the BUILT outcome). Table 2 summarizes the project coding decisions (Part B of Supplementary Information contains more details about the coding decisions).

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Table 1 Project Outcomes[1]

Project name	Company	Application to NEB	Outcome[2]
Alberta Clipper Expansion Project	Enbridge Pipelines Inc.	May 2007	In service (Leave to Open [LTO] granted in December 2009)
Alberta Clipper Capacity Expansion Project	Enbridge Pipelines Inc.	October 2012	In service (final LTO granted July 2014)
Alberta Clipper Capacity Expansion Project Phase 2	Enbridge Pipelines Inc.	August 2013	In service (final LTO granted in June 2015)
Alida to Cromer Capacity Expansion Project	Enbridge Pipelines (Westspur) Inc.	January 2007	In service (LTO granted in March 2008)
Bakken Pipeline Project	Enbridge Bakken Pipeline Company Inc.	January 2011	In service (LTO granted in January 2013)
Edmonton to Hardisty Pipeline Project	Enbridge Pipelines Inc.	December 2012	In service (LTO granted in March 2015)
Keystone Pipeline	TransCanada Keystone Pipeline GP Ltd.	December 2006	In service (LTO authorization in May 2013)
Keystone XL	TransCanada Keystone Pipeline GP Ltd.	February 2009	Significantly delayed (construction has not begun, at the time of writing)
Line 3 Replacement Project	Enbridge Pipelines Inc.	November 2014	Significantly delayed (construction has not begun, at the time of writing); LTO granted by NEB for some sections of the project
Line 4 Extension Project	Enbridge Pipelines Inc.	June 2007	In service (LTO granted in March 2009)
Line 9 Reversal Phase I Project	Enbridge Pipelines Inc.	August 2011	In service (LTO granted in January 2014)
Line 9B Reversal and Line 9 Capacity Expansion Project	Enbridge Pipelines Inc.	November 2012	In service (LTO granted in June 2015)
(Enbridge) Northern Gateway Project	Northern Gateway Pipelines Limited Partnership	May 2010	Rejected (Governor in Council denied project in November 2016)
Southern Access Expansion Stage 1	Enbridge Pipelines Inc.	June 2006	In service (NEB approved in September 2006)
Southern Access Expansion Stage 2	Enbridge Pipelines Inc.	December 2006	In service (NEB approved in January 2007)
Southern Lights Project	Enbridge Southern Lights GP	March 2007	In service (LTO granted in February 2009)
Trans Mountain Expansion Anchor Loop Project	Terasen Pipelines (Trans Mountain) Inc.	February 2006	In service (LTO granted in March 2008)
Trans Mountain Expansion Project	Trans Mountain Pipeline Unlimited Liability Corporation (ULC) (Kinder Morgan Canada)	December 2013	Significantly delayed (construction has not begun, at the time of writing)

[1]This table was compiled using information from NEB documents available at https://apps.cer-rec.gc.ca/REGDOCS/.
[2]Leave to Open (LTO) is required when opening a pipeline or section of a pipeline. In some cases, the proponent applies for the LTO in stages. In Table 1, the first date at which the NEB provided such authorization to a project is used unless otherwise indicated. As it is likely that other LTO authorizations were subsequently granted, the first LTO granted is thus a suitable proxy for a pipeline project to be assumed operational.

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Table 2 Concepts, Measures and Calibration

Concept		Measure	Calibration
Outcome condition	BUILT	Outcome of a project	1 = Project in service 0.9 = Construction complete, awaiting Leave to Open 0.6 = Construction has begun 0.4 = Project is stalled (and significantly delayed) but construction had begun 0.1 = Project is stalled (and significantly delayed), and construction has not started 0 = Project cancelled
Causal condition	Commercial support concerns (CSC)	Whether a project requires commercial support as a condition of its approval	1 = Yes 0 = No
	Long distance (LD)	Whether a project exceeds 500 km	1 = Yes 0 = No
	Legal risk (LR)	Amount of legal risk and conflict, represented by the number of cases brought against either the government or the proponent concerning the project	1 = 15 or more legal cases 0.9 = Between 9 and 14 cases 0.6 = Between 5 and 8 cases 0.4 = Between 2 and 4 cases 0.1 = 1 case 0 = No cases
	Major regulatory barrier (MRB)	Whether a project is required to redo part of the regulatory process	1 = More than 1 MRB 0.67 = 1 MRB 0.33 = minor regulatory delay 0 = No regulatory barriers
	Social mobilization (SM)	Whether there is social mobilization against the project, indicated by the number of protest events	1 = 50 or more protest events 0.9 = Between 20 and 49 events 0.6 = Between 6 and 19 events 0.4 = Between 4 and 5 events 0.1 = Between 1 and 3 events 0 = No events

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The outcome condition in this analysis is whether a project is successfully completed or not (or not yet). A project that is in service is coded 1. Projects where construction has begun are coded 0.6. Projects where construction is complete but the regulator has not granted a Leave to Open (LTO) are coded 0.9. Projects where construction has begun but is currently stalled are coded 0.4, since these projects are more out than in of the built set. Projects that are stalled but where construction has not begun are coded 0.1. Cases that score 0.1 and 0.4 also experience significant delays. Lastly, projects that are cancelled are coded 0.

The first causal condition is whether a project is approved with a commercial support condition (CSC). When the NEB makes a decision about whether or not to recommend a pipeline, it takes into consideration, among other things, the ability of the proponent to finance the project and whether the project has transportation agreements with shippers. For some projects, the NEB imposes a condition that the proponent must file its contracts with shippers before construction can begin, in order to demonstrate that the project has sufficient commercial support.

The second causal condition is whether a project requires more than 500 km of new pipeline—or in other words, is a long distance (LD) pipeline. This condition captures the reality that these projects cross many properties and Indigenous territories and involve comparatively more stakeholders, thus increasing the potential for opposition.

The third causal condition is the amount of legal risk (LR) involved with the project. While legal cases do not directly veto a project, they can significantly delay a project and create risk and uncertainty about the project's outcome. Certain actors may have more or fewer opportunities for legal recourse. For example, in Canada, landowners have few legal rights, although they often bargain collectively to reach a settlement with the proponent. By contrast, the rights of Indigenous peoples have evolved relatively quickly, in large part due to contestation over linear energy infrastructure projects (Wright, 2018: 221).

The fourth causal condition, major regulatory barrier (MRB), captures whether a project is required to redo part of the regulatory process. An MRB creates delays and thus increased costs, as well as increased uncertainty. The final condition measures whether there is social mobilization (SM) against the project. I use Quaranta's definition of protest events as "forms of civilian collective actions against some targets" (2017: 3). Campaigns opposing pipelines include a range of strategies such as public marches, interruption of public hearings and corporate meetings, and sometimes blockades. Protests were nonviolent but at times involved civil disobedience. Most directly, mobilization—when in the form of blockades—can delay construction. Mobilization can also raise the public profile of a project and apply pressure on politicians or increase risk for investors.

IV. Analysis of Necessary and Sufficient Conditions

A condition or a configuration (that is, a combination of conditions) is considered to be *necessary* if the outcome cannot occur in the condition's absence. Although there could be cases where the condition is present and the outcome is not, a necessary condition means that the condition is present in all cases of the outcome (Dușa, 2019: 99). In other words, the condition (X) is necessary for the outcome

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Table 3 Necessary Conditions

Outcome	Necessary condition	Consistency	Coverage
BUILT	mrb	0.943	0.961
~BUILT	SM	0.971	0.660

(Y), but the condition does not guarantee the outcome. By contrast, a condition is *sufficient* if whenever the condition—or configuration of conditions—is present, the outcome is present as well (Schneider and Wagemann, 2012: 57).

Analysis of necessary and sufficient conditions[7]

In QCA, necessary and sufficient conditions must be analyzed separately, beginning with the former (Schneider and Wagemann, 2010: 404). To measure conditions of necessity, the causal condition must pass the consistency threshold of at least 0.9 (Schneider and Wagemann, 2012: 143). The absence of a major regulatory barrier is individually a necessary condition for the BUILT outcome. For projects that have not (yet) been built, the presence of social mobilization is individually a necessary individual condition for the ~BUILT outcome (the tilde symbol [~] represents the absence of the outcome). The results are summarized in Table 3. The negation (or absence) of a condition is denoted with lowercase letters. Table 3 includes two measures of necessity: consistency and coverage. *Consistency* measures the extent to which a condition (or combination of conditions) agrees in displaying the outcome, while *coverage* measures the empirical relevance of a condition (Ragin, 2006: 292).[8] As indicated in Table 3, the consistency and coverage scores are consistent with those of necessary conditions.

A truth table is at the core of QCA (Schneider and Wagemann, 2012: 413). The truth table lays out which combinations of conditions are sufficient for projects that are built. While the truth table rows contain configurations that are sufficient for the outcome, the solution directly produced by the truth table is unnecessarily complex. Instead, Boolean algebra is used to logically minimize the truth table and identify the minimal combination(s) of conditions that are sufficient to produce the outcome. A complete truth table contains all possible configurations, including those that have no empirical observations; these rows without empirical cases are called logical remainders. The presence of many logical remainders creates a problem known as limited diversity, which is not unique to QCA. Logical remainders are dealt with differently in the three types of QCA solutions: the conservative, intermediate and parsimonious solutions. The results of all three solutions are included in Part C of the Supplementary Information, but only the results of the intermediate solution are presented here. The directional expectations for all conditions for the intermediate solution are that their presence should be linked to the BUILT outcome. I made the following directional expectations:

1. The absence of a commercial support condition should be linked to a project being built without significant delay (that is, the BUILT outcome).
2. The absence of long distance should be linked to the BUILT outcome.
3. The absence of legal risk should be linked to the BUILT outcome.

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Table 4 Intermediate Solution for BUILT Outcome

Causal pathway	Consistency	PRI	Raw coverage	Unique coverage	Cases covered
sm*mrb*csc	1.000	1.000	0.877	0.219	ACCE, AbCCE 1, Bakken Pipeline, Edmonton to Hardisty, Line 4 Ext, Line 9, Southern Access Exp 1, Southern Access Exp 2, TM Anchor Loop; Keystone Pipeline, Southern Lights; Alberta Clipper Exp
ld*lr*mrb*csc	1.000	1.000	0.690	0.032	ACCE, AbCCE 1, Bakken Pipeline, Edmonton to Hardisty, Line 4 Ext, Line 9, Southern Access Exp 1, Southern Access Exp 2, TM Anchor Loop; AbCCE 2, Line 9B

Solution formula: sm*mrb*csc + ld*lr*mrb*csc → BUILT
Solution consistency: 1.000
Solution coverage: 0.909

* = and
+ = or
→ sufficient for
Lower case = absence of
Upper case = presence of
Note: Case name abbreviations contained in Table S2 in Supplementary Information.

4. The absence of a major regulatory barrier should be linked to the BUILT outcome.
5. The absence of social mobilization should be linked to the BUILT outcome.

The intermediate solution shows there are two pathways for a BUILT project (Table 4).[9] The first is the absence of social mobilization *and* the absence of a major regulatory barrier *and* the absence of a commercial support condition. The second pathway, which has slightly lower coverage, is the absence of long distance *and* the absence of legal risk *and* the absence of a major regulatory barrier *and* the absence of a commercial support condition. Table 4 includes another indicator of sufficiency, the proportional reduction in inconsistency (PRI), which shows how much the configuration is exclusively a subset of the outcome.

Last, the solutions for the absence of the outcome were produced. The directional expectations were the opposite of those aforementioned (for example, the presence of a social mobilization should be linked to projects not being built). The intermediate solution shows that the presence of long distance *and* legal risk *and* social mobilization *and* a major regulatory barrier is sufficient to produce the absence of the outcome: pipelines that are not (yet) built (Table 5). This pathway has low coverage because it covers only the NGP and TMEP projects.

Robustness checks

QCA requires some decisions to be made at the researcher's discretion (Schneider and Wagemann, 2012: 284). Robustness tests mitigate concerns about whether results would change substantively if different decisions were made by the researcher (284). There are five types of robustness checks; these concern (1) the frequency thresholds,

Table 5 Intermediate Solution for ~BUILT Outcome

Causal pathway	Consistency	PRI	Raw coverage	Unique coverage	Cases covered
LD*LR*SM*MRB*CSC	1.000	1.000	0.394	–	NGP, TMEP
LD*LR*SM*MRB*CSC → ~BUILT					
Solution consistency: 1.000					
Solution coverage: 0.394					

(2) the inclusion thresholds, (3) the cases analyzed, (4) the conditions used and (5) the calibration decisions (Ide, 2015). I only include one test here because it reveals an insight about the role of social mobilization.[10]

It is plausible to raise the threshold to belong in the social mobilization set. In doing so, the absence of social mobilization becomes an individually necessary condition for the analysis of necessity for BUILT. The results for the analysis of sufficiency for the BUILT outcome yield only one pathway: the absence of social mobilization *and* a major regulatory barrier *and* a commercial support condition. These results suggest that social mobilization plays an important role in shaping the outcome of a project, although detailed case studies are required to theoretically justify this alternate threshold and to discern which mechanism (or mechanisms) explains why projects with a certain scale of social mobilization are particularly difficult to build.

V. Discussion

The logic of QCA reveals a dynamic that has not been captured in previous studies on oil sands pipelines: some conditions are on their own insufficient but are highly relevant in the presence or absence of others in explaining variation in the outcomes of proposed oil sands pipeline projects. For example, the QCA finds that the long distance condition, on its own, is not necessary in explaining project outcomes. However, long distance is part of the solution formulas in the analysis of sufficiency for both the BUILT and ~BUILT outcomes. And while social mobilization is a necessary condition in explaining ~BUILT projects, I—like McAdam and Boudet (2012: 130)—find that mobilization is not, on its own, a sufficient condition in determining whether a project is built. This article shows that the combination of mobilization with legal risk, long distance, and a major regulatory barrier is sufficient for explaining the outcomes of not (yet) built projects.

This analysis adds support to the claim in the social movements literature that mobilization matters in explaining the outcomes of contested energy infrastructure projects. Opposition to pipelines took off in the United States and Canada around the Keystone XL and Northern Gateway projects. An alliance of First Nations led resistance to the NGP project, alongside environmental NGOs. Resistance to KXL involved an unlikely coalition of farmers, climate activists and Native American tribes, amplified by environmental NGOs. Pipelines became an unexpected central focus for some environmental NGOs and the climate movement because they enabled production of the oil sands and were strategically vulnerable as chokepoints in fossil fuel energy systems.

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The findings of the QCA add nuance to a claim in the public policy literature that oil pipelines that take advantage of existing infrastructure reduce political risk (Hoberg, 2013). After the campaigns against NGP and KXL began, subsequent oil pipelines became much more difficult to build. While earlier proposals had high infrastructure needs that did not use existing pipeline infrastructure, later project applications including the L3R and TMEP projects proposed more modest routes that took advantage of existing infrastructure, either by twinning an existing pipeline or replacing an existing line. These projects attracted significant opposition. Even projects like the Alberta Clipper Capacity Expansion or Line 9B that did not require new pipeline infrastructure have attracted opposition, though not as much as the KXL, NGP, TMEP and L3R projects.

This analysis also complicates the idea of veto points (Hoberg, 2013). Legal cases —while they cannot veto a project themselves—are a key contributor to major regulatory barriers, the absence of which is a necessary condition for BUILT projects. In the NGP and TMEP cases, a federal court of appeal case required the government to redo the final phase of consultation with affected First Nations (the government took up this obligation only in the TMEP case). In the case of L3R, the Minnesota Public Utilities Commission was required to redo part of the environmental impact assessment due to a court decision in 2019. However, major regulatory barriers are not always tied to legal cases. In the case of KXL, there were several major regulatory barriers, the first of which was in 2011 when the US State Department delayed its decision in order to study other potential routes that avoid the Sandhills region of Nebraska. While two pipeline projects in North America had "veto" decisions where leaders chose to reject the applications—Keystone XL and Northern Gateway—there was a long causal chain that led to these decisions. In both cases, these decisions were made after sustained campaigns by a range of actors against the project.

Lastly, this analysis speaks to the importance of understanding project financing and commercial support for pipeline projects. Commercial support is necessary for construction to proceed. If a project attracts significant opposition and delays, project costs and uncertainty mount, which then have implications for commercial support. The confidential nature of commercial negotiations for oil pipelines makes these dynamics particularly challenging to understand. However, in both the TMEP and NGP cases, multiple intervenors expressed concerns about the financial viability of the projects. While the NGP project did not have long-term, firm transportation agreements, the TMEP did. However, given the importance of contracts to the NEB's assessment of the TMEP project, the NEB imposed a condition that required Trans Mountain to file its contracts with shippers before construction could begin. Both the NGP and TMEP projects are distinctive in that the NEB imposed a condition related to commercial support, and this causal condition appears in the intermediate solution formulas.

The analysis in this article has two limitations, which provide avenues for future research. First, QCA does not directly treat the dimension of time. Time matters in the study of pipeline politics in several ways. The sequence of events within and across cases matter. For example, the outcome of one project can affect the conditions of the others. Across cases, legal risk changes as groups gain knowledge and resources and learn from previous legal cases and also as case law develops.

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Opposition has become increasingly sophisticated—particularly legal and regulatory interventions—as opponents' strategies evolve. As well, campaigns can gain and lose momentum over time. Future research building on the findings here might examine how and why oil sands pipelines have become the subject of tremendous socio-political and legal conflict.

Second, QCA does not identify causal mechanisms or intermediate causes. Detailed case studies and process tracing can uncover and examine such mechanisms, and the QCA provides some guidance on where to look by identifying relevant causal conditions. Relatedly, there are important interrelations between key causal conditions, particularly between major regulatory barrier(s), social mobilization and legal risk. This means that a project that faces a major regulatory barrier is also likely to face stakeholder opposition. Legal cases do not occur in a vacuum. For projects that attract opposition, legal challenges are often a central part of the campaign or an actor's strategy to either reduce the likelihood of the project being built or to increase the actor's bargaining position during negotiations for benefits. In short, legal challenges and social mobilization are often strategies used by coalitions of actors opposing a project.

Conclusion

The politics of oil sands pipelines have changed significantly and rapidly in the last 15 years. This article provides insight into these changes by conducting a systematic cross-case analysis. While the vast majority of oil pipeline projects have been successfully built, several mega oil sands projects have been cancelled or significantly delayed. The QCA does not predict which of the three current oil sands pipeline projects—KXL, TMEP and L3R—will be built, but it explains why they have not yet been built. Understanding this variation is important because it identifies new socio-political and legal dynamics. The QCA reveals that social mobilization and major regulatory barrier(s) are particularly important in explaining variation in pipeline proposal outcomes. In particular, the presence of social mobilization is individually necessary for the not (or not yet) BUILT outcome, and the absence of a major regulatory barrier is individually necessary for the BUILT outcome. The analysis of sufficiency shows that the absence of a configuration of conditions—social mobilization, a major regulatory barrier (or barriers) and a commercial support condition—is one pathway for projects with the BUILT outcome. Projects with the not BUILT outcome are long distance pipelines that have attracted social mobilization and legal risk and face at least one major regulatory barrier. In short, the increase in socio-political and legal conflict around oil sands pipelines in the last decade has had a significant impact on pipeline project outcomes.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/S0008423920000190

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Notes

1 In August 2019, the federal government renamed the National Energy Board (NEB) as the Canada Energy Regulator (CER). I refer to the NEB here.

2 This article refers to projects that received approval or recommendation for approval from the NEB. Prior to 2012, the NEB had de facto authority to approve or reject a project. In 2012, changes to the NEB Act gave Cabinet the final decision-making authority for new pipeline projects.

3 Although Line 3 also crosses the Canada–United States border, the US State Department determined the LR3 project did not require a new presidential permit (Day, 2014).

4 I exclude terminal expansion projects from the analysis because they do not have the same characteristics as linear infrastructure projects. I also exclude segment replacement projects, as well as applications to deactivate or decommission projects.

5 The reform of the NEB Act in 2012 and the implementation of the Canadian Energy Regulator Act in 2019 both introduced changes to the regulatory process for pipeline project proposals.

6 Part A of Supplementary Information contains more detailed descriptions of the cases.

7 The analysis was conducted using Duşa's (2019) and Oana and Schneider's (2018) packages in R. Part E in the Supplementary Information contains the R Script.

8 Part C in Supplementary Information contains the complete results tables for the necessary conditions.

9 For the analysis of necessity, coverage is a measure of how trivial the condition is for an outcome; for the analysis of sufficiency, coverage measures how much the outcome is explained by a causal condition (Duşa, 2019: 136).

10 See Part D in Supplementary Information for additional robustness checks.

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