

Social impact assessment practice for hydroelectricity in Canada: a review of methods
and monitoring

by

Gardenio Diogo Pimentel da Silva

Submitted in partial fulfilment of the requirements
for the degree of Master of Environmental Studies

at

Dalhousie University
Halifax, Nova Scotia
June 2021

© Copyright by Gardenio Diogo Pimentel da Silva, 2021.

TABLE OF CONTENTS

LIST OF TABLES	v
LIST OF FIGURES	vi
ABSTRACT.....	vii
LIST OF ABBREVIATIONS USED	viii
ACKNOWLEDGMENTS	ix
CHAPTER 1 - INTRODUCTION.....	1
1.1. Social impact assessment: definition.....	1
1.2. History of Canada with social impact assessment	2
1.3. Problem statement and need for the study	5
1.4. Objective	8
1.5. Choosing hydroelectric dams.....	9
1.6. The research questions and thesis structure.....	9
CHAPTER 2	12
2.1. Introduction	13
2.2. Methods.....	17
2.1.1 Systematic searching mechanism	18
2.1.2 Screening and selection	19
2.1.3. Coding and data analysis.....	21
2.2. Results.....	23
2.2.3. Technical approaches to SIA	23
2.2.4. Engagement methods.....	24
2.2.4.1. Open houses	24
2.2.4.2. Interviews and surveys	24
2.2.4.3. Public participatory Geographic Information System (PPGIS) approach.....	26
2.2.4.4. Community-based impact assessment	27
2.2.4.5. Multicriteria approach	28
2.2.5. Social impacts identified	29
2.2.5.1. Demographic changes and related effects	31
2.2.5.2. Social impacts associated with physical infrastructure	33
2.2.5.3. Psychosocial issues.....	34
2.2.5.4. Socio-economic dimensions	35
2.2.5.5. Gender-based analysis: the socioeconomic perspective	36

2.2.5.6.	Other social concerns: equity, poverty, marginalization, community livelihood, wellbeing and cohesion	37
2.3.	Discussion.....	39
2.3.3.	Socioeconomics and demographic changes	39
2.3.4.	Improving gender-based analysis	42
2.3.5.	Livelihood, wellbeing, and others	42
2.3.6.	Community engagement and community-based impact assessment.....	44
2.3.7.	Improvements and addressing the root causes.....	47
2.4.	Conclusions	51
CHAPTER 3 –		53
3.1.	Recapitulation of the second objective: SIA and monitoring reports.....	53
3.2.	Systematic review of monitoring reports	54
3.3.	Preliminary findings	55
3.4.	Changing the perspective on assessing social impacts.....	56
3.5.	Refined sub-research questions.....	57
CHAPTER 4		59
4.1.	Introduction	59
4.2.	The two cases.....	62
4.2.1.	Keeyask project.....	62
4.2.2.	Site C project.....	64
4.4.	Methods.....	66
4.4.1.	Data collection	66
4.4.2.	Categorizing effects.....	68
4.4.3.	Categorizing actors.....	69
4.4.4.	Coding and analysis.....	70
4.5.	Results.....	71
4.5.1.	Community-based impact assessments.....	71
4.5.2.	Newspaper content.....	74
4.5.2.1.	Conflict and disputes.....	76
4.5.2.2.	Socioeconomic effects	79
4.5.2.3.	Psychosocial effects	81
4.5.2.4.	Cumulative effects on daily life.....	82
4.6.	Discussion.....	84

4.6.1.	The integration of news media into SIA.....	84
4.6.1.1.	Different opinions inhibiting socially sustainable projects	87
4.7.	Conclusion	90
CHAPTER 5 – CONCLUSIONS		91
5.1.	Consultant-led SIA to license projects	91
5.2.	A way forward with consultant-led SIA?.....	93
5.3.	An external factor influencing consultant-led SIA	94
5.4.	Recommendation and future research.....	94
5.5.	Concluding comments	96
References.....		97
Appendix.....		110

LIST OF TABLES

Table 1. Hydroelectricity production in Canada.....	17
Table 2. Sample of hydroelectric plants used in this study.....	20
Table 3. List of keywords used to search important themes.....	22
Table 4. Summary of methods and their application context in a sample of SIA documents for 37 hydroelectric projects in Canada.....	29
Table 5. Pearson correlation coefficient between power capacity, social impacts covered in each report, and decade of implementation of the dam.	31
Table 6. Examples of improvements for Social Impact Assessment practice.	46
Table 7. List of social or socioeconomic monitoring reports available online for hydroelectric dams in Canada.....	54
Table 8. Community-based impact assessments found for Keeyask and Site C projects.	67
Table 9. Breakdown of themes and social effects covered.....	69
Table 10. Main social effects identified in quoted passages from CBIA, by reference counts	72
Table 11. Coded news media coverage.....	74
Table 12. Number (#) and proportion (%) of news articles covering each social impact from each key perspective, affected people and decisionmakers.	76
Table 13. Comparative table for monitoring social effects within CBIA using news outlets.....	86

LIST OF FIGURES

Figure 2. 1. Flow chart of data collection methods.....	18
Figure 2. 2. Reporting of social impacts by hydroelectric assessments.....	31
Figure 4. 1. Distribution of news articles by quoted actor and project.....	75

ABSTRACT

This thesis reviewed social impact assessment (SIA) documents for licensing of projects, and news media articles for monitoring of social impacts from hydroelectricity projects. The results indicate a static consultant-led SIA practice using the same techniques to evaluate social impacts, with few improvements such as inclusion of community-based impact assessments (CBIA) for Site C and Keeyask. This study also demonstrated that news media analysis could be used to monitor selected social impacts, such as episodes of conflicts and chronic issues, socioeconomic effects, psychosocial impacts, and cumulative effects on daily life. Monitoring social impacts using news media coverage helped to explain political power playing a role in the different outcome for those projects in terms of community support. Finally, this work indicates that political interests and industry power to push forward projects, sometimes despite unresolved conflicts, are the critical hurdle for sustainable projects.

LIST OF ABBREVIATIONS USED

CBIA	Community-Based Impact Assessment
CEC	Clean Energy Commission
DRFN	Doig River First Nation
EIA	Environmental Impact Assessment
FLFN	Fox Lake First Nation
HRFN	Halfway River First Nation
IA	Impact Assessment
IAA	Impact Assessment Act
IAIA	International Association for Impact Assessment
IFC	International Finance Corporation
PRFN	Prophet River First Nation
SIA	Social Impact Assessment
TEK	Traditional Ecological Knowledge
ToR	Terms of Reference
USA	United States of America
WMFN	West Moberly First Nation
YFFN	York Factory First Nation

ACKNOWLEDGMENTS

Firstly, I thank God for opening this door and giving me the strength and knowledge to finish the master's journey with so many blessings to account for. Without His presence and guidance, it would not be possible for me to do it on my own. Secondly, my family, in special my mother, who always believed in my capacities and invested in my growth. Equally important, thanks to my wife and in-law family for supporting and putting me in their prayers.

I must acknowledge the role of Kate Sherren and John Parkins, my supervisor and committee member, respectively, in guiding me and equipping with the necessary tools to defend my thesis. I can genuinely say it has been a fantastic experience full of learning. During this thesis, my eyes were opened to many social problems and relevant areas that need to be looked at more carefully. I have grown as a professional and person thanks to this exposure.

I thank Nova Scotia Graduate Scholarship and Killam Scholarship as well as funds provided by the SSHRC (Mike Smit, PI). The funding package allowed me to focus on the research and excel in my academic training; this thesis and other publications were only possible due to the financial aid provided.

CHAPTER 1 - INTRODUCTION

1.1. SOCIAL IMPACT ASSESSMENT: DEFINITION

Social impact assessment (SIA) is an overarching framework or an elaborated process created to identify, anticipate, monitor, manage, and mitigate the effects of projects, policies, or programs on people (collectively and individually) (Vanclay, 2003; Vanclay et al., 2015). SIA is an integral part of the environmental impact assessment (EIA) process required by many countries to license projects (United Nations Environment Programme, 2018). Thus, EIA and SIA must complement each other to enlighten interested parties (communities, developers, governments, and others) about the changes a proposed project might cause in biophysical components (fauna, flora, and abiotic elements) and on the human environment (Glasson et al., 2005; International Association for Impact Assessment & Institute of Environmental Assessment, 1999; Vanclay, 2019). It is important to note that EIA/SIA is an ongoing effort to understand impacts induced by projects. Hence, monitoring is a key component of evaluating *ex-post* impacts and guarantee continuous improvement of activities (Aledo et al., 2015). Within this complex system of assessing impacts, the SIA component should make decisionmakers and project proponents understand the communities' opinions and needs. SIA is a key tool to maximize the potential benefits of projects to host communities and prevent conflicts between communities and stakeholders (Esteves et al., 2012). In this context, the involvement of affected communities has grown in the process of planning, monitoring, and managing the effects of natural resources projects to achieve such goals (Spaling, 2003). Thus, international practice of SIA has also evolved around the development of community-based

impact assessment - CBIA (also known as community-based environmental assessment – CBEA). CBIA integrates participation and traditional knowledge to define goals, evaluate community needs, and establish co-operation mechanisms to resolve tensions in assessing and alleviating detrimental impacts (Sinclair et al., 2009; Spaling, 2011). CBIA are complementary to traditional EIA studies and can shed some light into the understanding of indicators and factors important for different affected groups. While there are many forms of CBIA depending on the community input, CBIA can be lead by community members, specially in small-scale projects (Kilemo et al., 2014; Spaling, 2003), or be conducted by specialized consultancy firms hired on half of the community. In both cases, affected communities co-manage the production of documents that represent their perspectives for key factors to be considered in the decision-making (Dyer et al., 2014; Spaling, 2003).

1.2. HISTORY OF CANADA WITH SOCIAL IMPACT ASSESSMENT

Canada has a long history with SIA regulation and practice, dating back to the 1970s, especially in the Canadian North (Angell & Parkins, 2011). Throughout the 1950s, 1960s, and 1970s, prior to environmental assessment legislation/regulation that came in 1973 (Wood et al., 2010), Canada expanded large-scale projects in the far north to promote economic growth by exploring and exploiting natural resources. Among many of those projects, large-scale hydroelectric dams caused traumas and disruption of the social fabric of multiple Indigenous communities (Come, 2004; Loney, 1995; Niezen, 1993, 1998; Windsor & McVey, 2005). The ecological devastation and significant social impacts on Indigenous communities put infrastructure projects, especially hydroelectric dams, in the

public spotlight with activists calling for inquiries about the consequences that such projects would have on the life of people (Quinn, 1991; Stanton, 2012). Thus, many developers started to undertake consultation with and consideration of the public during the planning stage (Macfarlane & Olive, 2021).

The James Bay Hydroelectric Project in northern Quebec is an essential example of SIA learning in Canada. The James Bay project construction began in the early 1970s without public support, proper consultation, or considering Indigenous rights. The James Bay project severely changed the local economy of Cree people by altering the capacity of communities to hunt, fish, and trap in the region. Other social impacts induced by the project include influx of people that increased the population and led to local social problems such as vandalism, episodes of violence, substance abuse, suicide, and neglect of children (Horing, 1999; Niezen, 1993; Schiehl & Raufflet, 2013). The consequences of such developments aggravated the relationship between Indigenous groups and governments (provincial and federal) to the point that Indigenous Cree groups initiated a court battle against the Province of Quebec. In 1975, the battle culminated when the James Bay and Northern Quebec Agreement was signed to help alleviate the negative impacts on affected Indigenous people (Peters, 1999; Quinn, 1991). Since then, SIA/EIA has become more and more necessary to enhance those relations and promote reconciliation (Armitage, 2005).

The Berge Inquiry is another example demonstrating Canada's leadership in the field of SIA. In the 1970s, the petroleum industry and government had plans to construct the Mackenzie Valley Pipeline project to exploit oil and gas reserves in the Yukon Territory, Northwest Territories, and Alberta. The government of Canada appointed Mr.

Justice Thomas Berger to hold public hearings and evaluate the economic, social, cultural, and environmental impacts of the Mackenzie Valley Pipeline on northern communities (Southcott et al., 2018). The Mackenzie Valley Pipeline would affect caribou migration patterns and the socio-ecological system that Indigenous people relied upon for their livelihoods. The Berger Inquiry, as it became known, determined that pipeline impacts on Indigenous people would be significant, and no pipeline should be constructed unless Indigenous groups became active participants in the negotiations and decision-making of the project affecting their lands. The inquiry report suggested a project moratorium for at least ten years until Indigenous communities could negotiate land settlement claims and secure appropriate benefit programs for their communities (Abele, 2014; Goudge, 2016; Southcott et al., 2018; Stanton, 2012). Goudge (2016) states "[the] Berger Inquiry has had lasting social impacts by contributing to the rise of a collective northern voice and highlighting the fundamental importance of Indigenous interests in charting the future" (p. 393). Agreements about the Mackenzie Valley Pipeline construction were only reached in the 2000s after extensive consultation, negotiations, and Indigenous groups (*Inuvialuit*, *Gwich'in* and *Sahtu Got'ine*) became partners with the project (Pokiak, 2020; Stern, 2007).

An additional example of SIA influencing decision making, at the same time as the Berger Inquiry, includes a rejected hydroelectric dam in Saskatchewan. The government of Saskatchewan planned to develop the Wintego project, a 300 MW Hydroelectric dam on the Churchill River. However, the project construction would severely impact the livelihood of many northern Indigenous communities. Wintego is an early EIA/SIA process in the 1970s that incorporated Indigenous perspectives into the assessment of

potential impacts. Due to social impacts and lack of economic feasibility, the project was the first major hydroelectric dam to be rejected in the country (Macfarlane & Olive, 2021).

Reflecting on the learnings from inquiries about social impacts of development in Canada, Southcott et al. (2018) suggest that "knowledge of social impacts has increased, but it is still inadequate for understanding those social impacts that fall outside the traditional economic indicators" (p. 402). It is important to note that Canada continues to build or upgrade hydroelectric dams to meet economic and energetic goals. However, even though SIA has progressed as a response to social impacts from hydroelectric dams on communities, news articles show that hydroelectric developments are still controversial among Indigenous communities (Walker et al., 2019). Those affected communities still bear the cumulative social impacts caused by large-scale dams from the past, even while new ones are proposed on the same rivers. The following subsection elaborates on the need to advance in SIA practice in Canada further.

1.3. PROBLEM STATEMENT AND NEED FOR THE STUDY

Despite its importance to decision-making and avoiding conflicts, SIA and EIA have progressed differently over the years. Consulting industries doing impact assessment work have tended to give more attention to improving EIA methods (Burdge, 2002). Examples include enhancing baseline information, the presence of science-grounded quantitative predictions, and more structured mitigation measures to offset environmental changes (Landim & Sánchez, 2012). As for assessing social impacts, SIA is often limited to pointing out the employment benefits and other financial opportunities (Morrison-Saunders & Fischer, 2006) or simply identifying the sites that are culturally important for host communities (Baker & Westman, 2018). Recently, Khan (2020) analyzed SIA practice

in Bangladesh and found top-down approaches were mostly used that hide or provide insufficient information to understand the social impacts of projects. Other studies reviewing 37 EIA reports from projects operating in Malawi (Mhango & Mhango, 2007) and 10 EIA reports from infrastructure projects in Brazil (Borioni et al., 2017) arrived at the same conclusion that methods and information within the scope of those projects are seldom sufficient to properly anticipate and manage likely social impacts. Aguilar-Støen & Hirsch (2017) suggest that EIA/SIA consultants in Guatemala only engage with communities to obtain support for the project, not to build relationships and enhance social benefits. Equally, monitoring and reporting *ex-post* impacts are often absent in consultant-led SIA (Martinez & Komendantova, 2020). Hence, many projects might be approved and operate for years without a real understanding of their social consequences on host communities. Consultant or industry-led SIA has perhaps been adequate in improving site-specific components focused on socioeconomic measures but inadequate to anticipate, prevent, monitor and manage social conflicts on a broader scale where aspects of projects interact and accumulate with problems from other projects or contextual challenges (Aucamp & Woodborne, 2020; Gulakov et al., 2020).

SIA literature has evolved over the past 50 years, learning from the many inquiries and regulation processes in Canada and elsewhere. Practitioners and academics have contributed to developing frameworks, methods, and practical guidance to consider a wide range of complex factors during the assessment and understand their effects on people's lives (IFC, 2010; Kvam, 2018; Vanclay, 2019; Vanclay et al., 2015). However, there is a big gap between academic understandings of SIA and the industry practice of SIA. SIA as practiced by consultants, on behalf of industries, is quite undeveloped and narrow,

analyzing only a few indicators such as estimating demographic changes, employment metrics, identification of important sites for communities, and describing infrastructure changes in the community (Baker & Westman, 2018; Khan, 2020). For Bond et al. (2020) EIA/SIA focus still lies in checking boxes to comply with regulatory standards. Thus, consultant-led SIA sometimes neglects to include inputs from experts in specific areas, such as Indigenous knowledge and rights. Many aspects pertaining to health risks, cultural loss, change in community wellbeing, and disruption of family relationships as well as impacts on spiritual bonds remain underdeveloped (Hanna et al., 2014; Westman & Joly, 2019). In such cases, SIA plays a limited role in enhancing the assessment, management, and monitoring of social impacts to achieve sustainable projects (Khan, 2020).

Bridging the abovementioned studies to the Canadian context of conducting SIA, there is an ongoing interest to advance consulting and academic SIA practice in Canada. In 2019 the Government of Canada approved the Impact Assessment Act (IAA), a measure to improve SIA in Canada in terms of engagement with Indigenous communities, the inclusion of traditional knowledge into the assessment of social and environmental impacts, and better consideration of social, health, economic and ecological effects, among others (Doelle & Sinclair, 2018, 2019). In Canada, SIA practiced by consulting firms, particularly the methods and information used to anticipate, monitor, and control social impacts, has not progressed and kept up with innovation. This claim is based on a number of authors who are highly critical of SIA practice and the ways in which the process often serves as 'window dressing' for project approval processes (Baker & Westman, 2018; Westman & Joly, 2019). They state that industries use inadequate methods to engage with communities, analyze social impacts, and comprehend their implications for communities

(Baker & Westman, 2018; Joseph et al., 2015; Westman, 2013). The last retrospective analysis of SIA and EIA methods in Canada was conducted by Boothroyd et al. (1995), 20 years after implementing impact assessment as a regulatory tool to license projects. However, nobody has recently conducted detailed studies to assess consultant-led SIA in the country. Therefore, considering regulatory changes and continuous need to enhance consultant-led SIA in Canada, it is an excellent time to look back at previous SIA reports and update current knowledge about SIA methods in Canada.

Retrospective studies can map the evolution of consultant-led work around social impact assessments. The Impact Assessment Agency of Canada (hereafter the Agency) is investing in the production of knowledge synthesis on SIA practice (SSHRC & IAAC, 2019), posting a call in late 2020 for expression of interest to receive proposals for creating new methods and tools that support sustainable projects (Government of Canada, 2020). Earlier in 2018, the federal Social Science and Humanities Research Council of Canada (SSHRC) provided funds for a project (funding this work) aiming to understand SIA practice within the hydroelectric sector and propose innovative methods considering inputs from social scientists. Both support the need for a retrospective analysis of SIA practice within the country.

1.4. OBJECTIVE

My objective is to review pertinent consultant-led environmental studies (EIA, SIA, or similar documents) and other documents used in the licensing and monitoring phases to assess SIA methods used to anticipate, monitor, and manage social impacts from hydroelectric dams. In doing so, the study aims to highlight weaknesses, strengths, and opportunities for improvement within methods used in consultant-led SIA practice in

Canada. Secondary data analysis will allow me to see trends in consulting practice for assessing, monitoring, and dealing with social impacts in Canada, and assess their success.

1.5. CHOOSING HYDROELECTRIC DAMS

I chose SIA from hydroelectric dams to study in detail due to the historical and persistent social challenges associated with those type of infrastructure and their geographic and ecologic impacts caused by massive flooding and environmental changes that: negatively impacted people's livelihoods (Hackett et al., 2018), infringed on rights of Indigenous groups (Thompson, 2015), caused cumulative social impacts (Silva et al., 2020), psychosocial traumas (Loney, 1995), and changed the social fabric of regions (St-Pierre & Lambert, 2014). Indeed, despite being renewable energy sources hydroelectric plants are considered by some as more destructive than other developments such as mining and forestry (Treaty 8 First Nations Community Assessment Team, 2012). Chapter two more fully describes several reasons for choosing hydroelectric dams as a case study for assessing consultant-led SIA in the country, such as the economic importance of the industry to each province in terms of job creation and production of electricity from renewable energy sources, ongoing construction of new projects, and/or upgrading of old developments to increase their lifespan (projects might operate more than 100 years).

1.6. THE RESEARCH QUESTIONS AND THESIS STRUCTURE

The overall important research questions of this work at its outset were:

- How has consultant-led SIA practice pertaining to methods and anticipation of social impacts evolved in Canada? What methods were used to predict such effects?

- Do methods and social impacts differ when addressing *ex-ante* and *ex-post* impacts?

The first research question did not experience significant changes during my work as EIA and SIA are primarily focused on the anticipation or acknowledgment of likely effects. It was adapted to add a more analytical component to the study, shifting from just identifying methods and social impacts to uncovering key barriers preventing SIA from being more effective. The research sub-questions for this part of the work (also shown in chapter two) are:

- What methods have been used to study the social impacts of hydroelectricity in Canada?
- What fundamental baseline information has been used to anticipate and manage those social impacts?
- How do these methods and social impacts relate to the SIA literature?

As for the second overarching research question, the following sub-questions were proposed to understand monitoring of social impacts from hydroelectric dams:

- Are consultant-led SIA methods to assess social impacts different during the monitoring phase?
- Does the SIA literature provide innovative approaches to conduct monitoring?
- Do monitored social impacts differ from anticipated impacts?

The following chapters will develop all the abovementioned research questions and sub-questions. Chapters 2 and 4 are presented in a paper-based format as they were

approved/submitted for review by international journals. I am the leading author in all the chapters (papers) of this thesis. My supervisor (Kate Sherren) and committee member (John Parkins) collaborated on the work by helping develop the research design, guide the implementation, and review the writing. Chapter 3 is a bridging chapter that provides preliminary results from the second overarching research question and its sub-questions. This chapter sets the stage for the development of new research questions that ultimately complement the proposed analysis to conduct consultant-led SIA and understand social impacts during the monitoring phase, resulting in Chapter 4. Chapter 5 will merge the knowledge discussed and present the main conclusions to this work.

CHAPTER 2

Do methods used in social impact assessment adequately capture impacts? An exploration of the research-practice gap using hydroelectricity in Canada

This chapter has been accepted for publication in the Energy Research & Social Sciences journal. The suggested citation is:

Pimentel da Silva, G.D., Parkins, J.R., Sherren, K. (IN PRESS). **Do methods used in social impact assessment adequately capture impacts? An exploration of the research-practice gap using hydroelectricity in Canada.** *Energy Research & Social Sciences*.

Abstract: Reviewing Social impact assessment (SIA) documents is important to understand whether SIA methods and the range of issues covered have evolved as a response to legislation changes and best practices. A national study can help researchers to understand the practice of SIA under comparable regulatory requirements. This study used available hydroelectric SIA reports in Canada (n=37) to investigate SIA methods, and what impacts they tend to anticipate. First, compared with the scholarly literature, the study found that time (as a proxy for evolution in knowledge and legislation change) was only weakly correlated with the quality of reports. Usually, the size of projects had a greater influence on the range of social impact topics addressed within the reports. Secondly, we demonstrate that methods used to construct the reports are often poorly described. In addition, our comparison with the literature shows that SIA professional practice has not kept pace with scholarly literature that recommends incorporating more engagement components. The existence of a few community-led assessments, participatory map-based approaches, and some efforts to engage with communities outside open houses were considered positive changes. Nonetheless, baseline assessments and anticipations of social impacts remain focused on the implications of population growth, physical infrastructure, and socioeconomics with minimal consideration for the livelihoods, culture, and wellbeing of host communities. The study also identified possible root causes for the lack of innovation and narrow economic scope. Finally, we provide practical recommendations to improve SIA methods used to anticipate social impacts.

Keywords: livelihood; hydro dams; social effects; environmental impact assessment (EIA); SIA methods; community-based assessment.

2.1. INTRODUCTION

Social impact assessment (SIA) and sustainability planning share the goal of incorporating social and environmental components into decision making. These efforts can enhance benefits for communities to thrive economically while maintaining social, ecological, and environmental conditions that reflect a “more sustainable and equitable environment” (Vanclay, 2003, p.6). Research methods implemented for the practice of SIA, like research methods deployed for any purpose, represent a finite set of perspectives and procedures to explore the potential impacts of specific policies, plans and projects: they will make some impacts easy to see but will make others blurry or even invisible. With these limitations in mind, anthropologists have criticized SIA practice for not considering key social aspects or using inappropriate methods during assessments (Baker & Westman, 2018; De Rijke, 2013; C. Westman, 2013). Other researchers have complained that SIA methods have remained static (Sherren, Parkins, et al., 2017). While some observers seek to standardize and raise the quality of SIA across the board, others seek to tailor methods that are suited to local settings, thus reducing the possibilities for comparisons between projects (Fonseca et al., 2020). These issues are difficult to reconcile and reduce the possibilities for advancing SIA methods over time. To address these challenges, a longitudinal analysis of SIA reports can provide important insights by showing progress over time and revealing areas that require improvement (Khan, 2020). Longitudinal analysis can also refocus attention on what has been considered an ‘orphan’ sister of the environmental assessment process (Burdge, 2002). Understanding SIA methods can also help in identifying regulatory gaps in the SIA process (Martinez & Komendantova, 2020). To date, however, reviews of SIA documents have been limited

because of the many challenges of finding and reviewing assessments across jurisdictions and sectors.

Guidance around methods, principles, and steps for successful SIA practice is produced by international organizations such as International Association for Impact Assessment (IAIA), Arran Lule Sami Centre, Inter-American Development Bank, and the IFC (International Finance Corporation) (IFC, 2012; Kvam, 2018; Vanclay et al., 2015; Wilson, 2008). In the North American context, Burdge was a pioneer in SIA methods over many decades, e.g., (Burdge, 1991, 2003b; Burdge & Vanclay, 1996). The literature around SIA methods has been growing and providing examples of good practices that contribute to sustainable developments worldwide. For example, Silva et al. (Silva et al., 2020) recently summarized papers applying six SIA frameworks and five main methods designed to assess cumulative social impacts of industries in Indigenous lands: community-based impact assessments (CBIA) or co-management, questionnaires, spatial analysis associated with community interviews, and computer modeling for socioeconomic outcomes. Sherren et al. (Sherren, Parkins, et al., 2017) and Sinclair et al. (Sinclair et al., 2017) presented innovative ways to use social media and internet platforms to conduct SIA. Comparative case studies use data from secondary sources to predict social impacts based on similar projects (Asselin & Parkins, 2009). Complex multicriteria decision-making approaches are used as an alternative to merging traditional and western knowledges into an assessment (Mantyka-Pringle et al., 2017). Additional approaches include matrices, diagrams, checklists, indicators, alternative types of modeling, expert opinion, and spatial analysis, see (Becker & Vanclay, 2013; Parkins & Mitchell, 2016; Roudgarmi, 2018; Vanclay & Esteves, 2011). Certainly, there is no shortage of guidance for practitioners to conduct SIA.

SIA has now been practiced for many decades. But the question at hand is whether SIA methods used to anticipate and manage social impacts have improved, incorporated up-to-date guidance, and become more inclusive with the capacity to enlighten the public about the real consequences of projects (Khan, 2020; Vanclay, 2006). Therefore, the core objective of this research is to analyze how SIA has been carried out for a subset of SIA reports in Canada. Whereas SIA is important for any development, large projects such as hydroelectric dams deserve special attention considering discussions about renewable energy generation, climate change mitigation, as well as conflicts and acceptability issues arising from the costs of hydroelectricity on host ecosystems and people. A focus on large-scale hydroelectricity projects in Canada will allow us to evaluate the SIA documentation for trajectories of practice within a comparable social, legal and sectoral context. This will help interested parties (e.g., governments, practitioners, academics) to understand whether SIA has evolved in response to legislation changes and best practices.

Our focus is also supported by the importance of hydroelectric dams in the country and their capacity to induce social changes. Given the potential scale of impacts, SIA plays an important role in scoping areas of potential impact and also anticipating impacts prior to project inception. Approximately 600 hydroelectric dams have been installed in Canada since 1881 (Miller et al., 2019), currently contributing 60% of all electricity consumed in the country. Canada exports approximately 8% of production to the US market; Quebec exports alone reached 38.83 TWh in 2020 (**Table 1**). Estimates for 2010 to 2030 predict the construction of 158 new medium and large-scale hydroelectric plants (additional 29 GW in power), the creation of 1.75 million full-time equivalent job-years (or 87,724 full-time jobs for 20 years), the injection of 127 billion dollars to the economy, and further

profit from additional electricity exports to the USA (Desrochers et al., 2011). However, large hydroelectric dams have also disrupted social activities and led to conflicts in many parts of the country when developments did not consider adverse environmental and social impacts on host communities.

Consequently, such installations ended up flooding lands — much of it traditionally Indigenous — and causing disruption to communities' livelihoods and wellbeing, dislocating populations and accumulating methylmercury into water bodies. The James Bay Hydroelectric project is an iconic example of how hydroelectricity developments can also drive social conflicts, some of which may be the result of poor SIA practice as well as political decision-making. Social impacts were only taken seriously in James Bay after the case went to court with a legal decision demanding follow-up social research and compensations for adverse damages suffered by those affected communities, see (Horing, 1999).

Our objective is to conduct a review of SIA practice for *ex-ante* impacts in hydroelectric plants in Canada over time, using content analysis of SIA documents. Hydroelectricity is the case study sector, but results are likely transferrable to other extractive sectors within Canada, and beyond. To reach this objective, we answer the following questions:

- What methods were used to study social impacts?
- What fundamental baseline information has been used to anticipate and manage social impacts?
- How do these methods and impacts of concern relate to the SIA literature?

Table 1. Hydroelectricity production in Canada.

	Contribution to electricity generation (%)	Installed capacity (MW)	Predicted capacity for 2040 (MW)	Electricity generation (TWh)	Net exports (TWh)
Manitoba (MB)	96.8	5349.16	7534.16	30.73	10.74
Newfoundland and Labrador (NL)	95.6	6793.68	7617.68	43.54	0
Quebec (QC)	93.9	40442.15	42311.35	200.06	38.83
British Columbia (BC)	88.7	15905.47	19219.73	62.50	6.57
Yukon (YT)	87.1	94.50	104.50	0.41	-
Northwest Territories (NT)	37.4	55.48	63.98	0.09	-
Ontario (ON)	24.1	9250.88	9416.88	38.56	11.45
New Brunswick (NB)	18.7	960.98	960.98	2.53	-1.4
Saskatchewan (SK)	14.9	889.06	998.16	3.6	-0.29
Nova Scotia (NS)	9.3	376.35	461.01	0.91	0
Alberta (AB)	2.7	894.35	1226.30	1.99	-1.27
Canada	60	81,287.27	88,493.57	387.06	64.73

Data from (Canada Energy Regulator, 2020; Natural Resources Canada, 2020). Except for net exports of electricity, all information is specific for the hydroelectric sector.

Content analysis of SIA documents is time-consuming and restricted to material available for consultation. Unlike a scholarly literature review, it is difficult to perform it systematically because of patchy availability, diversity of document names, the number of documents associated with a single project, the volume of information in each document, and variations in the formats used to report findings. Nevertheless, such synthesis is important for the understanding of practices and contributes to the improvement of knowledge in environmental management, environmental impact assessment (EIA), and the social sciences associated with this field of study.

2.2. METHODS

Within the limits discussed above, we applied a systematic approach to find and review past EIA/SIA reports of Canadian hydroelectric projects for predicted social impacts and the methods used to understand them (**Figure 2. 1**). Each step is described further below.

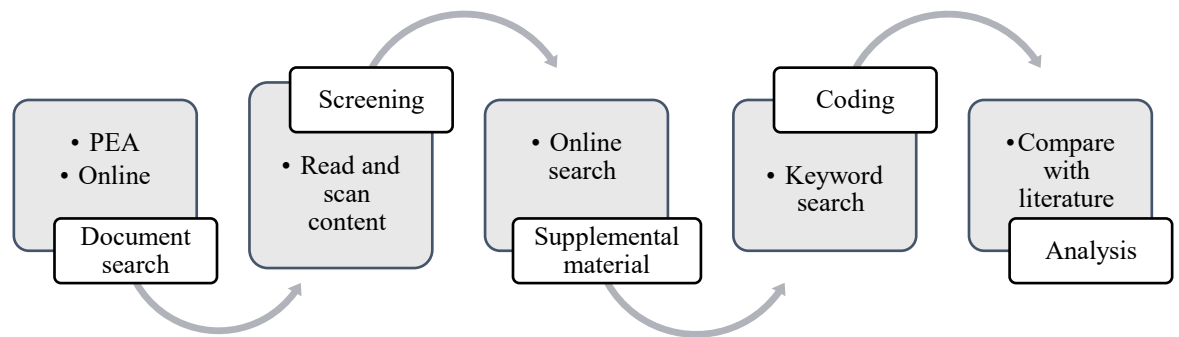


Figure 2. 1. Flow chart of data collection methods

2.1.1 Systematic searching mechanism

The first step was to access the environmental registry page of each provincial environmental agency (PEA), and federal agency, to verify which projects had EIA/SIA documentation available online. A list of hydroelectric projects was extracted from an energy map compiled by Miller et al. (Miller et al., 2019) that contains a comprehensive list of hydroelectric dams installed throughout the country since 1881. Project names and relevant keywords were used to search within the environmental registry websites for digital documents including EIA (and similar Canadian jargon such as comprehensive studies (CS)), traditional and ecological knowledge (TEK), consultation reports (CR), and

community-based impact assessment (CBIA). Documents written in both English and French were collected. When no EIA or similar document was available via the environmental agency, online searches were conducted to investigate the existence of the documents on other online archives (English only). Hard copy documentation was not sought out because of the difficulty of acquiring it at a national scale, and the challenge of coding it efficiently.

2.1.2 Screening and selection

It is worth mentioning that most hydroelectric dams were built in periods without environmental legislation; thus, no SIA equivalent documentation exists for numerous projects. Other developments were exempt from conducting detailed studies as the projects did not hit the minimal environmental thresholds required by agencies. After the initial screening search, 48 projects were identified as having documents available online.

We read each project's description to understand the context for the project (e.g., new project, rehabilitation, or expansion of existing dam). Then, each document was screened to see if it would provide relevant information for our analysis. For this process, we manually scanned each document to find parts pertaining to social issues, indicators, methods, and predictions or assumptions made. **Table 2** shows the sample list with 37 projects that were judged to present useful or somewhat useful information regarding SIA practice (**Table S1** in the supplemental material breaks them down by type of document per project). While reading each project's specifications, we also looked for mentions of specific additional documents that gave more information about social analysis and searched for those manually online. Almost all provinces are presented in the sample of projects. The projects identified in Nova Scotia and Yukon did not have any full reports

available for online consultation. For Eastmain 1-A and Rupert diversion (768 MW) in Quebec, hereafter Eastmain 1-A, we could not find the specific volume (EIA vol. 4) that would describe social issues in detail, but all other volumes were available online.

Table 2. Sample of hydroelectric plants used in this study.

Province	Project	Capacity (MW)	Year of report	Status (date of installation, if not new project)
AB	Dunvegan	100	2000	New project
BC	Keenleyside	150	1997	Rehabilitation (1969)
	East Toba River and Montrose	196	2007	New project
	Forrest Kerr	100	2003	New project
	Kokish	45	2002	New project
	Kwoeik	50	2009	New project
	McLymont Creek (run-of-river)	70	2012	New project
	Mica Dam (5 and 6 units)	1,850	2010	Expansion (1964)
	Narrows Inlet	45	2014	New project
	Pingston (run-of-river)	25	1999	New project
	Revelstoke	2,480	2007	Expansion (1984)
	Site C	1,100	2014	New project
	Tretheway Creek	79	2012	New project
	Upper Lillooet	121	2013	New project
	Upper Harrison	102	2006	New project
	Upper Toba Valley	130	2009	New project
	Waneta expansion	435	2007	Expansion (1954)
MB	Keeyask	695	2014	New project
	Pointe du Bois	78	2010	Expansion (1911)
	Wuskwatim	200	2002	New project
NL	Lower Churchill Project - LCP	2,800	2016	New project
NB	Mactaquac	670	2016	Rehabilitation (1968)
NT	Taltson	54	2013	Expansion (1966)
ON	Lower Mattagami River Complex	484	2009	Expansion (1931)
	Mattagami Lake Dam	5-7	2010	Rehabilitation (1921)
	Yellow falls	16	2009	New project
QC	Angliers	25	2004	Rehabilitation (1905)
	Chute Alard	62-76	2005	New project
	Eastmain 1-A and Rupert diversion	768	2004	New project
	Innavik	8	2010	New project
	La Romaine	1,550	2009	New project
	Magpie	40.6	2005	New project
	Mercier	60	2002	Rehabilitation (1927)
	Peribonka	385	2004	New project
	Saint Marguerite	52	2002	New project
	Toulnoustic	526	2001	New project
SK	Tazi Twe	50	2014	New project

2.1.3. Coding and data analysis

The documents were downloaded and coded using searches for specific words and expressions to categorize methods and social impacts within the reports. Several frameworks provided keywords and social themes to inform the analysis, including the previously mentioned references (IFC, 2012; Kvam, 2018; Vanclay et al., 2015; Wilson, 2008), plus Kirchherr and Charles (2016), Smyth and Vanclay (2017), Vanclay (2002), Becker et al. (2004), and the Impact Assessment Agency of Canada's tailored guidelines that inform impact assessment, thus SIA, in Canada (Impact Assessment Agency of Canada, 2019). Beyond this, we did not direct our coding with a theoretical framework as the focus was not testing or confirming theory but to identify and understand patterns of practice. As found by previous SIA document analysis (Burdge, 2003a), we expected content focused on employment, business opportunities, population increases (boom towns) and concerns over changes to public services and local infrastructure, aesthetic effects, and access to recreational areas. Nonetheless, we incorporated keywords to capture wider topics of interest (**Table 3**), such as community livelihoods, cohesion, well-being, gender-based impacts, social equity, and other non-material changes.

NVivo 12 software (QSR International Pty Ltd, 2018) was used to perform searching and qualitative coding using a semi-inductive content analysis. This hybrid approach finds a space between inductive research (observations to create generalizations) and deductive analysis (test a hypothesis or make comparisons varying the timeframe), pursuing a fit between observations and theory (Armat et al., 2018; Elo & Kyngäs, 2008; Fereday & Muir-Cochrane, 2006). This process was iterative, starting with code system

development and refinement and initial tests of keywords with a smaller sample of documents to verify their utility. Word searches were used to identify important passages within these large documents, each of which was then read for detailed coding purposes. When necessary and due to limitations in the searching mechanism, and in the case of French documents, manual screening (reading through sections) was performed to identify and code relevant data. Finally, we compared the findings about methods and baseline information used to predict impacts with scholarly literature addressing SIA methods, and social impacts. This step was inductive and included the creation of a list of methods found in the SIA documents and adapted versions from the literature to allow a better visualization of differences.

Table 3. List of keywords used to search important themes.

	Theme	Words
SIA Methods	Ethnographic and survey methods	Interview, mail, online, question, questionnaire, consultation, methods, framework, checklist, matrix
Socio economics	Positive impacts	Employment, job, opportunity, training.
	Social equity	Equity, poverty, vulnerable, marginalization, impoverishment.
	Negative socioeconomic impacts	(Job/employment) turnover, layoff, retention, (socioeconomic) multiplier
Infrastructure and population	Population growth	Demographic, work or construction camp.
	Human interaction	Discriminate, exclusion, psychosocial
	Pressure from population increase	Crime, illegal, abuses, accommodation, housing.
Social structure	Community way of living	Livelihood, wellbeing, cohesion, fear, aspirations
	Gendered-based analysis	Gender, women, female

2.2. RESULTS

Based on Parkins and Mitchell's classification of SIA methods (Parkins & Mitchell, 2016), subsections 2.3.1. and 2.3.2 highlight the technical and engagement methods found in our sample of 37 SIA reports for hydroelectric installations in Canada. Subsections 2.3.3 cover the results about baseline information used to predict and later manage social impacts.

2.2.3. Technical approaches to SIA

Technical approaches rely on the quantification and measurement of social impacts through computer-based manipulation of statistics, cost benefits analysis, and expert opinion (Parkins & Mitchell, 2016). Within our sample, input-output tables and expert opinion were the main technical approaches used. Input-output tables use economic multiplier effects to measure interdependence with different sectors of the economy¹. Data was extracted from Stats Canada to calculate direct, indirect, and induced employment rates for the projects.

Experts used input-out tables and the literature to contextualize past population, demographic and housing changes over time by providing information on other projects operating in the area. For instance, the Keeyask project described historical population booms changing the demographic profile of Indigenous communities during past dam constructions in the watershed (Kettle, Kelsey, Long Spruce, Limestone, Wuskwatim, Churchill diversion and Lake Winnipeg). The CBIA conducted for Site C conveyed

¹ See the site of the government of Canada for multipliers
<https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610001301> accessed on August 4, 2020

interviewees' concerns and experiences of past developments in the watershed as well. The Mica dam assessment reported the local experience of another dam constructed in nearby Revelstoke. Similarly, Eastmain 1-A reported previous hydroelectric developments in the James Bay area that changed infrastructure and population demographics. Lower Churchill CBIA performed comparative analysis with the Churchill Falls project as well and results from published grey literature. Nevertheless, parallels with existing projects were not a common component of most assessments.

2.2.4. Engagement methods

2.2.4.1. Open houses

All 37 studies reported using open houses and public comment periods (e-mail or mail) as part of the consultation process. For open houses, the proponents scheduled specific dates and places within the area of influence of the development to present the proposal, discuss environmental and social impacts, hear people's concerns, provide feedback, and discuss commitments, and mitigation measures. Among the projects in our sample, as far as we could tell from the documents, 16 might have only relied on open houses as their community outreach consultation process.

2.2.4.2. Interviews and surveys

We also searched for complementary ethnographic methods or other ways of gathering primary data that might have supplemented the desktop technical approaches and open-house processes. In this context, we looked for reports indicating interviews or participatory approaches that engaged with communities. The word "interview" was not

found or not used in the social sciences context in the documents of 16 dams (Forrest Kerr, East Toba and Montrose, McLymont, Pingston, Tretheway, Upper Lillooet, Upper Harrison, Mactaquac, Lower Mattagami Complex, Yellow Falls, Angliers, Chute Allard, Magpie, Saint Marguerite, Mercier, and Toulnostouc). Twenty (20) project documents mentioned having conducted interviews in the process of SIA community engagement. Six of these mentioned having conducted interviews with ‘key persons’ to understand impacts or construct the baseline context for the study but failed to provide further information on whom the interviewees were, the specific questions and themes covered, or the type of interview method used (Table S2 in the supplemental material). Some project documents did provide further details, however. The Site C assessment provided the list of questions asked during CBIA interviews. A list of themes for interviews and questions along with a sample of the invitation letter sent to participants were also provided in the Eastmain 1-A assessment. The Kokish TEK report provided a list of 21 questions asked of the Indigenous people interviewed to identify sites important for them. The Keeyask and Eastmain 1-A assessments both mentioned interviews being held in the Indigenous Cree language to facilitate communication with the community members. Equally interesting to these efforts to engage Indigenous people is the acknowledgement in the documents for the Taltson hydroelectric project of refusal by some such communities to provide interviews. Eastmain 1-A and La Romaine’s consultation reports noted difficulties recruiting participants for workshops and lack of representation of youth and women among interviewees. The single mention of interview in Upper Toba Valley refers to exploration of the socioeconomics of the region and current employment rate.

Dedicated community surveys have not been a common practice. Only six out of the 37 projects in our sample identified the use of quantitative surveys or questionnaires to elicit public perceptions about the project. For instance, the Mactaquac rehabilitation project included an online survey where people could express their concerns and comment about options to rehabilitate or dismantle the dam, but there were no controls on completion (e.g. people could do it numerous times) nor could response rates be estimated in ways common to rigorous social science. Mail-out or in-person surveys were more often implemented (Site C, Keeyask, Revelstoke, and La Romaine). The content of such surveys is not completely revealed in SIA documents, though. Questionnaires were used in Eastmain 1-A, but the content seemed to cover mostly land use and appreciation of landscape rather than perception of impacts or opinion about the project (see more details in **Table S3** in the supplemental material).

2.2.4.3. Public participatory Geographic Information System (PPGIS) approach

SIA literature has increasingly advocated participatory-based approaches to spatial techniques, such as public participation geographic information system (PPGIS) to elicit social-ecological values and create maps synthesizing the input. Mentions of map-based elicitation with interviewees were found in 9 projects: Mica dam (TEK), Narrows Inlet, Kwoiek, Revelstoke, Site C, Keeyask (35 map biography interviews), Lower Churchill (45 interviews with maps), Eastmain 1-A, and Tazi Twe. The mentions of map-based assessments included the identification of sites of cultural importance for Indigenous

communities, or follow up and monitoring plans that would include interviews to understand social impacts experienced as the projects' construction progressed.

2.2.4.4. COMMUNITY-BASED IMPACT ASSESSMENT

The most comprehensive SIA method found in the sample was the community-led assessment (CBIA). In this SIA model, dam proponents provide financial resources to affected communities so those communities can contract consulting companies or professionals to conduct an independent study following the guidelines and interests of the community. Our research only identified three projects with CBIA as part of the licensing process. They were Site C, Keeyask, and Lower Churchill, all new large-scale developments with prolonged debates over development, and located in areas previously affected by other dams. Site C and Keeyask CBIA are similar in the sense that they employ more storytelling frameworks. Lower Churchill CBIA, submitted by the Innu Indigenous Nation, used more GIS modeling mostly based on secondary sources of data belonging to the community and focused more on biophysical and infrastructure changes.

CBIA are more participatory than conventional SIA and designed to include methods designed/accepted by the community. For example, Site C and Keeyask CBIA conducted interviews with community representatives and members and included storytelling practice as part of the assessment. This is an oral practice of knowledge transmission used by Indigenous communities that can cover ways to interact with land, perform cultural ceremonies, provide locations, and guide the use of natural resources. Keeyask called this approach the “Mini Pimatisiwin – living a good life” framework. The stories not only present concerns of community members, but they can reveal historical and cumulative changes perceived as a result of past policies and activities. This aids in the

construction of baseline conditions and identification of concerns and issues important to community members beyond physical changes. Site C's CBIA report (Treaty 8 First Nations Community Assessment Team, 2012) presented a table with 105 issues of importance to Indigenous people affected by hydroelectric developments. The term "storytelling" was found in the assessment of four other projects (Revelstoke, Taltson, Narrows Inlet, and Lower Churchill) recognizing the method as a cultural practice important to Indigenous people. Those documents did not, however, incorporate storytelling practice as the main component of the assessments.

2.2.4.5. Multicriteria approach

Taltson hydroelectric project was unusual by presenting a multicriteria approach to rate the project's impact on people's livelihoods. The assessment presented the Sustainability Livelihood Framework index, which includes components for human, social, natural, physical, and financial capitals. This framework hypothesizes that overall community livelihood would be enhanced when all capitals experience improvement (Dezé Energy, 2009). No step-by-step methodology was provided nor raw data to estimate the overall index number. **Table 4** summarizes the main results from the analysis.

Table 4. Summary of methods and their application context in a sample of SIA documents for 37 hydroelectric projects in Canada

Predominant Method	Projects using method	Context	Project
Open house	37	Acquire public opinion	All
Input-output table	37	Predict economic and demographic changes	All
Interviews	20	Used to identify community concerns, and locate significant sites, and acquire detailed information about social problems	Dunvegan, Eastmain 1-A, Innavik, Keeyask, Keenleyside, Kokish, Kwoiek, La Romaine, LCP, Mattagami dam, Mica Dam, Narrows Inlet, Peribonka, Pointe du Bois, Revelstoke, Site C, Taltson, Tazi twe, Waneta expansion, Wuskwatim
PPGIS	9	Merges interviews and geographic information system to pinpoint important sites	Eastmain 1-A, Keeyask, Kwoiek, LCP, Mica Dam, Narrows Inlet, Revelstoke, Site C, Tazi twe
Surveys	6	Mailed out or online questionnaires used to acquire public opinion-	Eastmain 1-A, Keeyask, La Romaine, Mactaquac, Revelstoke, Site C
CBIA	3	Study submitted by the community and might include methods designed by the community	Keeyask, LCP, Site C
Multi-criteria approach	1	Merges different components and attributes numeric values to measure an overall impact based on the scores provided	Taltson

2.2.5. Social impacts identified

We created a master list of social issues covered to estimate how often they are present across our sample of reports. **Figure 2. 2** shows what percent of reports contained coverage of each social issue, recognizing that awareness of some issues is more recent than some of our reports. We then analyzed whether there was a correlation between project size, decade of construction (considering that time should play a role in improving the

quality of reports over decades of practice), and social impact coverage (**Table 5**). There is only weak evidence that SIA content evolved with time (as a result of legislation or practice) (correlation = 0.32, $p=0.05$). The coverage of identified social impacts varied widely among projects developed over the same period. Equally noted is that most of the large hydroelectric dams in the sample were constructed after 2010, which coincidentally matches to projects containing more of the keywords we used to identify social issues. The size of the projects thus seemed to have a major influence as larger developments tend to attract more public scrutiny and rigorous assessments (correlation = 0.69, $p<0.001$). Therefore, the increase of inclusion of social aspects might have only been a response to legislation demands rather than best practices evolving with knowledge and time. As observed, many assessments for hydroelectric dams varying from 4 MW (Mattagami dam) to 670 MW (Mactaquac) included less than 50% of identified social issues and as low as 20%. Tazi Twe (50 MW) and Taltson (484 MW) were unusual as being smaller but covering a large share of the issues (67% and 80%, respectively). Yet a handful of large dams included the most social issues in the assessment varying with values above 80%, except for Mica dam (60%) and La Romaine (67%). The following subsections will give more details on each social impact analyzed (i.e., demographic, psychological issue, physical infrastructure, socioeconomics, gender in SIA, and others such as livelihood, cohesion, wellbeing, and equity).

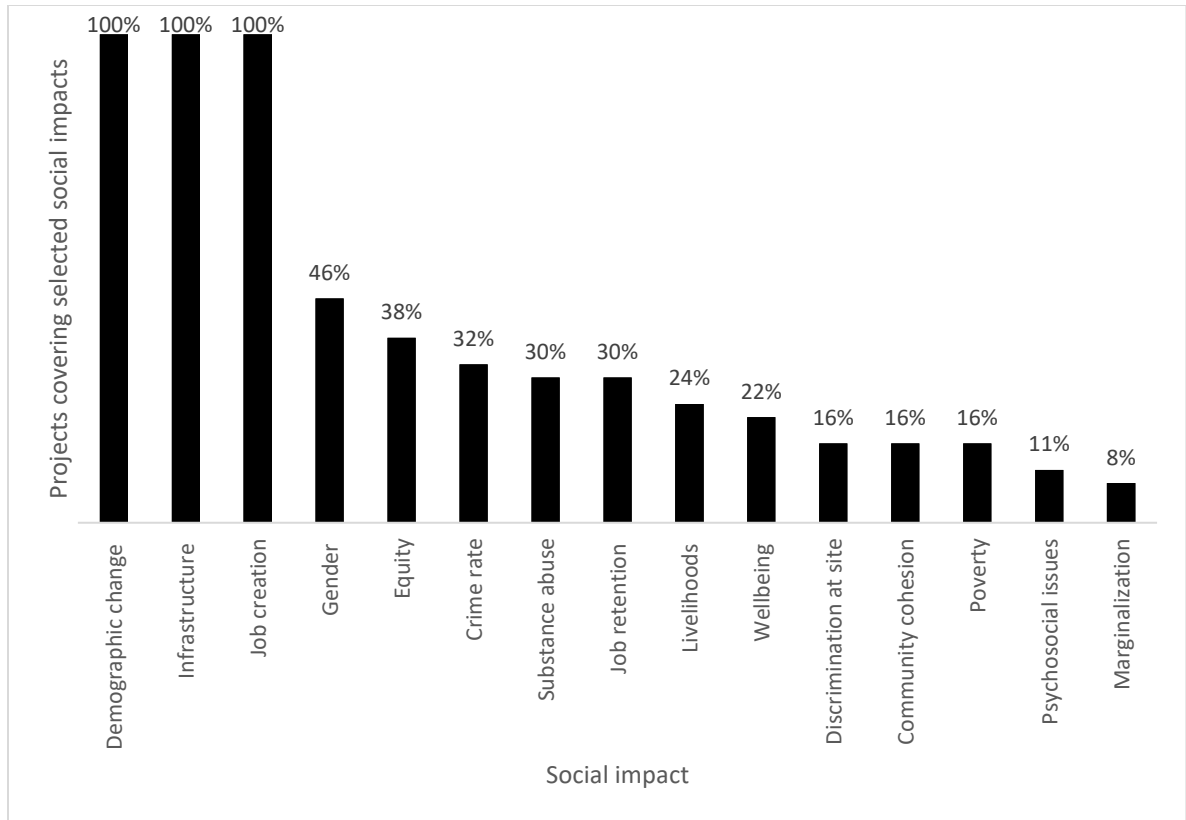


Figure 2. 2. Reporting of social impacts by hydroelectric assessments

Table 5. Pearson correlation coefficient between power capacity, social impacts covered in each report, and decade of implementation of the dam.

	Capacity (MW)	Social impact content	Decade of development
Capacity (MW)	1		
Social impact content	0.69***	1	
Decade of development	0.21	0.32*	1

Significance F for correlation between social impact content and capacity: 0.00000211. Significance F for correlation between decade of development and capacity: 0.05

2.2.5.1. Demographic changes and related effects

Hydroelectric projects are known for inducing a sudden boom of population caused by the influx of people looking for employment. The common assumption, in all

documents, was that any workforce would be composed of people from surrounding communities or stationed at work camps, so employees would commute during the day and return to their communities or work camps after the working day. Even though large projects could bring large number of outsiders, constructed work camps were described as alleviating the pressure of the sudden increase of population on existing communities. The construction of work camps was not felt to be necessary for ten projects that assumed the use of hotel accommodations or existing work camp sites nearby (Table S4 in the supplemental material). The predicted work camps ranged in size with carrying capacity varying from a few workers to large construction camps able to accommodate up to 5,500 employees on site (Eastmain 1-A). Work camps were expected to be equipped with recreational areas, gyms, and other infrastructure that would support workers to remain on site during days off. Projections typically concluded that population increase would be small, temporary, improve businesses opportunities, and have no residual effects after construction. When metrics were provided, the anticipated population growth ranged from 0.5% (Waneta), to 1% (Keenleyside), or 2% (Revelstoke and Site C). The remaining projects analyzed did not provide metrics or stated that demographic changes would not be significant or cause no residual effects.

The influx of non-locals or international workers to the community can increase social discrimination in host towns, inside the work camps, and in the process of hiring personnel work on the project, as acknowledged by six assessments (Site C, Revelstoke, Keeyask, Lower Churchill, Taltson, Eastmain 1-A). The La Romaine reports included a statement from the Indigenous Innuat group that opposed the hydroelectric development because they believed that the psychosocial risks associated with increase of drugs and

change of livelihood outweighed economic benefits. Social impacts prior to development (i.e. rumours) were not measured in most of the reports but were often acknowledged, e.g. increase of housing and rental costs. The Eastmain 1-A consultation report included an assessment of anticipated stresses, conflicts, and changed social behaviour because of the debate around support to the development when the project was announced. Inflation of real estate values was acknowledged, though it was expected that depending on market conditions, the problem would stabilize after construction. Other issues included often-reported fears such as increases in abuse of drugs and alcohol (11 projects) as net income rises, as well as higher crime rates (12 projects), more illegal hunting and fishing, and temporary pressure on community services during construction (all projects). Topics relating to the likelihood of low-income residents to become homeless due to high housing costs and demand at peak construction were not covered in any assessment.

2.2.5.2. Social impacts associated with physical infrastructure

Agreements are typically made for the construction of new access roads, and compensation made for the alteration of navigation patterns, modification of access to certain places, and degradation of existing transportation routes. Proponents sometimes repair and maintain local infrastructure to provide access to important areas. Construction of infrastructure came with concerns about temporary issues such as road traffic and noises that are linked to impacts on human health and fauna disturbance. Construction noise and infrastructure are noted in the traditional land use assessments to affect fauna habitat and subsistence activities of hunting, trapping, and fishing. Commitments to minimize negative impacts were often made, such as around hunting and fishing restrictions, habitat creation,

and corridor pathways for animals. Compensations are also negotiated in community agreements for losses or impacts that are not part of SIA reporting.

As for the resilience of people's relationship with landscape after construction of hydroelectric dams, the assessment of the Sentinelles des Quinze challenged the report submitted to Angliers hydroelectric station (25 MW). The Sentinelles des Quinze (Les Sentinelles des Quinze, 2005) claims that impacts on landscape and aesthetics should include less visible components and consider more aspects related to the community relationship with the land. This is contrary to proponent assumptions that population would just adapt to a transformed landscape. However, such opposition is not common in SIA reports.

2.2.5.3. Psychosocial issues

Rather than enumerate the many physical changes that are clearly altered by hydroelectric developments and reported by all projects, we looked for psychosocial issues caused by landscape changes. The two storytelling-based CBIA's included contributions from participants expressing their experience with loss of wellbeing due to the destruction of culturally significant landscape sites by past hydroelectric developments. Psychosocial issues of landscape visual changes and noise were concerns raised without clear mitigation measures other than compensations. The term psychosocial (or similar terms such as psychological and emotional) appeared in the documents of only four projects (Dunvegan, Site C dam, Eastmain 1-A, and La Romaine where the community demanded clear planning to mitigate issues). Examples of psychological impacts induced by landscape changes were reported in the Site C CBIA, which claimed that Indigenous workers decided to resign from job positions on prior dam constructions because they could no longer bear

to see the devastation of sites of significant spiritual value. Eastmain 1-A comprehensively addressed psychosocial issues in the consultation report by describing participants' senses of loss, anger during consultation, unhappiness and sadness when expressing past experiences and losses of community livelihood, aspirations about the future, frustrations in regard to mitigations, and fears of dam collapse.

2.2.5.4. Socio-economic dimensions

Socio-economic issues tackled within SIA convey a project's primary effects with regards to employment, local procurement, businesses opportunities, training, and development of skill sets.

Overall, the large amount of investment in hydroelectricity development, from 7-9 million (5 MW Mattagami dam development) to 10.7 billion dollars (Site C²), would offer direct income for workers and incentivize other sectors (e.g., hotels, restaurants, services) to diversify the local economy and increase tax revenue to governments. Hydroelectric dam construction can employ thousands of people and generate many business opportunities. The amount of anticipated employment ranged from 100s on small-scale projects to totals of 27,000 person-years (Eastmain 1-A). As per agreements with communities, contract preferences involving labour and procurement of materials or services are typically given to Indigenous people, local and regional residents, and provincial residents. But in the case of a lack of skilled workers available in the community or region, projects might require labour from other provinces or internationally. Job turnover and difficulties to retain Indigenous workers were reported in the assessments of 11 projects (East Toba and

² Information from <https://www.sitecproject.com/sites/default/files/info-sheet-site-c-project-budget-april-2018.pdf>

Montrose, Narrows Inlet, Site C, Revelstoke, Pointe du Bois, Keeyask, Wuskwatim, Lower Churchill, Taltson, La Romaine, Tazi Twe).

Compared to the construction phase, employment rates during operation drop significantly to smaller numbers of high-skilled positions, varying from 0 (Saint Marguerite autonomous dam) to 280 workers-year at Lower Churchill considering operation and scheduled maintenances for the entire project lifecycle (**Table S5**, supplemental materials). However, proponents typically state that there would be other opportunities for local investment due to equity income from partnerships with communities. Equity income is the use of financial resources to strengthen community livelihoods so members can be “free to choose the extent to which [they pursue] traditional and non-traditional economic pursuits” (Dezé Energy, 2009) [p.15.8.4].

2.2.5.5. Gender-based analysis: the socioeconomic perspective

We found most content about gender-based analysis was located in the socioeconomic parts of assessments. We used the words “gender” and “women” to explore the expected distribution of opportunities and how challenges were reported. The word gender was found in the documents of 12 projects, while women was found in the documents of 19 projects. Equity was commonly associated with gender. The assessments of Site C dam, Mica Dam, Lower Churchill, Revelstoke, and Wuskwatim offered specific goals to employ female workers and minority groups varying from around 10% (Waneta), and 11.3% (Mica Dam) to 24% (Wuskwatim) (see Table S6 in the supplemental material). The Wuskwatim project broke down the metrics further, targeting “Women: 24% Women in management: 12% Women Professionals: 31%”, and also provided targets for other underserved groups, such as “Persons with Disabilities: 4.6%, Visible Minorities: 3.8%”

(Manitoba Hydro, 2003) [p.9]. Site C, Keeyask, and McLymont TEK (briefly) included participant perceptions of the role of different genders in the community³. Site C, Keeyask, and Lower Churchill assessments, which represent the newest and largest dams of the 2010s, included concerns about challenges faced by women, such as remoteness and long hour shifts (and related psychological issues for all genders), unplanned pregnancies, sexual harassment, social vices emerging with the income of male in-migrants, and the social effects of raising children, in addition to common concerns over women and toddlers being more susceptible to mercury contamination. Site C and Keeyask focused on the host Indigenous communities, while Lower Churchill included both non-Indigenous and Indigenous people. The context of gender in the remaining documents (17 counting the abovementioned projects) relate to descriptions of demographic profiles and historical roles of women and men in the community, and mercury contamination on pregnant women and toddlers.

2.2.5.6. Other social concerns: equity, poverty, marginalization, community livelihood, wellbeing and cohesion

Keywords were used to identify non-physical notions of social issues such as livelihoods (the way people live), wellbeing, community cohesion, social equity, poverty, and marginalization. Searches showed that the term “equity” was the most commonly used of these, appearing in the documents of 13 projects. Poverty appeared in the documents of

³ Mica dam TEK cites Ignace and Ignace, Traditional, p. 382. “The men of those groups would hunt the mule deer, caribou and elk found at higher elevations while the women and children remained at the base camp where they trapped smaller game and processed the hunters” (p.180)

only the Mica dam, La Romaine, Peribonka, Site C, Lower Churchill, and Eastmain A-1 projects, but usually in the socioeconomic baseline or context sections rather than as an anticipated impact. Marginalization and social exclusion were mentioned in the two CBIAs and Lower Churchill project assessments (though not in the latter's CBIA), to demonstrate concerns based on past experiences with dams. Vulnerability was not used in the context of social vulnerability (except for the Site C and Keeyask CBIAs), thus it was not a good term to reveal social impacts inside the documents. **Table S7**, in the supplemental material, details the coverage of livelihood, wellbeing, and social cohesion.

Where the term equity was used, the context was usually associated with equity sharing benefits (royalties and dividends) and the balance of employment opportunities associated with the development. Equity in the sense of socio-economic gaps was flagged in the Site C, Keeyask, Revelstoke, and Lower Churchill. These reports discussed social constraints regarding disadvantageous conditions such as: few Indigenous-owned business and poor business planning and structure among those existing businesses; lower education and fewer skilled personnel in remote host communities; disparity of social conditions between Indigenous and non-Indigenous people; and, other socioeconomic hurdles faced by isolated and northern communities. On Site C and Keeyask documents, sentiments were expressed that benefits (contracts, employment, payments) could also cause more adverse impacts if they were not readily available for members of the communities.

Livelihood appeared in the documents of nine projects, wellbeing was used in seven projects, while (community or social) cohesion was only found in six projects. No other projects provided discussion about the keywords or included them within the text. The context in which these words were used ranged from affected people remembering the

impacts of previous hydroelectric developments; descriptions of land uses, traditional practices, or traditional economy; or concerns about the potential effects induced by a new development. However, we noticed that some reports focused on incorporating wage economy with the community livelihood so employment could be emphasized to improve livelihoods and community cohesion as well. For CBIAs, concerns were expressed about the effects of a wage economy interfering with a community's social cohesion due to the connection between livelihoods of Indigenous communities and land use and traditional practices of spiritual and cultural importance. For the Revelstoke assessment, while the licensing agency considered the assessment for impacts on livelihood and wellbeing performed by the proponent to be adequate, the affected community disagreed as it mainly addressed socioeconomic issues rather than investigating the way people lives would change.

2.3. DISCUSSION

The multiple and complex social implications of hydroelectricity call for a wide range of approaches to collect, analyze and synthesize relevant data. We saw a multiplicity of SIA methods being used by a few projects, but most using only a limited set. The following subsections aggregate and discuss methods and their assumptions to anticipate and manage social impacts.

2.3.3. Socioeconomics and demographic changes

Strictly technical approaches to SIA (that have been thoroughly critiqued in the literature (Parkins & Mitchell, 2016)) persist in driving baseline assessment, prediction, and planned management of social impacts. These technical approaches largely exclude

meaningful participation or consideration for complex social problems that would require moving beyond technical approaches. Most socioeconomic profiling and prediction of benefits used input-output modeling, via multiplier effects, focusing on the creation of direct, indirect, and induced jobs. Analyses do not incorporate information regarding broader impacts of dams on alleviating poverty or wealth distribution in the host communities. In communities where conflict regarding dam construction was more evident, there was slight improvement on economic analysis. But this enhanced analysis did not include the acknowledgement of negative affects with employment metrics towards turnover rates and retention of Indigenous people. In general, the multiplier effects used to predict employment benefits lack the social insight needed to reveal how benefits can be unevenly experienced. Input-out tables in the scholarly literature are being adapted to incorporate social impacts such as remuneration inequalities and costs of accidental injuries (Richter et al., 2019). Kamari et al. (2017) proposed a predictive SIA simulation model capable of quantifying qualitative and socioeconomic parameters for large-scale infrastructure projects. Other socioeconomic computer modeling in the literature is evolving from simply the creation of employment to measuring the willingness to receive those jobs in relation to environmental changes in the community (Spyce et al., 2012).

Another socioeconomic component that might be identified in SIA documents but not present in social modelling regards the nature of created jobs. Proponents break down the number of positions throughout the project lifetime. In the literature, concerns are raised about short training periods, which might not prepare individuals to successfully engage in the workforce (as reported about Keeyask (Buckland & O’Gorman, 2017) and La Romaine (Guimond & Desmeules, 2018)), and community feelings toward low-quality jobs with

their predominance of low-wage positions, e.g., cleaning and catering, and the exclusion of Indigenous people from management positions. The questions that remain unanswered are ‘how do these jobs contribute to minimize social problems and unequal distribution of wealth in the community?’ and ‘what do people feel or expect from those jobs?’.

A wider range of methods may be possible for *ex ante* social impact predictions related to such jobs. For instance, social media has been applied in the academic space to investigate how people feel about hydroelectric dams, e.g. (Sherren, Parkins, et al., 2017), but mostly in the context of non-Indigenous people. Adaptations could be made to assess the feeling about jobs and benefits that are included in social media or other data collection activities. Social media may also present a platform for public engagement and discussion around social impacts of projects (Sinclair et al., 2017).

As for management of socioeconomic impacts, efforts to retain Indigenous workers still seem to fall short. Companies largely expected that the hiring of employment counselors and recruiters from Indigenous backgrounds or within the community should minimize the problem. Past experience with the Wuskwatim dam construction showed that despite the presence of an on-site counsellor and a specialized liaison worker, Indigenous people comprised 29% of workers but their retention rate was low, with 40% turnover rates (Deloitte, 2013). The reporting of social impacts to potentially impacted people can be strengthened with supporting information from social monitoring results from other hydroelectric dams, especially where dams are new to the region. This way, the community can better understand the risks associated with the project and arrive at an informed consent.

2.3.4. Improving gender-based analysis

SIA should view gender as more than employment metrics; community profiles must incorporate the current (not just past) roles of both genders and evaluate the expected impacts on the livelihoods and everyday lives of women and men. This can be achieved with early and continuous community engagement focused on women and minorities, with methods carefully designed based on the local characteristics and culture. Our recommendation agrees with that of Dalseg et al. (2018) who conducted research with Indigenous women from northern Canada. Thus, from the assessment point of view, specific impacts require more visibility, and mitigation of those effects on minorities and women. The gender-based SIA literature provides a wider range of indicators related to the participation and knowledge of women in decision-making based on both current and changing livelihoods and roles in the community (e.g. single mothers working), see (Hill et al., 2017; Stienstra, 2015; Stienstra et al., 2018). A wider set of methods would doubtless illuminate gender issues more clearly. Nevertheless, it might require more resources, additional training, and perhaps time to tackle such issues adequately.

2.3.5. Livelihood, wellbeing, and others

A preliminary challenge faced in this work was the limited amount of social content covered in the reports overall. Many reports lacked words such as livelihood, wellbeing, gender, marginalization, poverty, inequity, community cohesion or disruption, and other words commonly used by social scientists. The limited content in SIAs about community cohesion and vulnerability may reflect the methods used to assess these complex social impacts. Reports acknowledged hydroelectricity as the harbinger of change for traditional,

social, and cultural way of life in hydroelectric host communities, while advancing hopes that socioeconomic benefits would somehow compensate such negative effects. In this sense, we noticed an overwhelming focus describing livelihoods as linked to the exploration of natural resources as economic activity (fishing, hunting, and herbs gathering), rather than components proposed by Smyth & Vanclay (2017) that pertain to capacity to pursue community goals, understanding of the political context, identification of livelihoods, what the community constitutes as wellbeing, and inclusion of cultural and spiritual aspects.

In addition to comparing the effects of past projects on the livelihood and wellbeing of communities, the scholarly literature and communities have long been reporting cumulative social impacts and irreversible losses of resources that decrease the capacity of such communities to carry on traditional resource exploitation (Banks, 2013; Lechner et al., 2017; Weber et al., 2012). Working together with host communities through CBIA approaches is suggested to improve the assessment of impacts on livelihoods and wellbeing. Communities might desire the inclusion of non-economic mitigation measures to sustain traditional ways of living and local wellbeing. For example, a CBIA conducted with Indigenous communities in the Yukon Territory (Christensen et al., 2010) selected indicators that explore the themes of social healing (indicators focused on dealing with injustices, strengthen culture and capacity within the community, and restore community health), and healthy relationship with the land (pollution, health of animals, traditions and land use, and conversation), especially in relation to cumulative social impacts. Another aspect missing in the indicators we reviewed is the notion of social resilience where

communities can preserve traditional ways of life while still adapting and prospering in face of environmental changes (Christensen & Krogman, 2012; Parlee et al., 2012).

More complex and computational approaches are also found in the literature. Climent-Gil et al. (2018) proposed a SIA method focused on assessing social vulnerability and poverty in a hydroelectric dam in Chile. Such analysis is needed as few projects express concern over vulnerabilities, poverty, marginalization, and cohesion of host communities. Mantyka-Pringle et al. (2017) proposed to integrate qualitative and quantitative components of Indigenous and Western knowledge into a multicriteria decision-making tool. Multicriteria approaches are not new proposals in the literature, but their application on SIA is rare as far as we could identify in our sample.

2.3.6. Community engagement and community-based impact assessment

Public consultation via open-houses and workshops were the predominant source of information regarding social issues expected to occur from hydroelectricity development. We identified 16 projects that seem to have relied entirely upon open houses and literature reviews for their assessment. This is not surprising, but worrisome as several past studies have criticized the participation component of open houses held for licensing of projects for several reasons. Problems include lack of trust, manipulation of the process, lack of impartiality, fatigue due to the cumulative number of consultations for different projects, and structural hurdles imposed by legislation frameworks and socioeconomic characteristics (Diduck & Sinclair, 2002; Udofia et al., 2017). These obstacles contribute to limited participation, exacerbated by common beliefs that decisions will not change even

if participation is increased. Vanclay et al. (2015) stated that public consultation is not SIA as it does not empower communities to take control over social components and the assessment of likely impacts. We do not want to diminish the role of such approaches but emphasize that participatory SIA goes beyond gathering people to discuss concerns. The scholarly literature is rich in proposals for engaging communities more meaningfully to perform SIA, see (Christensen et al., 2010; IFC, 2007; Wilson et al., 2016). These approaches, though, require more civic engagement and active participation in the process of identifying indicators, changing the scope of projects based on community feedback, and negotiating clear measures to mitigate social impacts. The idea is giving power to communities instead of controlling the process via open houses. Community-led assessment may be key to improving SIA.

With regards to the interviews, reports were not always clear about the contents of these interviews and how they influenced decision-making. Many interviews were held to collect information regarding TEK, animal migration, and baseline conditions for the assessment. When semi-structured map-based interviews were used to complement quantitative social and environmental data, the goal was focused on identification of important areas and possibly animal migration patterns. Such information is important for SIA but could be extended. Map-based SIA approaches in the literature have also focused on tracking the impacts of extractive industries on fauna behavior and how it relates to changes to traditional communities whose diet depend on hunting, see (Herrmann et al., 2014; Kumpula et al., 2010). However, even such interviews might not reveal the complete social and cultural value of the region and might be strictly designed to pinpoint sites rather than providing support to social analysis (Baker & Westman, 2018; Joly et al., 2018). As

quoted for the Mica dam TEK “the challenge is identifying those [cultural] values. As is often the case with sensitive cultural or sacred sites, people may be unwilling to provide what is essentially very private information. [...] [we] cannot show specific locations” (Paskin, 2009) [p.7]. Researchers analysing interviews with Indigenous communities in Canada critiqued the conversations and meetings conducted for SIA (Booth & Skelton, 2011; Lawe et al., 2005). The allegation is that those interviews and reports are mainly conducted within a Western framework that conflicts with traditional ways to share information, which could result in the reluctance to contribute to the process. The fact that we identified only 2 CBIAAs using Indigenous storytelling is indicative of the preference for approaches that are not designed to accommodate communities’ preference. **Table 6** provides examples to improve SIA practice based on the analysis performed here.

Table 6. Examples of improvements for Social Impact Assessment practice.

<i>Topic</i>	<i>Issue</i>	<i>Suggested adaption</i>	<i>Ref. example</i>
Technical approaches	Input-output tables cannot predict how wealth and benefits are distributed.	Identify root causes for vulnerabilities and include people’s needs, living wage distribution, and reduce poverty indicators in the technical approaches	(Climent-Gil et al., 2018; Richter et al., 2019)
	Technical and social aspects are not integrated well	Diversify methods. E.g., perform simulations for social impacts, use multicriteria analysis that includes both engagement and scientific techniques, or social media analysis to perceive people’s feelings towards the project	(Karami et al., 2017; Mantyka-Pringle et al., 2017; Sherren et al., 2016; Sherren, Parkins, et al., 2017)
	Lack of analysis between trade-offs for environmental changes and economic benefits	Study the willingness to trade employment for environmental change	(Spyce et al., 2012)

<i>Topic</i>	<i>Issue</i>	<i>Suggested adaption</i>	<i>Ref. example</i>
	Tables are not sufficient to “predict” and manage impacts.	Comparative diachronic cases showing changes, how projects dealt with social impacts, and results improving community life, management of turnover rate problems, previous results with employment training and past projects changing socioeconomic of other regions	(Asselin & Parkins, 2009)
Engagement	Open houses do not provide real engagement, process controlled by industry, poor public participation, no empowerment of communities	Increase community-led initiatives and diversify approaching methods.	(Christensen et al., 2010; IFC, 2007; Wilson et al., 2016)
	Meaningful engagement	Consider Indigenous, traditional, and local ways of passing information and design questions to understand the local perspective. Include questions about feelings, expectations, psychological issues, expectations, values, and others not entirely focused on economics or identification of sites. Include traditional knowledge onto the assessment and demonstrate how the community life can be improved. Respect opposition and collaborate to find solutions.	(IFC, 2007, 2012; Wilson, 2008)
	Gender-based analysis	Include parameters wider than employment metrics (roles of each gender, how women interact with the environment, availability of childcare, hardships for getting employment, isolation and time away from children, violence and abuses, education gap between men and women)	(Hill et al., 2017; Stienstra, 2015; Stienstra et al., 2018)

2.3.7. Improvements and addressing the root causes

In terms of methods, a significant improvement in SIA practice is evidenced by the few CBIAAs reviewed and their use of oral storytelling frameworks to engage Indigenous people. Conversely, there is significant criticism about the consultation process conducted

for Site C CBIA reports (Amnesty International, 2016). Despite the comprehensive assessments, the project has been widely criticized for social impacts and infringement of Indigenous rights (Bakker & Hendriks, 2019). As such, it can be noted that even CBIA approaches do not guarantee a ‘perfect’ match between the nature or intensity of impacts discussed in the baseline to the real impacts experienced. Subsequent proponent actions and legislation frameworks might have hindered the capacity of the assessments to mitigate negative impacts on Indigenous rights, which resulted in conflicts and inefficacy of the consultation process (Dubrule et al., 2018; Muir, 2018). Hence, we might infer that methods alone will not improve SIA practice; institutional arrangements have an important role in the empowerment of affected communities (Esteves et al., 2012). Similar studies investigating SIA practice in Bangladesh (Khan, 2020), Brazil (Fonseca et al., 2020), and Mexico (Martinez & Komendantova, 2020) arrived at the conclusion that impact assessments are generally poorly described, tend to use the same methods, focus on baseline conditions for environmental impacts, and undermine SIA practice in relation to engagement and support of communities. Our study complements those analyses by offering the perspective from SIA for hydroelectric dams in Canada over 20 years of practice. The additional questions left unanswered by our work might be ‘whose fault is that’ and ‘how can SIA actually be improved in practice’?

In addition to verifying the content of SIA documents and deciding the fate of projects, institutions contribute to the scoping and requirement of studies. Thus, the variation in SIA content and their lack of sophistication can be generally explained by lack of institutional/government consistency and comprehensiveness in creating guidelines. In some cases, data collected prior to planning does not reflect the project characteristics in

relation to the social viability of the project for the region (Martinez & Komendantova, 2020). Therefore, the Terms of Reference (ToR) created to support the SIA process may be ineffective to capture the likely social impacts for a given technology (Golder Associates, 2019). In Alberta, there are Standardized ToR for developments like coal, and oilsands, but not for hydroelectric dams. At the federal level, there is the Tailored Impact Assessment Statement Guidelines (Impact Assessment Agency of Canada, 2019) and draft project specific terms of reference, e.g., Site C ToR, but these are emerging. Fonseca et al. (2020) argued that such standardization of methods would be positive to create terminologies and structure, but also challenging because of the complexity in dealing with intangible aspects of culture and community life that are inherent to specific places and people. Standardized methods may be as harmful to them as ‘boilerplate’ content reused by busy consultants.

Expanding on that, another root cause of the ineffectiveness of SIA practices may be the role that consultancies play in developing SIA content (Wong & Ho, 2015). There are informal norms and expectations between proponents and regulators in each jurisdiction. The consultant’s job is to help the proponent navigate these regulatory expectations and, as put by Baker et al. (2018), professionals might be compelled to write and edit SIA reports that will eventually pass the regulatory review process. Ijabadeniyi & Vanclay (2020) put it in different words, arguing that consultants discover ways to manipulate SIA for regulatory approval. This malpractice will eventually exacerbate social conflicts and lead to the impoverishment of host communities. While consultants are blamed for ‘giving in’ to industry pressure (sponsoring the work and expecting a certain result), institutions equally share the responsibility for the deficient SIA practice and

inadequate progress over time. In fact, a recent study showed that environmental regulatory agencies in Canada and Brazil (thus both developed and developing nations) seldom deny approval for projects (Fonseca & Gibson, 2020). With this design, approval is obtained despite opposition, inappropriateness of methods, or lack of information enlightening the real benefits or consequences for vulnerable peoples affected by the developments. Therefore, SIA methods become inefficient tools to prevent conflicts and contribute to social enhancement as institutions use impact assessment (thus SIA) to better understand impacts but not necessarily to increase the weight of those impacts in approving projects (Hunsberger et al., 2020; Martinez & Komendantova, 2020).

Based on our analysis, a suggestion to improve SIA methods and practice would be the consolidation of rigorous guidelines for specificities of projects that are aligned with institutional arrangements that are free of bias, resulting in the refusal of projects that fall short in terms of SIA (and EIA) practice. Moreover, Mora et al. (2018) argue that smaller hydroelectric projects might cause significant degradation, particularly cumulatively, thus policies should not allow streamlined SIA for smaller hydroelectric projects. Such recommendations are, however, unlikely to be taken up in practice due to economic interests. Another consideration is the recent change in the Canadian Impact Assessment Act (IAA). Hunsberger et al. (2020) believe that the new IAA scores higher than its predecessors (environmental acts of 1992 and 2012). However, this new regulation would still not satisfy the high standards imposed by the Expert Panel regime (prior to IAA), which was used to license Site C, Keeyask, and Muskrat Falls, all projects that are still the source of many controversies. Consistent with Baker & Westman (2018), it is clear that SIA/EIA should be improved at the political level, rather than just the technical aspects, to

accommodate the rights of Indigenous communities in particular (P. Hanna & Vanclay, 2013; Kemp & Vanclay, 2013). The sphere of treaty rights within SIA is an important aspect not covered in our research. We acknowledge its relevance for future studies focused on the policy side of social impacts.

2.4. CONCLUSIONS

We offered an overview of methods and the content of 37 SIA reports conducted for hydroelectric dams in Canada over 20 years of practice. We demonstrated that methods used to construct the reports are limited, vague in content and not transparent with regards to the information used. Industrial practice has not kept pace with the scholarly literature in incorporating more engagement and data collection approaches in assessment. The indicators were more economic than social. When we reflect on both methods and baseline information in relation to the literature, we argue that in order to improve SIA there is a need to include other parameters pertaining to culture, livelihoods and wellbeing apart from socioeconomics, and introduce the notion of limits for development that would seek to guarantee socially accepted, economically feasible, and ecologically friendly hydroelectric projects.

Some limitations associated with our approach include the use of keywords and manual screening to identify social impact content. Due to the large volume of information contained in each document, specific details might have been missed. Moreover, most reports found for hydroelectric installed in Quebec were written in French, which made it difficult to translate and code areas of social impacts effectively. We acknowledge these limitations of our approach in analyzing the reports but argue for their fit here.

This study aimed to fill a gap pertaining to research-technical studies around SIA; future researchers can explore political aspects to methods and predictions of social impacts. As we have addressed, written SIA reports can hide the social and political dimensions around projects, issues that may eventually hinder the efficiency of the whole SIA process. In addition, our paper focused on *ex-ante* impacts; future studies may supplement the analysis with monitoring social impacts during and after construction (*ex-post* impacts).

CHAPTER 3 –

A BRIDGING CHAPTER: FROM MONITORING REPORTS TO MEDIA REPORTS

3.1. RECAPITULATION OF THE SECOND OBJECTIVE: SIA AND MONITORING REPORTS

During the scoping phase of this project, the initial idea was to survey EIA reports used to license hydroelectric dams as well as monitoring reports covering social impacts. This approach was expected to reveal methods and all other assumptions used to identify and manage social impacts, compare those predictions made during the licensing phase with monitoring results to establish whether negative impacts were adequately mitigated, and compare consultant-led SIA with the SIA literature. Behind the analysis, there was the idea of assessing the quality of consultant-led SIA (Bond et al., 2018) using an environmental auditing approach (Wood et al., 2000) to answer the following specific questions:

- Are consultant-led SIA methods to understand social impacts different during the monitoring phase?
- Does the SIA literature provide innovative approaches to conduct monitoring?
- Do monitored social impacts differ from anticipated impacts?

3.2. SYSTEMATIC REVIEW OF MONITORING REPORTS

This research applied the same systematic mechanism described in Chapter 2 to find monitoring reports for the 37 Canadian hydroelectric dams that had SIA/EIA and any social or socioeconomic monitoring documents available online (Table 7).

Table 7. List of social or socioeconomic monitoring reports available online for hydroelectric dams in Canada

<i>Project</i>	<i>Monitoring report</i>
<i>Brilliant Expansion* (BC)</i>	Final socioeconomic monitoring report (2007)
<i>East Toba & Montrose (BC)</i>	Annual environmental monitoring report (2010-2011)
<i>Eastmain 1-A (QC)</i>	Summary of Mitigation and Enhancement Measures (2012) Many documents are mentioned online but they were not found on the Quebec registry
<i>Keenleyside (BC)</i>	Summary socioeconomic monitoring report (2002)
<i>Keeyask (MB)</i>	Multiple documents since 2016 ¹
<i>La Romaine (QC)</i>	Summary Analysis of the Impact of the Romaine Hydroelectric Project on the Health of the Population: Monitoring the Situation in the Municipality of Havre-Saint-Pierre (St-Pierre & Lambert, 2014) Other 44 documents in French since 2018 ²
<i>Muskrat Falls (NL)</i>	Multiple monthly reports (more economic and biophysical assessments) ³
<i>Site C (BC)</i>	Multiple documents ⁴
<i>Toulnostouc (QC)</i>	Summary of environmental activities (2005)
<i>Waneta Expansion (BC)</i>	Final socioeconomic monitoring report (2015)
<i>Wuskwatim (MB)</i>	Evaluation reports (2013 and 2014) Year in Review (since 2013)

* An EIA report was not found for this project, just the monitoring report. I kept the document for a preliminary screening and analysis.

¹ Keeyask website: <https://keeyask.com/the-project/environment-and-monitoring/preliminary-environmental-protection-program/environmental-monitoring-plans/>.

² Quebec environmental registry https://www.ree.environnement.gouv.qc.ca/projet.asp?no_dossier=3211-12-086.

³ Muskrat falls website: <https://muskratfalls.nalcoreenergy.com/environment/generation/>.

⁴ Site C website <https://www.sitecproject.com/in-the-community/community-benefits-and-mitigation-measures>.

3.3. PRELIMINARY FINDINGS

The following step was to perform a preliminary analysis on those reports to summarize the methods used to identify social impacts and which indicators (or social impacts) were being reported on by those monitoring documents. The analysis generated the following insights that answer the first overarching research question, “do methods and social impacts differ when addressing ex-ante and ex-post impacts?”:

- Within the industry-led social impact monitoring reports in our sample, methods were not innovative or different from those used during the licensing phase (desktop approach and interviews with a few community members without applying methodological rigour).
- Social monitoring and management strategies lack community engagement and follow a top-down approach focusing on job creation and business opportunities (amount of money spent in the region).
- Words used to describe or identify pre-assessment concerns significant for the social fabric were completely missing in most monitoring reports, such as crime rates, abuse of drugs and substances, psychosocial effects, livelihood, wellbeing, discrimination, and demographics.

- Documents lack metrics for social impacts and comparisons showing how much the project helped or negatively impacted the host communities.
- Companies spend millions of dollars on vegetation and fish monitoring programs but fail to link the results of such initiatives to the community's wellbeing and livelihood.

With those insights, the study did not have enough information to say whether monitored social impacts differ from anticipated impacts, as monitoring reports are few and give preference to reporting socioeconomic impacts. I agree with other scholars that predicted consequences cannot be easily compared with actual impacts for two main reasons (Ahammed & Nixon, 2006; Chang et al., 2018; Noble & Storey, 2005): first, poor reporting or monitoring makes the match between predictions and effects difficult to track; secondly, social impacts are mostly addressed as 'concerns' without a predictive component attached to it as demonstrated in Chapter 2. Noble & Storey (2005) and Wessels et al. (2015) argue that monitoring is performed as a management strategy to mitigate impacts rather than a social auditing process measuring the accuracy of predictions, (see also, Morrison-Saunders & Arts, 2005; Nicolaisen & Fischer, 2016). These facts make the original idea unfeasible. Therefore, I needed to focus on the sub-research questions:

- Does the SIA literature provide innovative approaches to conduct monitoring?
- Do monitored social impacts differ from anticipated impacts?

3.4. CHANGING THE PERSPECTIVE ON ASSESSING SOCIAL IMPACTS

The approach to seeing assessing and identifying monitoring of social impacts had to be significantly revised. Therefore, the study needed to change the research goal from establishing whether *ex-ante* and *ex-post* impacts differed and how this was established to proposing an emerging method for conducting monitoring of social impacts. This idea would explore the two previous sub-questions in more detail. In order to achieve such goals, I chose news media analysis to track people's concerns and specific social impacts based on a suggestion made by Sherren et al. (2017). News media and digital platforms might serve a channel for organizing and sharing information about how people experience social impacts (Hanna et al., 2016; Sinclair et al., 2017). Using localized news media can reveal how locals and other important actors experience development, which gives an opportunity to analyze both positive and negative perspectives of those stakeholders towards infrastructure projects (Lawhon et al., 2018; Lawhon & Makina, 2017; MacRobert, 2020). Hence, news media coverage can also reveal how those perceptions changed or evolved (De Loë, 1999). The decision to proceed with news media analysis fits in the context of using online resources to improve EIA/SIA processes, (see, Bond & Dusík, 2020). In addition, a news media approach takes under consideration the current worldwide restrictions on face-to-face meetings, which makes some methods unfeasible to be applied. Chapter 4 provides more information on the use of news media in the impact assessment process.

3.5. REFINED SUB-RESEARCH QUESTIONS

Exploration of news media required the research to focus on fewer cases—two similar cases was chosen for this task (Asselin & Parkins, 2009). I used the results from Chapter 2 to select two recent hydroelectric dams that used community-based impact

assessment (CBIA) for the licensing. The same hydroelectric dams have been considered controversial projects, with significant media coverage. To answer the research question “Do monitored social impacts differ from anticipated impacts?” I chose to analyze the voices of different people involved in the EIA/SIA process. News media provided quotes for two groups: locals and affected people as well as decision-makers; while CBIA serve to identify social impacts significant for some local stakeholders affected by the developments. Therefore, I also needed to formulate new specific research sub-questions for this part, which are:

- Can social impacts raised inside CBIA be tracked using news coverage during different stages of a hydroelectricity project?
- How different are the interests of affected people and decisionmakers for social impacts of hydroelectricity covered by news media outlets?
- By comparing those perspectives, what can we learn about the factors inhibiting SIA and CBIA from achieving more sustainable hydroelectricity projects?

The following chapter elaborates on the abovementioned research questions.

CHAPTER 4

Using Newspaper coverage and Community-Based Impact Assessment to track Social Impacts using the Perspectives of Affected People and Decisionmakers.

This paper has been submitted for the **Journal of Environmental Management**. A suggested citation style will be added after acceptance.

Abstract: This paper applies an innovative approach to monitoring social effects occurring before and during construction of two hydroelectric dams in Canada. The two studied dams, Site C and Keeyask, are under construction in Canada and underwent community-based impact assessment (CBIA). News coverage and the CBIA documents were analyzed to understand and compare how those two groups perceive social effects induced by the two projects. CBIAs contain concerns expressed by affected people, whereas news coverage can include quotes from both affected people and decisionmakers involved in the assessment process. By contrasting these datasets, we found that the documents are complementary: while CBIAs are comprehensive in assessing community concerns, news outlets can reveal how those concerns evolved throughout different phases of the projects' implementation. This approach fills a gap in SIA around monitoring of key social effects around local conflicts and disputes, psychosocial effects, socioeconomic effects, and cumulative effects on a daily life. Furthermore, by contrasting the views identified within the impact assessments and the media, the study demonstrates how specific concerns diverged: affected people focus on local social effects while decisionmaker's interests lie in a broader political perspective grounded in local sacrifices 'for the good of the whole province'. Our analysis emphasizes the role of political power over decision making that can inhibit CBIA and social impact assessment practice from contributing to socially sustainable projects.

Keywords: Community-based assessment; social impact assessment (SIA); news media analysis, hydro power, social impacts

4.1. INTRODUCTION

Engaging communities is an integral part of the social impact assessment (SIA) process. For such tasks to be effective, researchers claim that SIA must involve more community-based impact assessment (CBIA) approaches, also known as community-based assessment, not only during the pre-approval phase (licensing) but for the entire lifetime of a project, to monitor and manage social effects (Vanclay et al., 2015). SIA's final objective would be achieving socially sustainable projects (Morrison-Saunders et al., 2020) by

enhancing benefits and minimizing conflicts (Vanclay, 2019). Nonetheless, monitoring social effects from projects has been a weakness of SIA. In proposing innovative solutions to undertake this monitoring task, Sherren et al., (2017) suggested that news coverage could be utilized to trace social effects before, during, and after project installation. Consistent with that approach, Prenzel and Vanclay (2014) argued that news media coverage can create awareness about important social effects and contribute information to alleviate conflicts, promoting the diffusion of information and shaping public opinion (Sinclair et al., 2017). News will also disseminate the concerns of communities as well as report emotions and public responses about infrastructure projects (MacRobert, 2020). Therefore, local or provincial news media are critical yet relatively untapped for understanding local discourse and social effects emerging from infrastructure developments (De Loë, 1999; Lawhon et al., 2018; Sovacool et al., 2018).

While news outlets have their own biases, those biases are different from those present in SIA or CBIA. The literature bridging environmental and social effects and news media analysis includes research to understand attitudes about wildlife introduction in North American conservation areas (Houston et al., 2010) and how local stakeholders view water management problems in South Africa. The latter authors argued that news analysis can complement research using local interviews and reveal different local perceptions of water problems such as environmental and political concerns (Lawhon & Makina, 2017). A complementary study shows the role of local news coverage in giving voice to localized concerns (e.g., pollution, electricity, health services) rather than global or regional perspectives (e.g., climate change and biodiversity) (Lawhon et al., 2018). More recently, MacRobert (2020) reviewed 10 years of news coverage by the Mail and Guardian (South

Africa) on environmental and social effects from different infrastructure projects. The research identified social effects around social justice, socioeconomics, and community livelihoods, among others. Such studies indicate the opportunity to use news content analysis for SIA. Nonetheless, in the realms of SIA and CBIA, we could find no studies that have leveraged information provided by news outlets to monitor social effects (before and after a project installation) or investigate whether those concerns are comparable to themes present in the SIA or CBIA used to license developments.

The current study targets this gap using news coverage in lieu of direct monitoring of social effects by community groups or project proponents. We perform a content analysis on the coverage of provincial and local news outlets and CBIA reports for two similar projects. News analysis is an innovative approach used to identify and contrast the perception of social effects by key actors involved in those projects (Sovacool et al., 2018). CBIA is used as a point of comparison to elicit themes that are deemed important to the communities, often resulting in a list of key concerns that should be given further attention. By combining these sources of information, we seek to answer the following research questions: 1) Can social effects identified by CBIA be tracked using news coverage during different stages of a project? 2) Are there differences between the interests of affected people and decisionmakers as identified by news media outlets? 3) By comparing those views, what can we learn about the factors inhibiting SIA and CBIA from achieving more sustainable projects?

Narrowing to specific projects for comparison allows us to use a case study approach to enlighten the larger phenomena and practice of impact assessment. The study focuses on Site C and Keeyask, both hydroelectric projects under construction in British

Columbia and Manitoba, respectively, in Canada. The hydroelectric developments share many similarities in terms of assessment type and regulatory approval, submission of a CBIA for the licensing phase, geographical latitude, year of approval and start of construction, reservoir area, and location on rivers that already have hydroelectric dams. A comparative approach between two cases that are otherwise so similar helps to reveal key insights that are important to understanding social impacts in these settings. Structuring the analysis, first, we briefly describe the two case studies in section 2. Section 3 contains the methodological steps used to collect the data and conduct the analysis, including identifying social effects, specifying actors, and the coding process. In section 4 the results are presented detailing the analysis of four key social effects. Finally, section 5 builds upon the results from the previous section to discuss how news media can be leveraged to monitor social impacts and limitations to the approach. We also examine factors impeding SIA from resolving conflicts and achieving more sustainable project outcomes.

4.2. THE TWO CASES

4.2.1. Keeyask project

Keeyask project is a 695 MW hydroelectric dam under construction in the lower Nelson River, Northern Manitoba, Canada, close to Thompson (180 km northeast) and Gillam (30 km west). This new hydroelectric dam is designed to generate 4,400 GWh of electricity annually and flood 45 km² of land, or 4,463 ha; adding its impacts to a watershed that has been historically transformed by other large hydroelectric dams, such as Kelsey (211 MW), Kettle (1,228 MW), Long Spruce (1,010 MW), Limestone (1,340 MW), and

Wuskwatim (200 MW MW). Since the early 1990s Manitoba Hydro has been planning to construct the Keeyask. Nevertheless, a partnership had to be established between Manitoba Hydro (75%) and four impacted Indigenous groups to acquire community support and develop the project (Tataskweyak Cree Nation - TCN, War Lake First Nation - WLFN, York Factory First Nation - YFFN, and Fox Lake First Nation - FLFN, equity sharing of 25%). The flooding of a large portion of the territory and changes in the river characteristics would decrease the communities' capacity to hunt, trap, and fish, affecting their diets and socioeconomic activities. In addition, there are effects associated with changing traditional knowledge of navigation and accessing fishing grounds as well as in the influx of foreigners to work in the region, e.g., increased alcohol and drug use among Indigenous people (Keeyask Hydropower Limited Partnership, 2012), and health-related problems such as diabetes and tuberculosis (York Factory First Nation, 2012). The partnership agreed to modify the project (decrease reservoir area and power capacity by half) to accommodate Indigenous concerns, as well as to enable benefit-sharing agreements to alleviate negative effects on the communities. Key benefits from those agreements involve the generation of more than 28K jobs from 2012 to 2020, of which 10K were secured by Indigenous people, training opportunities for more than 500 community members, and businesses opportunities amounting to over 830 million dollars in direct purchases and 33 million spent in the communities by contractors.

Justification behind the Keeyask development include selling electricity to the US market and supplying future domestic demand. In 2012, the project was subjected to a Joint Review Panel process, evaluated by the province of Manitoba and the Canadian Environmental Agency (now Impact Assessment Agency). Each Indigenous partner

submitted an environmental study conducted on the behalf of the community, here called CBIA, using traditional knowledge and storytelling techniques to express their concerns about the project and inform the licensing process. Funds to support this work were provided by the partnership. Keeyask received regulatory approval and started construction in 2014, with predicted conclusion in 2021 (now delayed to 2022), and costs increasing from 6.5 to 8.7 billion dollars.

4.2.2. Site C project

Site C is a 1,100 MW hydroelectric dam being constructed in the Peace River valley, British Columbia (BC), near the Alberta border. It sits only 5 km south of Fort St. John, east of Hudson's Hope (95 km), and near four Indigenous communities that are part of the Treaty 8 First Nations -T8FNs (Doig River First Nation - DRFN, 50 km north; Halfway River First Nation – HRFN, 85 km northwest, Prophet River First Nation - PRFN, 240 km north, and West Moberly First Nation - WMFN, 75 km southwest), among others who were identified but not included in their CBIA such as McLeod Lake Indian Band, Blueberry First Nation, and Sauleau First Nation. The four Indigenous communities described in Site C's CBIA share similarities in terms of using natural resources for livelihoods. They expressed concerns towards extractive activities that can increase land alienation within First Nations and impact their capacity to access traditional food and participate in other land-based practices. Population varies from 237 to 284 registered members per community with high rates of outmigration; on average 58% of the members live outside the reserve. Communities report facing hardships associated with remoteness making it difficult to access health, school, and social services

Site C is the third hydroelectric dam on the Peace River, part of a plan created in the mid-1950s to construct five hydroelectric dams to generate electricity. The two other installed projects are upstream: the 2,730 MW W.A.C. Bennett dam built in 1968, and 700 MW Peace Canyon built in 1980. This third site is thus “Site C”. The BC government rejected Site C in the 1980s due to environmental impacts and unproved need for extra electricity. Nevertheless, using arguments about electricity imports to meet BC needs, the necessity to provide affordable electricity, and a lack of other viable alternatives to supply current and future demand, in 2004 former Premier Gordon Campbell revived the discussion about building Site C. The new Site C project is expected to flood 5,340 ha and generate 5,100 GWh of electricity annually to power the province, provide electricity to oil and gas developments and sell exports to the US.

Furthermore, Site C would generate 13 K persons-year of employment during construction and 29 permanent positions during operations in addition to business opportunities. The latest employment metrics produced by BC Hydro show that in January 2021 there were 3,852 workers on site (74% from BC and 25% locals). The project underwent a Joint Review Panel process by the BC Government and Canadian Environmental Agency in 2011. The project is entirely owned by BC Hydro, a publicly owned company. During the second stage of environmental studies, BC Hydro provided funds to Four T8FNs to conduct their own CBIA using a storytelling approach and traditional knowledge to create baseline information about the communities, identify their goals and concerns, and characterize important components for impact assessment. The document was used to support the 3-year licensing process. Site C received regulatory approval in 2015, starting construction the same year with an expected completion by 2024

(now delayed to 2025), despite controversies regarding cost (8.7 billion when approved in 2015), infringement of Indigenous rights, and concerns about environmental degradation. **Table S8**, in the supplemental materials, compares both projects side by side, showing their similarities and similarities.

4.4. METHODS

4.4.1. Data collection

The research accounts for the collection of documents from two different sources. CBIAs came from the projects' websites. News media search mechanisms were applied to identify and select news outlets.

The four communities affected by the Keeyask project produced three CBIAs (Tataskeyak and War Lake First Nation merged their CBIA). Site C presented one single file that reflected the CBIA conducted for four Indigenous Nations affected (**Table 8**). Those four communities do not represent all Indigenous communities affected by the project. Saulteau, Blueberry River First Nations, and other treaty 8 members mentioned in the assessment but are not part of the CBIA. As far as we could identify, neither Site C nor Keeyask provided funds for a CBIA to be undertaken by non-Indigenous farmers or municipalities affected by the development.

Eureka and *Factiva* databases were used to screen media outlets. The objective was to find relevant local and provincial news coverage without extreme political views. Among the options provided, Canadian Broadcasting Corporation (CBC) is a common link between the news media coverage for both projects, having provincial and somewhat local coverage, and includes written versions of TV and radio articles. Other choices offered

provincewide and local coverage. For Keeyask, the Brandon Sun, Winnipeg Sun, and Thompson Citizen were selected. In relation to Site C, the Times Colonist and Vancouver Sun were chosen, both of which are based further from the project than those used for Keeyask. The closest news outlet to Site C (Alaska Highway News) is from a publisher that is not indexed in the available databases and thus was unable to be systematically searched. That said, Site C received significant coverage in the selected papers due to the controversy over its development.

Table 8. Community-based impact assessments found for Keeyask and Site C projects

Project	CBIA	Affected community
Keeyask	FLFC Environment Evaluation report	Fox Lake First Nation (FLFN)
	Keeyask Environmental Evaluation	Cree Nation Partners (Tataskweyak Cree Nation and War Lake First Nation)
	Kipekiskwaywinan (our voices; our history and values; change and damage to the water, land, and people; the way forward)	York Factory First Nation (YFFN)
Site C	Telling a Story of Change the Dane-zaa Way	Doig River First Nation (DRFN), Halfway River First Nation (HRFN), Prophet River First Nation (PRFN), West Moberly First Nation (WMFN)

Total page count (excluding cover pages) for Keeyask CBIA: 330. Total page count for Site C CBIA: 377.

We did not specify dates for the search, but the search period was from 2004 to 2020 due to database limitations. This search period allowed a longitudinal observation of how news coverage evolved around such projects before and after the start of construction. Due to the large number of articles found for Site C, only references with “Site C” in the headline were selected for a detailed screening, which accounted for more than 1800

articles. Keeyask project news coverage had fewer news articles, so the screening process considered articles without the project name in the title to understand the circumstances for such difference.

The next step consisted of performing a chronological reading of the selected news articles to remove possible repetitions of news, and unrelated stories. Selected news articles were given an ID for reference in the coding phase (see, **Tables S9 and S10** in the supplemental material).

4.4.2. Categorizing effects

CBIA reports and news coverage were first read entirely to have a sense of social effects covered by these documents and key voices, then coded using a systematic content analysis approach. A hybrid inductive-deductive approach was used to identify the main social effects covered in the news. The authors used previous knowledge on social effects, the projects' CBIAs, and the literature guidelines on SIA to identify topics and subtopics, (e.g., Smyth and Vanclay, 2017; St-Pierre and Lambert, 2014). This identification process was simultaneous, iterative and comparative, analyzing first CBIAs, then the set of news articles. It is worth noting that the study did not aim to pinpoint all social effects within the CBIAs but examine those which were given attention in news media to establish a point of comparison between the concerns raised throughout the projects' lifetimes. The approach also reveals the challenge of 'newsworthiness' to news media as CBIAs are more inclusive and detailed in relation to the effects identified than news media. Using this comparative and hybrid approach, the coding process involved four social themes: psychosocial effects [*Sensu* (Health Canada, 2005)]; conflicts and disputes; socioeconomic effects; and, cumulative effects on daily life (**Table 9**). In addition to the four themes analyzed, CBIAs

also report concerns with health-related problems, cultural impacts associated with loss of language influenced by an influx of foreigners, and impacts on local diets and food access (hunting and fishing) that are not widely addressed by media analysis. Other themes, such as costs of the project and political debates (e.g., accusations and questioning about costs of project and burden to the region’s budget) are widely tackled in news media but are lacking in CBIAs. While pertinent for some analyses, we decided to track the latter concerns but not to perform a deep discussion as they are more related to political views than social effects. We use insights from such coverage to understand the wider context.

Table 9. Breakdown of themes and social effects covered

Theme	Types of effect (not exhaustive list)
Psychosocial effects	Stress, anger, frustration, fear, sadness, hope and hopelessness, anxiety, mistrust, isolation, grief, powerlessness.
Conflicts and disputes	Grievance mechanisms (e.g., protests and conflicts), court disputes, infringement of treaties, and disagreements, chronic problems with the consultation process
Socioeconomic effects	(Un)employment, benefits, business opportunities, and economic effects
Cumulative effects on daily life	Change traditional ways of life (livelihoods), impact the life in the community (e.g., abuse and use of drugs) and people’s wellbeing, effects of multiple projects on the social environment

4.4.3. Categorizing actors

The views of people interviewed or quoted in the news outlets are representative of important social groups that help us to see how social effects are experienced and perceived. A single project can generate good outcomes to one group, while being felt by another as strongly negative. Thus, different stakeholders in the process of impact

assessment often hold different interests and views about the effects of infrastructure projects (Lawhon & Makina, 2017). This research divided the voices into two groups; the affected people, those who experience the social effects locally or regionally, and decisionmakers such as companies and those who have political or influential power about the fate of the project. Reviewing the voices within media outlets, we identified the following decisionmakers: Prime Ministers, Premiers, Cabinet Ministers, opposition leaders, chairpersons of important institutions, judges, and other important government representatives (supplemental material, **Table S11**). As for affected people, we identified Indigenous chiefs and councilors, locals (protesters), farmers (Site C), and non-government organizations. Due to the complexity associated with the data structure and the coding process, it was not possible to calculate the number of codes per specific actor name. While social effects were coded for both datasets, only the voices of affected people are coded inside CBIA's; decisionmaker voices are not reported within these community-led documents.

4.4.4. Coding and analysis

Qualitative and quantitative analysis were conducted using NVivo 12 software (QSR International Pty Ltd, 2018) and Microsoft Excel spreadsheets. The pre-screened news articles were again read in a chronological order, from oldest to newest. While those themes in Table 3 represent only a fraction of the effects associated with SIA (Vanclay, 2002), they reflect the areas of overlapping concern for CBIA's and news outlets. One article or CBIA section could be coded in more than one theme. The specific views of affected people and decisionmakers were coded separately and cross-referenced with the code content to reveal overlaps between sections. For the psychosocial effects theme, we

aimed to identify frequent words used to describe such emotional responses and their contexts.

4.5. RESULTS

This section covers the content analysis performed on both CBIAs and news outlets. First, the CBIA analysis highlights social effects important to the community and flagged inside news coverage. Then, we can compare how those effects evolved in the news throughout the years.

4.5.1. Community-based impact assessments

Table 10 shows the number of referenced codes per theme conveyed in the CBIAs. Each theme shown is further analyzed to understand affected people' perspectives around the hydroelectric dams.

Topics that are covered under the theme of psychosocial effects mainly focused on two areas: traumas and psychosocial effects caused by previous hydroelectric dams (also cumulative effects), and hopes for reconciliation. While the former theme (traumas) was expressed similarly in both project CBIAs, the latter (hopes about reconciliation) was almost exclusively found in the Keeyask ones. Many sections of the Keeyask CBIA documents expressed community hopes to improve the relationship with Manitoba Hydro and heal from past social effects and traumas.

Table 10. Main social effects identified in quoted passages from CBIA, by reference counts

<i>Theme</i>	<i>Main sub-themes</i>	<i>Site C</i>	<i>Keeyask</i>
<i>Psychosocial effects</i>	Traumas about past impacts	46	39
	Hopes for reconciliation	0	13
<i>Conflicts and disputes</i>	Problems and hopes with relationship and agreements	4	15
	Infringement of rights	27	5
	Consultation process	15	11
<i>Cumulative effects on daily life</i>	Destruction of landscape, natural resources, important sites accumulating in time and summing from problems	36	32
	Abuse (sexual and substances), and social changes affecting traditional way of life, culture, loss of language, housing prices and rental increase among other changes	8	34
<i>Socioeconomic effects</i>	Negative views toward socioeconomic effects such as loss of revenue from traditional activities, few opportunities, unemployment and turnover rates, no wealth distribution, youth dropping school to work on the project.	46	8
	Future of children, employment and training, partnership and ownership, Hopes for better housing	0	22

Site C and Keeyask CBIA each built a socioeconomic profile for each Indigenous community analyzed. Socioeconomic topics were covered differently, however. Quoted passages from interviewees in the Site C CBIA focused on negative socioeconomic effects of the dam more than its benefits, whereas the Keeyask quotes in CBIA balanced positive and negative views towards the hydroelectric dam. It was evident from the Site C CBIA that employment in the project is not necessarily the most important benefit to the Indigenous communities. There are many values associated with their culture and quality of life that are not compensated by engaging in jobs offered by the developer. Rather, culture and the right to maintain traditional ways of life, language, hunting, and community wellbeing were valued by those quoted inside the CBIA. For Keeyask, as indicated in the CBIA, Indigenous communities believed that Keeyask would be built with or without their consent, thus they decided to form a partnership in favour of the project so they would have a voice, yet a limited one, in the negotiation process. The Keeyask project was therefore

more optimistic, discussing hopes associated with benefits for the communities and the future of their children in accessing jobs, training, better housing, cultural programs, and opportunities created by the Manitoba Hydro partnership.

Themes about cumulative effects on daily life and conflicts and disputes often overlapped in their coding. Keeyask tended to emphasize more the local social changes than Site C. These changes include past and current infrastructure projects that affected, and continue to affect, the livelihoods of Indigenous communities, their access to hunting and fishing grounds, impacting diets and the capacity to eat locally (instead of buying from grocery stores), collect herbs for medicinal purposes, and pick berries. More generally CBIAs mention cultural impacts such as desecration of burial sites and challenges in passing down traditional knowledge languages to younger generations. In addition, there are concerns regarding the influx of non-local populations and consequent social effects such as racism and discrimination, easy and increasing access to drugs and other illicit substances, sexual harassment, and other influences on the well-being and social cohesion of the members of the community. In these terms, both projects are perceived as detrimental to their communities.

CBIAs tend to address chronic problems and try, in doing so, to prevent episodes of conflicts due to unresolved problems. The main themes emerging from the content analysis about chronic problems that could escalate to conflicts and disputes at the time of the CBIAs include relationship and agreements with the hydro proponents; environmental degradation; effects on Indigenous treaties, and consultation processes (both projects). Opposition was stronger in Site's CBIA, where quotes of Indigenous people concentrated on the infringement of their treaty rights, and the cumulative environmental destruction

that would interfere with the capacity of those communities to pursue traditional livelihoods, warning about lawsuits if the project proceeds.

4.5.2. Newspaper content

This section contains the main findings from the content analysis applied to identify actors' quotes and key social effects reported by news media coverage of the two selected hydroelectric dams. The number of news articles pre-screened (first step) and coded (second step) varied significantly by case (**Table 11**). For Keeyask, 99 articles were pre-screened, but only 45 of them were coded to avoid repetition. For Site C 245 news articles were pre-screened with only 154 coded. The voices of affected people tended to dominate news coverage for Site C, especially when the decision to approve or reject the project was approaching (from 2012 to 2014) and after the approval when government leadership changed and submitted the project to review by the BC Utilities Commission (analyzing the costs in 2017). For Keeyask, the first news spike started around the same time (2012-2015 marking licensing process and construction start) and re-emerged in 2018 when an external report addressing problems with discrimination at the workcamp was published,

Figure 4. 1.

Table 11. Coded news media coverage

Project	Media outlet (Code for article numbers*)	Quantity of articles	Year	Database
Keeyask	CBC (K-CBC)	14	2008-2020	Eureka
	Brandon Sun (BRS)	12	2013-2020	Eureka
	Thompson Citizen (TPC)	0	-	Factiva
	Winnipeg Sun (WNS)	18	2012-2020	Factiva
Site C	Vancouver Sun (VCS)	51	2004-2019	Factiva
	Victoria Times Colonist (VTC)	40	2009-2019	Factiva
	CBC (S-CBC)	62	2005-2020	Eureka

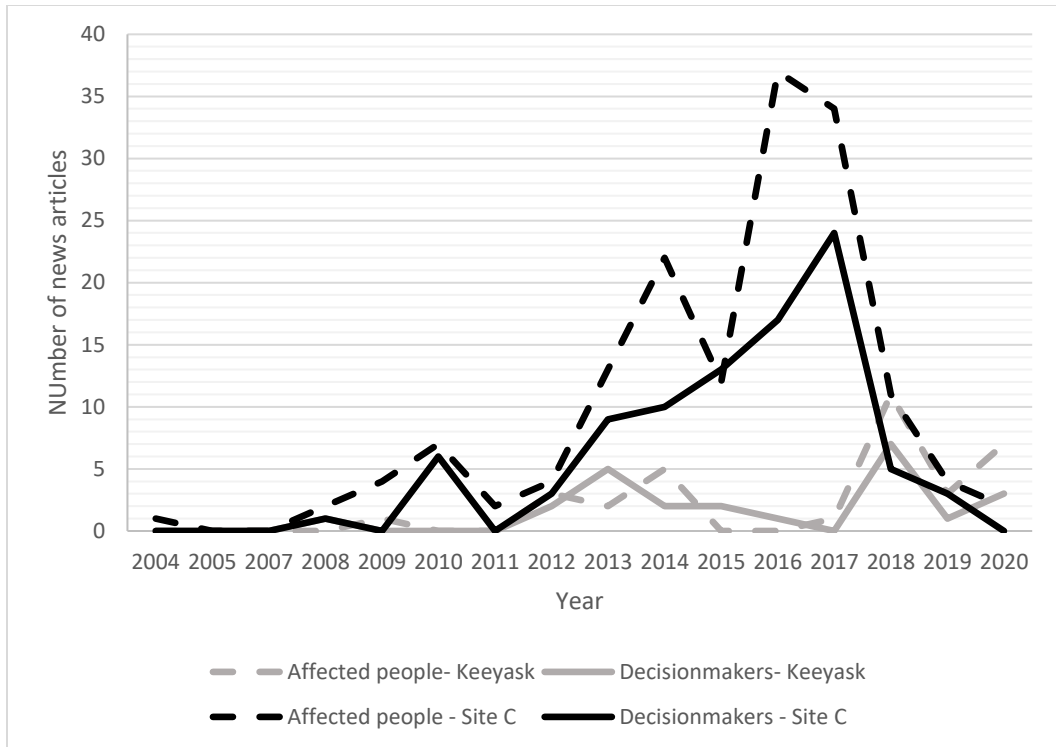


Figure 4. 1. Distribution of news articles by quoted actor and project

Table 12 demonstrates the distribution of articles per project and perspective, using the same key themes as the CBIA save for health problems (mercury contamination and skin problems) which was not prevalent inside the news articles and themes related to costs and political debate that were not addressed by CBIA's. Problems/conflicts were more episodic for Keeyask, whereas they were more chronic for Site C (**Supplemental Tables S12 and S13**). During the screening phase, the analysis excluded news strictly covering political views or costs of the project that did not have a direct social impact component. However, we acknowledge that these themes tended to dominate the news media covered and were widely used to question the feasibility of both projects (**Figures S1 and S2** in the supplemental materials). **Table S14**, in the supplemental material, provides a tabular comparison of social impacts identified in both set of documents

Table 12. Number (#) and proportion (%) of news articles covering each social impact from each key perspective, affected people and decisionmakers.

Theme	Keeyask				Site C			
	Affected people		Decision makers		Affected people		Decision makers	
	#	%	#	%	#	%	#	%
Conflicts and disputes	15	34	12	27	73	48	25	16
Socioeconomic effects	7	16	6	14	25	16	34	22
Psychosocial effects	13	30	6	14	33	22	8	5
Cumulative effects on daily life	10	23	2	5	24	16	7	5

The sum of the proportion of social effects covered by articles is not equal to 100 as the same news article could be coded for more than more theme. Articles are counted once per theme regardless of how many times actors were coded.

4.5.2.1. Conflict and disputes

Controversies such as legal aspects, conflicts, and rights were the most coded topics among the four themes analyzed, composed of 83 and 54 news articles coded for affected people and decisionmakers, respectively. This is not surprising as media always responds to acute events more than chronic problems.

Affected people

Analyzing the quotes of affected people first, most news articles covered conflicts such as local protests (both projects) and legal fights in the court as well as consultation processes (Site C).

Protests in Keeyask happened for two main reasons. First, the government cut compensation funds destined for the Manitoba Metis Federation to alleviate infringement of rights caused by the Bipole III transmission line to be used by Keeyask (news in 2012, 2014, and 2018-2019). Note, however, Metis are not Indigenous partners in the Keeyask project. The second period of protest occurred during the first wave of the COVID-19

pandemic in Manitoba (news in 2020). The overall context was Indigenous people forming barricades to stop new workers from entering the work site until an agreement was made about the situation, such as measures to prevent the spread of diseases and improve work conditions in the work site. Those situations were not anticipated by CBIAs and relate to adaptive management problems.

The consultation process was not a substantial chronic challenge when analyzing Indigenous positions toward Keeyask in the news. Perhaps because of the partnership, many members believe they were consulted during the licensing phase.

As for Site C, the history of conflicts is much longer, and more complex, well preceding the timing of the CBIA reports. Affected people are quoted in the media about the infringement of Indigenous treaty rights, reconciliation (two big themes within CBIA) and the expropriation of farmers (who were not part of any CBIA). Moreover, affected people often questioned the EIA process and permits allowing Site C to proceed despite strong public opposition. People expressed discontent towards the consultation process conducted as part of the SIA process around 2012 and before approval in 2014-2015. Those concerns about consultation usually came from two Indigenous communities (Prophet River and West Moberly First Nations - PRFN and WMFN, respectively) that refused to sign an agreement with Site C project or from farmers that would be displaced by the project.

The combined problems led to the PRFN and WMFN launching lawsuits against Site C after approval in 2014, an action that had been warned about in the Site C CBIA report: “If the government decides [...] to proceed and build this dam [...] we will have a big court battle” (Treaty 8 First Nations Community Assessment Team, 2012, appendix B

impact pathway 44). Most news then related to infringement of Indigenous rights, protests contesting legal decisions, or lawsuits from farmers. In 2020, Prophet River First Nation decided to sign an agreement and not to oppose Site C any longer, leaving West Moberly First Nation alone in the legal dispute against Site C. The other Indigenous bands, part of the CBIA, have not emerged in the news media opposing the project

Decisionmakers

With regards to Keeyask, decisionmakers focused on financial expenses used for consultation rather than the meaningfulness of the process. Premier Pallister called compensation "persuasion money" and called off the compensation package negotiated with Metis, which generated the main conflicts and lawsuits in Keeyask. A few non-Indigenous writers as well as representatives of the Canadian Taxpayer Federation submitted comments to the news outlets about financial audit reports and expenses for CBIA studies, wages paid to consultants hired by Indigenous groups, and overall costs used for the consultation. Although this study is not including passages about the financial case for building the Keeyask project (see Figure S1 in the supplemental material) it is important to include the response of decisionmakers to the idea of cancelling the project based on financial burden to the province. The closest mention to social impact was that abandoning the project would result in economic burden to ratepayers, increasing their bills without a plan to compensate for the loss of investment, exacerbating social inequalities. However, this argument was not further developed.

Decisionmakers appeared more frequently in the media to defend or respond to problems raised by the public around Site C than Keeyask. The consultation process was at the centre of media coverage of court lawsuits against the Site C project. Provincial

government ministers as well as federal court judges got involved and quoted in the news media outlets. BC Hydro defended the process, claiming that the consultations were “a lengthy process, was in good faith and was extensive both qualitatively and quantitatively” (VCS71), which contrasts the views raised by Indigenous people in the submitted CBIA document as well as media coverage. Furthermore, decisionmakers blame affected groups for poor engagement, as many opposing communities refused to participate in dialogues. In court, the ruling judge agreed with decisionmakers and wrote that opposition does not mean inadequate consultation, thus, for the court, the Site C record of consultation was of adequate quantity and quality.

4.5.2.2. Socioeconomic effects

Socioeconomic effects were the second most covered theme in the news and included both positive and negative opinions about the projects analyzed. In contrast to other social effects evaluated, the number of news articles expressed more quotes from decisionmakers (n=40) than affected people (n=32).

Decisionmakers

In Keeyask news coverage, during early licensing, decisionmakers spoke of project benefits and employment as well as investments in infrastructure and compensation programs such as a fish recovery program. Furthermore, electricity from Keeyask would contribute to “keeping the lowest rates in North America” (WNS22) benefiting all people of Manitoba.

Site C decisionmakers covered a similar range of topics but received more news coverage than Keeyask. News coverage addressing economic benefits spanned from 2010

to 2017. Decisionmakers and supporters believed that lawsuits were “wasting taxpayers dollars on court cases” (S-CBC36) but did not necessarily generate sympathy for those affected people whose lives would be changed negatively (news coverage around 2017). Politicians and supporters defended Site C as the best long-term solution to provide cheap electricity for ratepayers. Social costs were addressed rather optimistically by decisionmakers: “we [former Energy ministers Blair Lekstrom and Dan Miller] understand and appreciate the sacrifices that local communities make for the benefit of the whole province” (VCS23). The overall decisionmakers’ view was that Site C’s provincial socioeconomic gains outweigh negative social effects.

Affected people

Affected people also fluctuated between positive and negative sentiments depending on the group quoted by the news outlet. Keeyask had few news articles spread over time, with only episodes when the theme was addressed by the media (2013-2014, 2016-2017, 2020). In Keeyask, Indigenous partners expressed opinions that agreement benefits were positive for the communities. The few Indigenous critics addressed economic impacts amidst COVID-19 and compensations that they did not believe make up for the losses. The major negative comments came from a Times Colonist opinion, submitted by Graham Lane, who questioned the economic feasibility of the project, the cost of the agreements made, and payments to Indigenous partners. He argued the combined expenditures would increase ratepayer bills and decrease the project’s feasibility.

Most news articles about Site C included quotes from people impacted by the dam. The same concerns as in Keeyask were raised by affected people in Site C news coverage in addition to a few references to how Fort Saint John rental prices were changing. Positive

and negative views were tackled by both Indigenous and non-Indigenous people. Positive mentions of socioeconomic impacts included (mostly non-Indigenous) people hoping to obtain employment during job fairs. For the McLeod Lake Indian Band (not part of the CBIA report), their economic benefits were seen as “economic reconciliation” helping “self sufficiency” (S-CBC83) of the community. Notwithstanding this optimism by the latter community, a DRFN member believed they “[had] little choice but to sign on with [the] project” in 2020. In this context, decisionmakers failed to fully acknowledge social costs or disputes and kept focusing on job generation and business opportunities.

4.5.2.3. Psychosocial effects

For both Site C and Keeyask, psychosocial effects were the third most common theme, with quoted content dominated by affected people expressing negative views toward the two controversial projects on their communities. Quotes in the articles do not allow a full analysis of the psychosocial effects relevant to communities or decisionmakers, and often related to other themes such as conflicts and disputes, cumulative effects on daily life, or socioeconomic effects.

Affected people

News articles about emotional responses to Keeyask first emerged in 2014 but were more common after 2018 when the Clean Energy Commission (CEC) report about discrimination and sexual harassment was released. The latter caused much discussion of psychosocial effects caused by past projects. Site C news coverage of psychosocial effects tended to have a longer distribution than Keeyask, from 2009 to 2019; and related to unresolved chronic problems or discontent due to episodes of conflicts (lawsuit, protests),

or even hopes for getting employment in the project or benefits for the region. Overall, we were able to capture more words expressing negative feeling towards the projects such as ‘frustration’ or ‘disappointment’, ‘concerns’, ‘anger’ or synonyms, ‘fear’, and sentiments about wanting to stop the Site C project or be heard in Keeyask (for the Metis Federation and transmission line). Positive words were used in the context of employment, as in ‘hoping’ to get employment in the project.

Decisionmakers

Decisionmakers’ quotes about psychosocial effects are patchy in the media coverage. Those few expressions about emotions have a positive tone such as ‘hope’ to generate benefits for all people, or ‘pleased’ to reach agreement with Indigenous people. In Site C, Premier Horgan stated he was ‘disappointed’ in 2017 when he announced his government’s decision to proceed with the project notwithstanding cost overruns and public opposition. However, his statement echoed that the project was too advanced in the construction phase, thus cancelling it would compromise the provincial budgets even more.

4.5.2.4. Cumulative effects on daily life

Cumulative effects on daily life covered by the media outlets also varied by project but mostly referred to localized disturbances, life in the workcamp, episodes of discrimination, sexual and substance abuses.

Affected people

For Keeyask, news coverage published testimonies from the CEC report (see psychosocial section, 4.5.2.3.1) sources and interviewed Indigenous leaders addressing the discrimination and sexual harassment problems faced (2018-2019).

With regards to Site C, the social environment is rather different. As the project is subject to several unresolved conflicts, protests, and controversies, some specific themes pertinent to workcamp life and interaction between workers did not earn space in news media coverage. In parallel, the expropriation of land from ten farmers (quotes from farmers Arlene and Ken Boon) represents another important life change relating to the loss of local social structure. It is worth mentioning that farmers did not have a CBIA addressing their concerns. Most Site C quotes from affected people focus on the future change in the way of life of Indigenous people when the reservoir is flooded.

Decisionmakers

Decisionmakers' passages in the Keeyask dataset spoke to the seriousness of cumulative impacts and sexual abuse suffered by Indigenous women. Hydro representatives often stated that Keeyask has a cultural training program trying to educate workers about these problems.

As for local municipalities and effects on their communities most mayors adopted a neutral position, save for opposition by the mayor of Hudson's Hope who stated that decisionmakers in Victoria (the provincial capital) do not pay attention to social effects happening in northern communities. Decisionmakers in Site C focused on the quality of life provided to workers inside the camps, which are comfortable and equipped, with economic benefits allowing workers to maintain their livelihoods thus sustaining the regional social structure.

4.6. DISCUSSION

This paper aimed to use news content analysis as an alternative to perform monitoring of social effects as well as compare the perspectives of affected people and decisionmakers about those selected social effects. The following section will first discuss how news media can be used to identify and monitor social effects over the time and answer research questions 1 and 2 stated in the introduction. The second section highlights the perception of social effects by two different groups and identifies possible root causes to the problem, answering research question 3.

4.6.1. The integration of news media into SIA

The ‘internet age’ has brought new ways to communicate and share information, as well as to conduct, discuss and participate in impact assessment (Aaen et al., 2018; Sinclair et al., 2017). More online approaches to impact assessment may emerge as an outcome of restrictions imposed by the Covid 19 pandemic. Monitoring is a required component of SIA that is often neglected and this paper proposes the use of news media coverage to address this gap in information (Lawhon et al., 2018; Lawhon & Makina, 2017; MacRobert, 2020). We conducted a comparative analysis of news media coverage and content from CBIAAs for two large-scale dam projects in northern Canada.

The study reveals insights about SIA practice and different viewpoints on the process. Many concerns expressed inside the CBIAAs were echoed by news outlets, showing that media analyses can be utilized to keep track of projects that affect social dynamics in a region. Social effects are dynamic and cover wide-ranging themes. News media coverage

provides a longitudinal dataset that can help to track these themes, along with baseline information about the region prior to new project development.

With regards to media coverage, the fact that Keeyask was developed in partnership with the community explains the emphasis on reconciliation, local social changes, and positive views towards socioeconomic changes. In contrast, Site C was less positive, with early opposition and a lack of formal agreement about the alternatives to the project or alleviation of social impacts. In addition, legal problems escalated with the lawsuits, which drew increasing negative attention to the project, thus explaining the larger news coverage focused on struggles and conflicts.

News media can only track a limited set of impacts in comparison to specific research to identify and measure social effects. Therefore, media analysis might still have blind spots with regards to localized problems (e.g., wealth distribution, social fabric, socioeconomic dynamics, Indigenous language, and health problems). The level of detail might be lower when monitoring social effects using media than in-situ and specialized studies (e.g., St-Pierre and Lambert, 2014), yet it can be useful for identifying opinions and conflicts to be addressed. However, news media content might have limited representation from local perspectives, especially in isolated regions (Public Policy Forum, 2018), as news can be biased towards influential voices (Sovacool et al., 2018) or those focused on negative events (MacRobert, 2020). If more localized news content were included, such as Indigenous newsletters, there could be a potential to identify richer themes pertaining to their culture, values, and other aspects (Lawhon et al., 2018; Waller et al., 2015). A summary of positive and negative impacts of using news media to monitor social effects is presented in **Table 13**.

Table 13. Comparative table for monitoring social effects within CBIA using news outlets

	<i>Strengths</i>	<i>Weaknesses</i>
<i>Psychosocial effects</i>	Able to capture words and expressions for discontentment and hopes (anger, frustration, hope, etc.)	Information lacking to fully understand how psychosocial effects evolved or are experienced by a larger number of stakeholders. Not a specific tool to assess mental and psychosocial effects. No way to quantify impact for a larger population, only a few individuals who are interviewed Keywords usually linked to events and episodes, sometimes more focused on negative emotions.
<i>Conflicts and disputes</i>	Highlight current conflicts and unresolved chronic problems	More attention to episodes of conflicts rather than resolution of disputes. Localized problems (e.g., internal to work camp, sexual harassment, discrimination) might not be addressed well due to coverage of other unsolved chronic problems News might not present all groups involved in the project, only a fraction opposing to the project
<i>Socioeconomic effects</i>	Might evidence how different groups view positive and negative economic impacts Might “daylight” economic metrics from reports and documents (e.g., number of jobs, amount spent with consultation)	No capacity to assess wealth distribution (problem identified even for other SIA methods) Might not provide detailed information about changes in the local socioeconomic effects, see (St-Pierre & Lambert, 2014)
<i>Cumulative effects on daily life</i>	Able to capture words and expressions about past or current experience with other projects (e.g., Site C and oil and gas, Keeyask and transmission line) May capture some social changes (rental prices and crimes) Non-Indigenous might contribute to identification of social effects	May only focus on few local cumulative impacts on the community, such as rental and crimes. Other social effects might not be addressed in depth (e.g., impact on diet of the community, capacity to hunt, lack of health care, changes in the quality of services, health problems) Might not pay attention non-conflicting aspects happening (e.g., language retention for Indigenous, ceremonies, culture value, among others) Depth of information may not be sufficient for analysis Might be focused on negative cumulative and social effects while disregarding positive changes to many groups

Going forward with media analysis also means we need to be able to capture positive impacts. That means not just adverse impacts but also how proponents promote events that contribute to a better relationship with community members, which can be less ‘newsworthy’. There is also potential to complement the current analysis by using social media such as Twitter, Facebook, Instagram, among others (Aaen et al., 2018; Sherren, Parkins, et al., 2017), as a window into community concerns and ongoing social effects, or even cultural values (Calcagni et al., 2019). In doing so, both tools could be integrated to monitor social effects and contribute to alleviate conflicts, as proposed by some researchers (Prenzel & Vanclay, 2014; Sinclair et al., 2017). Suggested questions for further studies are: how can the integration of news and social media be used to improve monitoring of localized social effects? How can such tools be utilized to develop mitigation measures and alleviate dynamic social effects?

4.6.1.1. Different opinions inhibiting socially sustainable projects

Sustainable projects must integrate components of social, economic, environmental, and cultural environments to achieve Sustainable Development Goals and promote equitable and just solutions (Morrison-Saunders et al., 2020; Vanclay, 2003). In practice, conflict management, enhancement of benefits, co-management between communities and companies, as well as meaningful participation during the decision-making process constitute fundamental pillars for sustainable projects (Prenzel & Vanclay, 2014; Prno et al., 2021).

More than pinpointing social effects occurring throughout the lifetime of the development, the political influence on SIA must be highlighted. Media analysis evidenced

the institutional power that decisionmakers have over the licensing process, pushing ideas and decision-making towards political agendas rather than local and social consequences (Alan Bond et al., 2020). Affected people perceive impacts differently as they will endure the biophysical and social effects over a longer period of time, typically crossing generations (Roche et al., 2021). Decisionmakers have a broader social perspective, ‘speaking’ for people of whole jurisdictions about the sacrifices of resource-dependent northern communities. In doing so, decisionmakers might neutralize the capacity of SIA work to prevent conflicts (Barrow, 2010; Vanclay, 2003). It seems that SIA is overpowered by political vision and industry interests in the development of projects in certain areas, usually those inhabited by historically marginalized communities (Waldron, 2018). The problem becomes more complex when the cumulative effects caused by years of community marginalization, mistrust, conflict, and frustration communicating with governments are not considered in new negotiations (Bakker & Hendriks, 2019; Franks et al., 2011; Tollefson & Wipond, 1998). Fonseca and Gibson (2020) note that few projects in Canada ever get denied an environmental certificate to proceed with construction. For the two cases analyzed here, quotes inside CBIAs revealed that the Keeyask partnership was only formed because the four Indigenous communities did not believe opposition would result in cancellation of the project; that scenario has turned out to be accurate for Site C, as opposition and court disputes have not stopped the project from proceeding regulatory approval. Our media analysis evidenced decisionmakers ignoring or minimizing local social effects. Companies invest millions of dollars in environmental studies, aiming to receive approval from the regulator; some researchers accuse industries of manipulating EIA reports and consultation processes to pass regulatory requirements (Enríquez-de-

salamanca, 2018). It seems clear that institutional power constrains more sustainable and socially just projects (Suprayoga et al., 2020), especially for historically marginalized communities.

Our news media analysis also revealed that several lawsuits filed by opponents were not given proper attention. The CBIA literature indicates that early engagement, identification of social effects, and actions to address public concern may result in the enhancement of benefits, reduction of remediation costs, and decrease of conflicts (Kwiatkowski, 2011; Vanclay et al., 2015). Successful CBIAs require constant participation, long-term partnership, meaningful consultation, and the establishment of mutual agreement that adapt projects to local concerns (Prno et al., 2021). Otherwise, unresolved crises become chronic (e.g., legal aspects and disagreements over free, prior, and informed consent) and will hinder the capacity of SIA to deal with community concerns (Prenzel & Vanclay, 2014). In addition, SIA in such circumstances fails to include a strategic social component required to meet social development goals (Morrison-Saunders et al., 2020). The discussion is instead shifted to themes grounded in human rights (P. Hanna & Vanclay, 2013), ending up spending more resources and time on court cases; a solution that might not resolve problems related to inequities or increase opportunities for affected people. Therefore, it becomes unlikely to promote social sustainability amid conflicts. Future questions for research include: considering that CBIA (containing opposition voices) might not actually affect project approval due to political power, what is the true role of CBIA in decision making? Can CBIA provide support for socially accepted and just projects under such conditions?

4.7. CONCLUSION

This content analysis of news coverage and CBIA has been effective in showing how the voices of affected people and decisionmakers evolved for key social effects during different phases of two case study projects. Conflicts and disputes, psychosocial effects, a few socioeconomic impacts, and cumulative effects on daily life had greater representation in the news. First, the study shows that news media analysis can contribute to SIA monitoring by tracking the opinions of affected people and decisionmakers about community concerns. Reaching agreements is fundamental in the early phases of the project planning as is the assessment of localized social effects. However, as demonstrated by the news analysis, decisionmakers do not often share the same concerns as affected people, thus localized social dynamics might not be given proper attention until conflicts escalate. In this context, the current paper highlighted policy implications for SIA and shows that political power over licensing processes (and even inside legal judgements) can render consultation and SIA ineffective in preventing and managing conflicts. Hence, we propose questions for future studies: what is the role of CBIA in managing social effects when approval is driven by political views? How can SIA practice overcome institutional power and promote socially sustainable projects? Can the integration of news media, social media, and other qualitative datasets improve monitoring of localized social effects?

The current approach of analyzing social effects using news outlets also has limitations. Only a limited set of social effects surface in news coverage, and the level of detail often does not reach the depth required to enable more comprehensive analyses about local social effects. Many rural areas have poor media coverage, thus this type of analysis is not equally useful in all places.

CHAPTER 5 – CONCLUSIONS

This work aimed to advance the knowledge about methods used by consultants to conduct social impact assessments (SIA) of projects, using hydroelectric dam cases in Canada to generate insights that could be applied elsewhere. Chapter 2 analyzed consultant-led methods to predict likely social impacts, whereas Chapter 3 proposes an innovative media-based method to monitor social impacts. Using this approach, this research shed some light on consultant-led SIA for the licensing of projects as well as improving ways to monitor social impacts during different phases of a project lifetime. The research combines a systematic document review (i.e., a method of appraising a large number of documents) with a content analysis (i.e., logical recording and analysis of material) approach to search, select, screen, synthesize, and analyze publicly available secondary data.

5.1. CONSULTANT-LED SIA TO LICENSE PROJECTS

Chapter 2 systematically analyzed 37 EIA documents from hydroelectric dams developed in Canada to assess the methods consultants performing SIA used to anticipate and manage social impacts. The results indicate that consultant-led SIA practice has used the same techniques to evaluate social impacts over the years. Additionally, the research could not identify technical improvements, such as input-output tables using Census data to estimate population and income impacts. There are participative methods being employed, such as interviews and surveys, but consistently without the same rigour with regards to questions and statistical analysis applied in academic-led SIA.

The most promising advancement identified in terms of SIA practice for licensing of projects was community-based impact assessments (CBIA), applied to the Site C dam and Keeyask projects, using an Indigenous storytelling approach. CBIA's are essential to understand social impacts and capture different local perspectives about positive and negative changes in the region. Nevertheless, CBIA's are descriptive tool for assessing social impacts, and do not function as a method for predictions. For the Keeyask project, the community-based approach seems to have brought benefits and minimized conflicts, with only a few discrete episodes of opposition, and stakeholder responses to manage such impacts. For the Site C dam, the CBIA did not seem to have affected decision-making, nor did it minimize or alleviate conflicts. In this sense, SIA's capacity to manage and minimize conflicts might not be precisely related to accurate impact predictions, but rather a clear understanding of baseline conditions and agreement on the methods to alleviate those negative consequences. As a key consideration from this analysis, our analysis suggests that investments should continue to conduct CBIA to include local perspectives in the understanding of social impacts for affected communities. However, CBIA alone should not be used to license the projects; communities must be engaged during monitoring to ensure that potential conflicts are resolved before escalation. CBIA's effectiveness to enhance relationships and manage social impacts also depends on external political decisions. Therefore, developing partnerships with affected communities is needed to alleviate conflicts by giving voice to affected people and creating solutions based on input from those who experience the impacts.

5.2. A WAY FORWARD WITH CONSULTANT-LED SIA?

Chapter 3 focused on monitoring the social impacts of two selected hydroelectric dams. The preliminary results indicate that, from a small amount of monitoring reports that exists, there was no difference between approaches used to anticipate and monitor social impacts. While the lack of monitoring has been highlighted by other works in Bangladesh and Malawi (Khan, 2020; Mhango & Mhango, 2007), the current research reaffirms that limited progress has been achieved in monitoring social impacts in Canada. Such reporting was not prevalent enough to fuel a robust study, so instead we tested an alternative approach to monitor social impacts by using news media outlets and compared those concerns with impacts identified by CBIA.

This study demonstrated that news media analysis could be used to monitor some social impacts, such as episodes of conflicts and chronic issues, socioeconomic effects, psychosocial impacts, and cumulative effects on daily life. This research also explored the difference in views about project impacts experienced by communities that are covered by news media, which might have explained the different outcome for Site C and Keeyask.

As news media might overly focus on negative responses to projects' effects, the approach mostly monitored negative social impacts. Another weakness of a purely media-based approach is the relatively low coverage of northern issues in big newspapers, and the decline of rural independent newspapers in Canada, see (Public Policy Forum, 2018). Nevertheless, there is a potential synergy to utilize news and other media datasets to complement the assessment and monitoring of social impacts anticipated to be caused by, or actually caused by, development projects.

5.3. AN EXTERNAL FACTOR INFLUENCING CONSULTANT-LED SIA

By analyzing consultant-led SIA (Chapter 2) and understanding decisionmakers' positions towards the process of impact assessment and social impacts (Chapter 4), this research indicates that political interests and industry power to push forward projects, sometimes despite unresolved conflicts or lacking a proper assessment of social consequences, are the critical hurdle hindering SIA from achieving socially sustainable projects. In both papers, it is argued that for Site C dam, which presented a comprehensive CBIA, decisionmakers chose to proceed with the approval for construction despite opposition flagged by communities. This scenario was likely to generate disputes and decrease the effectiveness of practitioners' and communities' work to understand and manage concerns. Therefore, CBIA should be accompanied by a clear decision-making mandate to avoid and minimize conflicts, not just acknowledge them. This study agrees with Bond et al., (2020) affirming that the institutional authority ruling on impact assessment processes and deciding the fate of applications (approve or deny) should be accountable for playing a significant role in the efficacy of consultant-led SIA work.

5.4. RECOMMENDATION AND FUTURE RESEARCH

The current work leveraged secondary data to analyze consultant-led practices to perform social impact assessment. First, I found a significant difference in accessibility, availability, and completeness of information for both EIA and monitoring reports on each provincial environmental registry website due to different nomenclature and searching mechanisms to find projects and reports. Thus, the first recommendation is to standardize

terms instead of naming documents with numbers and to create options to access specific documents associated with the projects more efficiently.

As for the content of SIA/EIA reports, there are limitations to understand many decisions and variables associated with consultant-led SIA in Canada. Future studies should conduct collaborative research between academia SIA practitioners and consulting firms working in the area. For example, internship or fellowship placements could be created for scholars to work for consulting firms in impact assessment as well as improved training on conducting social research (questionnaires and interviews) with professionals. Such studies might better facilitate understanding of the practical hurdles and reasons for deciding on the application of specific methods, and other factors impeding consultants from applying more complex and participative approaches. In addition, future studies can potentially analyze multi-stakeholder governance committee to oversee the implementation of management and monitoring actions and establish whether there is innovation for SIA practice across sectors.

Content analysis of digital media (news and social media) resources is another avenue to be explored by future studies aiming to increase the use of digital media for impact assessment. For example, using Instagram and Facebook photos/discussions to evaluate people's adaptation and interaction with hydroelectric dams (Chen et al., 2018; Sherren, Smit, et al., 2017) as well as leveraging participation and dialogue among different age groups using digital platforms for the governance of projects (Sinclair et al., 2017). Moreover, future researchers can use the Network for Expertise and Dialogue for Impact Assessment (www.nedia.ca) as a platform to exchange knowledge between academics and other professionals doing impact assessment in Canada. Studies can also reflect on how

digital and news media might serve as a channel to monitor people's dialogue about the social impacts of projects.

5.5. CONCLUDING COMMENTS

The consultant-led practice of social impact assessment is a complex theme that has been discussed for many years, especially to enforce more socially sustainable projects. The current study was highly relevant to update the academic and practitioner's community about consultant-led SIA methods in Canada, assess whether practice evolved, as well as identify barriers and propose alternatives to enhance SIA practice. Consultants have failed to adopt innovations offered by the SIA literature. Moreover, even CBIAs, an important approach to anticipate and avert conflicts, have not achieved that end due to political interests behind the development of projects that can hinder SIA/CBIA work.

REFERENCES

- Aaen, S. B., Lyhne, I., & Nielsen, H. (2018). The use of social media in impact assessment: Experiences among national infrastructure developers in Denmark. *Impact Assessment and Project Appraisal*, 36(6), 456–466. <https://doi.org/10.1080/14615517.2018.1500091>
- Abele, F. (2014). The lasting impact of the berger inquiry into the construction of a pipeline in the mackenzie valley. In *Commissions of Inquiry and Policy Change: A Comparative Analysis* (pp. 88–112). University of Toronto Press. <https://doi.org/10.3138/9781442668867-008>
- Aguilar-Støen, M., & Hirsch, C. (2017). Bottom-up responses to environmental and social impact assessments: A case study from Guatemala. *Environmental Impact Assessment Review*, 62, 225–232. <https://doi.org/10.1016/j.eiar.2016.08.003>
- Ahammed, A. K. M. R., & Nixon, B. M. (2006). Environmental impact monitoring in the EIA process of South Australia. *Environmental Impact Assessment Review*, 26(5), 426–447. <https://doi.org/10.1016/j.eiar.2005.09.002>
- Aledo, A., García-Andreu, H., & Pinese, J. (2015). Using causal maps to support ex-post assessment of social impacts of dams. *Environmental Impact Assessment Review*, 55, 84–97. <https://doi.org/10.1016/j.eiar.2015.07.004>
- Amnesty International. (2016). *The Point of No Return: the Human Rights of Indigenous Peoples in Canada Threatened by the Site C Dam*. Amnesty International. [https://www.amnesty.ca/sites/amnesty/files/Canada Site C Report.pdf](https://www.amnesty.ca/sites/amnesty/files/Canada%20Site%20C%20Report.pdf)
- Angell, A. C., & Parkins, J. R. (2011). Resource development and aboriginal culture in the Canadian north. *Polar Record*, 47(1), 67–79. <https://doi.org/10.1017/S0032247410000124>
- Armat, M. R., Assarroudi, A., Rad, M., Sharifi, H., & Heydari, A. (2018). Inductive and deductive: Ambiguous labels in qualitative content analysis. *Qualitative Report*, 23(1), 219–221. <https://doi.org/10.46743/2160-3715/2018.2872>
- Armitage, D. R. (2005). Collaborative environmental assessment in the Northwest Territories, Canada. *Environmental Impact Assessment Review*, 25(3), 239–258. <https://doi.org/10.1016/j.eiar.2004.06.012>
- Asselin, J., & Parkins, J. R. (2009). Comparative case study as social impact assessment: Possibilities and limitations for anticipating social change in the far north. *Social Indicators Research*, 94(3), 483–497. <https://doi.org/10.1007/s11205-009-9444-7>
- Aucamp, I., & Woodborne, S. (2020). Can social impact assessment improve social well-being in a future where social inequality is rife? *Impact Assessment and Project Appraisal*, 38(2), 132–135. <https://doi.org/10.1080/14615517.2019.1676068>
- Baker, J. M., & Westman, C. N. (2018). Extracting knowledge: Social science, environmental impact assessment, and Indigenous consultation in the oil sands of Alberta, Canada. *Extractive Industries and Society*, 5(1), 144–153. <https://doi.org/10.1016/j.exis.2017.12.008>
- Bakker, K., & Hendriks, R. (2019). Contested knowledges in hydroelectric project assessment: The case of Canada's Site C Project. *Water (Switzerland)*, 11(3), 1–18. <https://doi.org/10.3390/w11030406>
- Banks, G. (2013). Little by little, inch by inch: Project expansion assessments in the Papua New Guinea mining industry. *Resources Policy*, 38(4), 688–695.

- <https://doi.org/10.1016/j.resourpol.2013.03.003>
- Barrow, C. J. (2010). How is environmental conflict addressed by SIA? *Environmental Impact Assessment Review*, 30(5), 293–301.
<https://doi.org/10.1016/j.eiar.2010.04.001>
- Becker, D. R., Harris, C. C., Nielsen, E. A., & McLaughlin, W. J. (2004). A comparison of a technical and a participatory application of social impact assessment. *Impact Assessment and Project Appraisal*, 22(3), 177–189.
<https://doi.org/10.3152/147154604781765932>
- Becker, H. A., & Vanclay, F. (2013). *The International Handbook of Social Impact Assessment Conceptual and Methodological Advances*. Edward Elgar.
<https://doi.org/10.1017/CBO9781107415324.004>
- Bond, A., Retief, F., Cave, B., Fundingsland, M., Duinker, P. N., Verheem, R., & Brown, A. L. (2018). A contribution to the conceptualisation of quality in impact assessment. *Environmental Impact Assessment Review*, 68(October 2017), 49–58.
<https://doi.org/10.1016/j.eiar.2017.10.006>
- Bond, Alan, & Dusík, J. (2020). Impact assessment for the twenty-first century—rising to the challenge. *Impact Assessment and Project Appraisal*, 38(2), 94–99.
<https://doi.org/10.1080/14615517.2019.1677083>
- Bond, Alan, Pope, J., Fundingsland, M., Morrison-Saunders, A., Retief, F., & Hauptfleisch, M. (2020). Explaining the political nature of environmental impact assessment (EIA): A neo-Gramscian perspective. *Journal of Cleaner Production*, 244. <https://doi.org/10.1016/j.jclepro.2019.118694>
- Booth, A. L., & Skelton, N. W. (2011). “We are fighting for ourselves” - First nations’ evaluation of british columbia and canadian environmental assessment processes. In *Journal of Environmental Assessment Policy and Management* (Vol. 13, Issue 3).
<https://doi.org/10.1142/S1464333211003936>
- Borioni, R., Gallardo, A. L. C. F., & Sánchez, L. E. (2017). Advancing scoping practice in environmental impact assessment: an examination of the Brazilian federal system. *Impact Assessment and Project Appraisal*, 35(3), 200–213.
<https://doi.org/10.1080/14615517.2016.1271535>
- Buckland, J., & O’Gorman, M. (2017). The Keeyask hydro dam plan in northern Canada: a model for inclusive indigenous development? *Canadian Journal of Development Studies*, 38(1), 72–90. <https://doi.org/10.1080/02255189.2016.1224969>
- Burdge, R. J. (1991). A brief history and major trends in the field of impact assessment. *Impact Assessment*, 9(4), 93–104. <https://doi.org/10.1080/07349165.1991.9726070>
- Burdge, R. J. (2002). Why is social impact assessment the orphan of the assessment process? *Impact Assessment and Project Appraisal*, 20(1), 3–9.
<https://doi.org/10.3152/147154602781766799>
- Burdge, R. J. (2003a). Benefiting from the practice of social impact assessment. *Impact Assessment and Project Appraisal*, 21(3), 225–229.
<https://doi.org/10.3152/147154603781766284>
- Burdge, R. J. (2003b). The practice of social impact assessment background. *Impact Assessment and Project Appraisal*, 21(2), 84–88.
<https://doi.org/10.3152/147154603781766356>
- Burdge, R. J., & Vanclay, F. (1996). Social impact assessment: A contribution to the state of the art series. *Impact Assessment*, 14(1), 59–86.

- <https://doi.org/10.1080/07349165.1996.9725886>
- Calcagni, F., Amorim Maia, A. T., Connolly, J. J. T., & Langemeyer, J. (2019). Digital co-construction of relational values: understanding the role of social media for sustainability. *Sustainability Science*, 14(5), 1309–1321.
<https://doi.org/10.1007/s11625-019-00672-1>
- Canada Energy Regulator. (2020). *Canada's Energy Future Data Appendices*.
<https://doi.org/10.35002/3hze-jk50>
- Chang, I. S., Wang, W., Jing, W., Yuhong, S., & Rong, H. (2018). Environmental impact assessment follow-up for projects in China: Institution and practice. *Environmental Impact Assessment Review*, 73(July), 7–19.
<https://doi.org/10.1016/j.eiar.2018.06.005>
- Chen, Y., Parkins, J. R., & Sherren, K. (2018). Using geo-tagged Instagram posts to reveal landscape values around current and proposed hydroelectric dams and their reservoirs. *Landscape and Urban Planning*, 170(August 2017), 283–292.
<https://doi.org/10.1016/j.landurbplan.2017.07.004>
- Christensen, L., & Krogman, N. (2012). Social thresholds and their translation into social-ecological management practices. *Ecology and Society*, 17(1).
<https://doi.org/10.5751/ES-04499-170105>
- Christensen, L., Krogman, N., & Parlee, B. (2010). A culturally appropriate approach to civic engagement: Addressing forestry and cumulative social impacts in southwest Yukon. *Forestry Chronicle*, 86(6), 723–729. <https://doi.org/10.5558/tfc86723-6>
- Climent-Gil, E., Aledo, A., & Vallejos-Romero, A. (2018). The social vulnerability approach for social impact assessment. *Environmental Impact Assessment Review*, 73(April), 70–79. <https://doi.org/10.1016/j.eiar.2018.07.005>
- Come, M. C. (2004). Survival in the Context of Mega-Resource Development: Experiences of the James Bay Cree and the First Nations of Canada. In M. Blaser, H. A. Feit, & G. McRae (Eds.), *In the Way of Development: Indigenous Peoples, Life Projects and Globalization* (pp. 153–165). Zed Books.
https://books.google.ca/books?hl=en&lr=&id=-IJjDgAAQBAJ&oi=fnd&pg=PT147&ots=QE1ceAnIV9&sig=vJP5J5yQbGLuq47tW5PwbHK83Jg&redir_esc=y#v=onepage&q&f=false
- Dalseg, S. K., Mills, S., & Simmons, D. (2018). Gendered Environmental Assessments in the Canadian North: Marginalization of Indigenous Women and Traditional Economies. *The Northern Review*, 47, 135–166.
- De Loë, R. C. (1999). Dam the news: Newspapers and the Oldman River Dam project in Alberta. *Journal of Environmental Management*, 55(4), 219–237.
<https://doi.org/10.1006/jema.1999.0258>
- De Rijke, K. (2013). Coal Seam Gas and Social Impact Assessment: An Anthropological Contribution to Current Debates and Practices. *Journal of Economic and Social Policy*, 15(3), 3.
- Deloitte. (2013). *Wuskwatim Training and Employment Initiatives – Final Evaluation Report*. http://www.pubmanitoba.ca/v1/nfat_hearing/nfat_exhibits/CAC-45-7.pdf
- Desrochers, R., Montour, I., Grégoire, A., Choteau, J., & Erwan, T. (2011). *Job Creation and Economic Development Opportunities in the Canadian Hydropower Market*.
- Dezé Energy. (2009). *Taltson Hydroelectric Expansion Project: development assessment report*.

- Diduck, A., & Sinclair, A. J. (2002). Public involvement in environmental assessment: The case of the nonparticipant. *Environmental Management*, 29(4), 578–588. <https://doi.org/10.1007/s00267-001-0028-9>
- Doelle, M., & Sinclair, A. J. (2018). The New Federal Impact Assessment Act in Canada: Delivering on Reform Expectations? *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3290255>
- Doelle, M., & Sinclair, A. J. (2019). The new IAA in Canada: From revolutionary thoughts to reality. *Environmental Impact Assessment Review*, 79(July). <https://doi.org/10.1016/j.eiar.2019.106292>
- Dubrulle, T., Patriquin, D. L. D., & Hood, G. A. (2018). A Question of Inclusion: BC Hydro's Site C Dam Indigenous Consultation Process. *Journal of Environmental Assessment Policy and Management*, 20(2), 1–19. <https://doi.org/10.1142/S1464333218500059>
- Dyer, J., Stringer, L. C., Dougill, A. J., Leventon, J., Nshimbi, M., Chama, F., Kafwifwi, A., Muledi, J. I., Kaumbu, J. M. K., Falcao, M., Muhorro, S., Munyemba, F., Kalaba, G. M., & Syampungani, S. (2014). Assessing participatory practices in community-based natural resource management: Experiences in community engagement from southern Africa. *Journal of Environmental Management*, 137, 137–145. <https://doi.org/10.1016/j.jenvman.2013.11.057>
- Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1), 107–115. <https://doi.org/10.1111/j.1365-2648.2007.04569.x>
- Enríquez-de-salamanca, Á. (2018). Stakeholders' manipulation of Environmental Impact Assessment. *Environmental Impact Assessment Review*, 68(July 2017), 10–18. <https://doi.org/10.1016/j.eiar.2017.10.003>
- Esteves, A. M., Franks, D., & Vanclay, F. (2012). Social impact assessment: The state of the art. *Impact Assessment and Project Appraisal*, 30(1), 34–42. <https://doi.org/10.1080/14615517.2012.660356>
- Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development. *International Journal of Qualitative Methods*, 5(1), 80–92. <https://doi.org/10.1177/160940690600500107>
- Fonseca, A., de Brito, L. L. A., & Gibson, R. B. (2020). Methodological pluralism in environmental impact prediction and significance evaluation: A case for standardization? *Environmental Impact Assessment Review*, 80(May 2019). <https://doi.org/10.1016/j.eiar.2019.106320>
- Fonseca, A., & Gibson, R. B. (2020). Why are projects rarely rejected in environmental impact assessments? Narratives of justifiability in Brazilian and Canadian review reports. *Journal of Environmental Planning and Management*, 0(0), 1–23. <https://doi.org/10.1080/09640568.2020.1852073>
- Franks, D. M., Brereton, D., & Moran, C. J. (2011). Cumulative social impacts. *New Directions in Social Impact Assessment: Conceptual and Methodological Advances*, 202–220. <https://doi.org/10.4337/9781781001196.00024>
- Glasson, J., Therivel, R., & Chadwick, A. (2005). Introduction to environmental impact assessment. In *The Natural and Built Environment Series* (3rd ed., Vol. 50, Issue 4). Routledge Taylor & Francis Group. <https://doi.org/10.1080/07293682.2012.747551>

- Golder Associates. (2019). *Good Practice in Social Impact Assessment* (Issue March).
- Goudge, S. T. (2016). The Berger Inquiry in retrospect: Its legacy. *Canadian Journal of Women and the Law*, 28(2), 393–407. <https://doi.org/10.3138/cjwl.28.2.393>
- Government of Canada. (2020). *Call for expression of interest - funding available*. <https://www.canada.ca/en/impact-assessment-agency/news/media-room-2020/call-for-expressions-of-interest.html>
- Guimond, L., & Desmeules, A. (2018). Indigenous minorities on major northern worksites: Employment, space of encounter, sense of place. *Geoforum*, 97(April), 219–230. <https://doi.org/10.1016/j.geoforum.2018.09.007>
- Gulakov, I., Vanclay, F., & Arts, J. (2020). Modifying social impact assessment to enhance the effectiveness of company social investment strategies in contributing to local community development. *Impact Assessment and Project Appraisal*, 38(5), 1–15. <https://doi.org/10.1080/14615517.2020.1765302>
- Hackett, P., Liu, J., & Noble, B. (2018). Human health, development legacies, and cumulative effects: environmental assessments of hydroelectric projects in the Nelson River watershed, Canada. *Impact Assessment and Project Appraisal*, 36(5), 413–424. <https://doi.org/10.1080/14615517.2018.1487504>
- Hanna, P., & Vanclay, F. (2013). Human rights, Indigenous peoples and the concept of Free, Prior and Informed Consent. *Impact Assessment and Project Appraisal*, 31(2), 146–157. <https://doi.org/10.1080/14615517.2013.780373>
- Hanna, P., Vanclay, F., Jean, E., & Arts, J. (2014). Improving the effectiveness of impact assessment pertaining to Indigenous peoples in the Brazilian environmental licensing procedure. *Environmental Impact Assessment Review*, 46, 58–67. <https://doi.org/10.1016/j.eiar.2014.01.005>
- Hanna, P., Vanclay, F., Langdon, E. J., & Arts, J. (2016). Conceptualizing social protest and the significance of protest actions to large projects. *Extractive Industries and Society*, 3(1), 217–239. <https://doi.org/10.1016/j.exis.2015.10.006>
- Health Canada. (2005). *Addressing Psychosocial Factors Through Capacity Building: A Guide for Managers of Contaminated Sites*. June.
- Herrmann, T. M., Sandström, P., Granqvist, K., D'Astous, N., Vannar, J., Asselin, H., Saganash, N., Mameamskum, J., Guanish, G., Loon, J. B., & Cuciurean, R. (2014). Effects of mining on reindeer/caribou populations and indigenous livelihoods: Community-based monitoring by Sami reindeer herders in Sweden and First Nations in Canada. *Polar Journal*, 4(1), 28–51. <https://doi.org/10.1080/2154896X.2014.913917>
- Hill, C., Thuy, P. T. N., Storey, J., & Vongphosy, S. (2017). Lessons learnt from gender impact assessments of hydropower projects in Laos and Vietnam. *Gender and Development*, 25(3), 455–470. <https://doi.org/10.1080/13552074.2017.1379777>
- Horing, J. F. (1999). *Social and Environmental Impacts of the James Bay Hydroelectric Project Planning* (Vol. 53, Issue 9). McGill-Queen's University Press.
- Houston, M. J., Bruskotter, J. T., & Fan, D. (2010). Attitudes toward wolves in the United States and Canada: A content analysis of the print news media, 1999–2008. *Human Dimensions of Wildlife*, 15(5), 389–403. <https://doi.org/10.1080/10871209.2010.507563>
- Hunsberger, C., Froese, S., & Hoberg, G. (2020). Toward 'good process' in regulatory reviews: Is Canada's new system any better than the old? *Environmental Impact*

- Assessment Review*, 82(March), 106379. <https://doi.org/10.1016/j.eiar.2020.106379>
- IFC. (2007). Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets. In *International Finance Corporation* (p. 201).
- IFC. (2010). *Strategic community investment: a good practice handbook for companies doing business in emerging markets* (Issue IFC Advisory Services).
- IFC. (2012). *IFC Performance Standards on Environmental and Social Sustainability*. World Bank.
http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/publications/publications_handbook_pps
- Ijabadeniyi, A., & Vanclay, F. (2020). Socially-Tolerated Practices in Environmental and Social Impact Assessment Reporting: Discourses, Displacement, and Impoverishment. *Land*, 9(33), 1–18. <https://doi.org/10.3390/land9020033>
- Impact Assessment Agency of Canada. (2019). *Tailored Impact Statement Guidelines Template for Designated Projects subject to the Impact Assessment Act and the Canadian Energy Regulator Act*. Practitioner’s Guide to the Impact Assessment Act; Government of Canada. <https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/tailored-impact-statement-guidelines-template-impact-assessment-canadian-energy-regulator-act.html>
- International Association for Impact Assessment, & Institute of Environmental Assessment, U. (1999). Principles of environmental impact assessment, best practice. In *International Association for Impact Assessment*.
<https://doi.org/10.1017/S0376892900009474>
- Joly, T. L., Longley, H., Wells, C., & Gerbrandt, J. (2018). Ethnographic refusal in traditional land use mapping: Consultation, impact assessment, and sovereignty in the Athabasca oil sands region. *Extractive Industries and Society*, 5(2), 335–343. <https://doi.org/10.1016/j.exis.2018.03.002>
- Joseph, C., Gunton, T., & Rutherford, M. (2015). Good practices for environmental assessment. *Impact Assessment and Project Appraisal*, 33(4), 238–254. <https://doi.org/10.1080/14615517.2015.1063811>
- Karami, S., Karami, E., Buys, L., & Drogemuller, R. (2017). System dynamic simulation: A new method in social impact assessment (SIA). *Environmental Impact Assessment Review*, 62, 25–34. <https://doi.org/10.1016/j.eiar.2016.07.009>
- Keeyask Hydropower Limited Partnership. (2012). *Keeyask Generation Project environmental impact statement: supporting volume - Socio-Economic Environment, Resource Use and Heritage Resources* (Issue June).
- Kemp, D., & Vanclay, F. (2013). Human rights and impact assessment: Clarifying the connections in practice. *Impact Assessment and Project Appraisal*, 31(2), 86–96. <https://doi.org/10.1080/14615517.2013.782978>
- Khan, I. (2020). Critiquing social impact assessments: Ornamentation or reality in the Bangladeshi electricity infrastructure sector? *Energy Research and Social Science*, 60(November 2019), 101339. <https://doi.org/10.1016/j.erss.2019.101339>
- Kilemo, D. B., Parkins, J. R., Kerario, I. I., & Nindi, S. J. (2014). Making community based environmental impact assessment work: Case study of a dairy Goat and Root Crop Project in Tanzania . *International Journal of Development and Sustainability* , 3(4), 767–783. <http://idsnet.com/ijds-v3n4-14.pdf>

- Kirchherr, J., & Charles, K. J. (2016). The social impacts of dams: A new framework for scholarly analysis. *Environmental Impact Assessment Review*, *60*, 99–114. <https://doi.org/10.1016/j.eiar.2016.02.005>
- Kumpula, T., Forbes, B. C., & Stammer, F. (2010). Remote sensing and local knowledge of hydrocarbon exploitation: The case of bovanenkovo, Yamal Peninsula, west Siberia, Russia. *Arctic*, *63*(2), 165–178. <https://doi.org/10.14430/arctic972>
- Kvam, R. (2018). *Social Impact Assessment: Integrating Social Issues in Development Projects*. Inter-American Development Bank. <https://doi.org/10.18235/0001138>
- Kwiatkowski, R. E. (2011). Indigenous community based participatory research and health impact assessment: A Canadian example. *Environmental Impact Assessment Review*, *31*(4), 445–450. <https://doi.org/10.1016/j.eiar.2010.02.003>
- Landim, S. N. T., & Sánchez, L. E. (2012). The contents and scope of environmental impact statements: how do they evolve over time? *Impact Assessment and Project Appraisal*, *30*(4), 217–228. <https://doi.org/10.1080/14615517.2012.746828>
- Lawe, L. B., Wells, J., & Cree, M. (2005). Cumulative effects assessment and EIA follow-up: A proposed community-based monitoring program in the Oil Sands Region, northeastern Alberta. *Impact Assessment and Project Appraisal*, *23*(3), 205–209. <https://doi.org/10.3152/147154605781765508>
- Lawhon, M., & Makina, A. (2017). Assessing local discourses on water in a South African newspaper. *Local Environment*, *22*(2), 240–255. <https://doi.org/10.1080/13549839.2016.1188064>
- Lawhon, M., Pierce, J., & Bouwer, R. (2018). Scale and the construction of environmental imaginaries in local news. *South African Geographical Journal*, *100*(1), 1–21. <https://doi.org/10.1080/03736245.2016.1231626>
- Lechner, A. M., McIntyre, N., Witt, K., Raymond, C. M., Arnold, S., Scott, M., & Rifkin, W. (2017). Challenges of integrated modelling in mining regions to address social, environmental and economic impacts. *Environmental Modelling and Software*, *93*, 268–281. <https://doi.org/10.1016/j.envsoft.2017.03.020>
- Les Sentinelles des Quinze. (2005). *Projet d'aménagement d'une centrale hydroélectrique privée à Angliers, Témiscamingue: Mémoire des Sentinelles des Quinze*.
- Loney, M. (1995). Social problems, community trauma and hydro project impacts. *Canadian Journal of Native Studies*, *15*(2), 231–254.
- Macfarlane, D., & Olive, A. (2021). Whither Wintego: Environmental Impact Assessment and Indigenous Opposition in Saskatchewan's Churchill River Hydropower Project in the 1970s. *Canadian Historical Review*, e20200011. <https://doi.org/10.3138/chr-2020-0011>
- MacRobert, C. J. (2020). A review of impacts associated with infrastructure news coverage in South Africa. *South African Geographical Journal*, *102*(2), 236–248. <https://doi.org/10.1080/03736245.2019.1677491>
- Manitoba Hydro. (2003). *Supplementary Filing on Need For and Alternatives to the Wuskwatim Project (NFAAT)* (Issue 204).
- Mantyka-Pringle, C. S., Jardine, T. D., Bradford, L., Bharadwaj, L., Kythreotis, A. P., Fresque-Baxter, J., Kelly, E., Somers, G., Doig, L. E., Jones, P. D., Lindenschmidt, K. E., & Partnership, the S. R. and D. (2017). Bridging science and traditional knowledge to assess cumulative impacts of stressors on ecosystem health.

- Environment International*, 102(August 2018), 125–137.
<https://doi.org/10.1016/j.envint.2017.02.008>
- Martinez, N., & Komendantova, N. (2020). The effectiveness of the social impact assessment (SIA) in energy transition management: Stakeholders' insights from renewable energy projects in Mexico. *Energy Policy*, 145(June 2019), 111744.
<https://doi.org/10.1016/j.enpol.2020.111744>
- Mhango, S. D., & Mhango, S. D. (2007). The quality of environmental impact assessment in Malawi: a retrospective analysis. *Development Southern Africa*, 22(3), 383–408. <https://doi.org/10.1080/14797580500252837>
- Miller, A., Patel, S., Gorzitza, C., & Parkins, J. R. (2019). *Canadian Renewable Energy Project Map*. Community Energy in Western Canada: Insights from Case Studies on Small-Scale Renewable Energy Development.
<https://www.futureenergysystems.ca/resources/renewable-energy-projects-canada>
- Moran, E. F., Lopez, M. C., Moore, N., Müller, N., & Hyndman, D. W. (2018). Sustainable hydropower in the 21st century. *Proceedings of the National Academy of Sciences of the United States of America*, 115(47), 11891–11898.
<https://doi.org/10.1073/pnas.1809426115>
- Morrison-Saunders, A., & Arts, J. (2005). Learning from experience: Emerging trends in environmental impact assessment follow-up. *Impact Assessment and Project Appraisal*, 23(3), 170–174. <https://doi.org/10.3152/147154605781765580>
- Morrison-Saunders, A., & Fischer, T. B. (2006). What Is Wrong With Eia and Sea Anyway? a Sceptic's Perspective on Sustainability Assessment. *Journal of Environmental Assessment Policy and Management*, 08(01), 19–39.
<https://doi.org/10.1142/S1464333206002372>
- Morrison-Saunders, A., Sánchez, L. E., Retief, F., Sinclair, J., Doelle, M., Jones, M., Wessels, J. A., & Pope, J. (2020). Gearing up impact assessment as a vehicle for achieving the UN sustainable development goals. *Impact Assessment and Project Appraisal*, 38(2), 113–117. <https://doi.org/10.1080/14615517.2019.1677089>
- Muir, B. R. (2018). Effectiveness of the EIA for the Site C Hydroelectric Dam Reconsidered: Nature of Indigenous Cultures, Rights, and Engagement. *Journal of Environmental Assessment Policy and Management*, 20(4), 1–41.
<https://doi.org/10.1142/S146433321850014X>
- Natural Resources Canada. (2020). *Electricity facts*. <https://www.nrcan.gc.ca/electricity-facts/20068>
- Nicolaisen, M., & Fischer, T. B. (2016). Editorial: Special Issue on Ex-Post Evaluation of Environmental Assessment. *Journal of Environmental Assessment Policy and Management*, 18(1), 1–4. <https://doi.org/10.1142/S1464333216010018>
- Niezen, R. (1993). Power and dignity: The social consequences of hydro-electric development for the James Bay Cree. *Canadian Review of Sociology/Revue Canadienne de Sociologie*, 30(4), 510–529. <https://doi.org/10.1111/j.1755-618X.1993.tb00652.x>
- Niezen, R. (1998). *Defending the Land: Sovereignty and Forest Life in James Bay Cree Society* (2th ed.). Allyn and Bacon.
https://books.google.ca/books?hl=en&lr=&id=pQ1ZCwAAQBAJ&oi=fnd&pg=PP1&ots=fxuYIKs3nE&sig=FTvuyyHjFrYMrswsqH8rgQWOpAM&redir_esc=y#v=onpage&q&f=false

- Noble, B., & Storey, K. (2005). Towards increasing the utility of follow-up in Canadian EIA. *Environmental Impact Assessment Review*, 25(2), 163–180.
<https://doi.org/10.1016/j.eiar.2004.06.009>
- Parkins, J. R., & Mitchell, R. E. (2016). Social Impact Assessment: A Review of Academic and Practitioner Perspectives and Emerging Approaches.”. In K. S. Hanna (Ed.), *Environmental Impact Assessment: Process, Practice, and Critique* (third, Issue December, pp. 122–140). Oxford University Press.
<https://doi.org/10.13140/RG.2.1.5158.7920>
- Parlee, B. L., Geertsema, K., & Willier, A. (2012). Social-ecological thresholds in a changing boreal landscape: Insights from cree knowledge of the Lesser Slave Lake region of Alberta, Canada. *Ecology and Society*, 17(2). <https://doi.org/10.5751/ES-04410-170220>
- Paskin, C. (2009). *Ktunaxa Nation Traditional Use in the Upper Columbia River Watershed: A Review of the 1996 – akisqnuq Traditional Use Study Documenting Ktunaxa Activities in the Columbia River Watershed and Within the Columbia Valley Transmission Corridor* (Issue November).
- Peters, E. J. (1999). Native People and the Environmental Regime in the James Bay and Northern. *Arctic*, 52(4), 395–410.
- Pokiak, L. (2020). *Meaningful Consultation, Meaningful Participants and Meaning Making: Inuvialuit Perspectives on the Mackenzie Valley Pipeline and the Climate Crisis*.
- Prenzel, P. V., & Vanclay, F. (2014). How social impact assessment can contribute to conflict management. *Environmental Impact Assessment Review*, 45, 30–37.
<https://doi.org/10.1016/j.eiar.2013.11.003>
- Prno, J., Pickard, M., & Kaiyogana, J. (2021). Effective Community Engagement during the Environmental Assessment of a Mining Project in the Canadian Arctic. *Environmental Management*. <https://doi.org/10.1007/s00267-021-01426-5>
- Public Policy Forum. (2018). Mind the gaps: quantifying the decline of news coverage in Canada. In *The Shattered Mirror Series*. <https://doi.org/10.1145/1557019.1557094>
- QSR International Pty Ltd. (2018). *NVivo (Version 12)*.
<https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home>
- Quinn, F. (1991). As long as the rivers run: the impacts of corporate water development on native communities in Canada. *Canadian Journal of Native Studies*, 11(1), 137–154.
- Richter, J. S., Mendis, G. P., Nies, L., & Sutherland, J. W. (2019). A method for economic input-output social impact analysis with application to U.S. advanced manufacturing. *Journal of Cleaner Production*, 212, 302–312.
<https://doi.org/10.1016/j.jclepro.2018.12.032>
- Roche, C., Brueckner, M., Walim, N., Sindana, H., & John, E. (2021). Understanding why impact assessment fails; a case study of theory and practice from Wafi-Golpu , Papua New Guinea. *Environmental Impact Assessment Review*, 89, 1–12.
<https://doi.org/10.1016/j.eiar.2021.106582>
- Roudgarmi, P. (2018). Cumulative Effects Assessment (CEA), A Review. *Journal of Environmental Assessment Policy and Management*, 20(2), 1–18.
<https://doi.org/10.1142/S1464333218500084>
- Schiehll, E., & Raufflet, E. (2013). Hydro-Québec and the Crees: the challenges of being

- accountable to First Nations - case and teaching notes. *International Journal of Teaching and Case Studies*, 4(3), 243. <https://doi.org/10.1504/ijtc.2013.058806>
- Sherren, K., Beckley, T. M., Parkins, J. R., Stedman, R. C., Keilty, K., & Morin, I. (2016). Learning (or living) to love the landscapes of hydroelectricity in Canada: Eliciting local perspectives on the Mactaquac Dam via headpond boat tours. *Energy Research and Social Science*, 14, 102–110. <https://doi.org/10.1016/j.erss.2016.02.003>
- Sherren, K., Parkins, J. R., Smit, M., Holmlund, M., & Chen, Y. (2017). Digital archives, big data and image-based culturomics for social impact assessment: Opportunities and challenges. *Environmental Impact Assessment Review*, 67(March), 23–30. <https://doi.org/10.1016/j.eiar.2017.08.002>
- Sherren, K., Smit, M., Holmlund, M., Parkins, J. R., & Chen, Y. (2017). Conservation culturomics should include images and a wider range of scholars. *Frontiers in Ecology and the Environment*, 15(6), 289–290. <https://doi.org/10.1002/fee.1507>
- Silva, G. D. P. da, Parkins, J. R., & Nadeau, S. (2020). *Social Impact Assessment Methods for Predicting Cumulative Effects involving Extractive Industries and Indigenous People*.
- Sinclair, A. J., Peirson-Smith, T. J., & Boerchers, M. (2017). Environmental assessments in the Internet age: the role of e-governance and social media in creating platforms for meaningful participation. *Impact Assessment and Project Appraisal*, 35(2), 148–157. <https://doi.org/10.1080/14615517.2016.1251697>
- Sinclair, A. J., Sims, L., & Spaling, H. (2009). Community-based approaches to strategic environmental assessment : Lessons from Costa Rica. *Environmental Impact Assessment Review*, 29(3), 147–156. <https://doi.org/10.1016/j.eiar.2008.10.002>
- Smyth, E., & Vanclay, F. (2017). The Social Framework for Projects: a conceptual but practical model to assist in assessing, planning and managing the social impacts of projects. *Impact Assessment and Project Appraisal*, 35(1), 65–80. <https://doi.org/10.1080/14615517.2016.1271539>
- Southcott, C., Abele, F., Natcher, D., Parlee, B., Southcott, C., Abele, F., Natcher, D., & Parlee, B. (2018). Beyond the Berger Inquiry: Can Extractive Resource Development Help the Sustainability of Canada’s Arctic Communities? *Arctic Institute of North America*, 71(4), 393–406.
- Sovacool, B. K., Axsen, J., & Sorrell, S. (2018). Promoting novelty, rigor, and style in energy social science: Towards codes of practice for appropriate methods and research design. *Energy Research and Social Science*, 45(October 2018), 12–42. <https://doi.org/10.1016/j.erss.2018.07.007>
- Spaling, H. (2003). Innovation in environmental assessment of community-based projects in sub-Saharan Africa. *Canadian Geographer*, 47(2), 151–168.
- Spaling, H. (2011). BEST PRACTICES FOR PROMOTING PARTICIPATION AND LEARNING FOR SUSTAINABILITY : LESSONS FROM COMMUNITY-BASED ENVIRONMENTAL ASSESSMENT IN KENYA AND TANZANIA. *Journal of Environmental Assessment Policy and Management*, 13(3), 343–366. <https://doi.org/10.1142/S1464333211003924>
- Spyce, A., Weber, M., & Adamowicz, W. (2012). Cumulative effects planning: Finding the balance using choice experiments. *Ecology and Society*, 17(1). <https://doi.org/10.5751/ES-04491-170122>

- SSHRC, & IAAC. (2019). *Knowledge Synthesis Grants Evidence Briefs*.
https://www.sshrc-crsh.gc.ca/society-societe/community-communite/ifca-iac/evidence_briefs-donnees_probantes/index-eng.aspx
- St-Pierre, J., & Lambert, R. (2014). *Summary Analysis of the Impact of the Romaine Hydroelectric Project on the Health of the Population: Monitoring the Situation in the Municipality of Havre-Saint-Pierre*. Institut national de santé publique du Québec.
- Stanton, K. (2012). Looking Forward, Looking Back: The Canadian Truth and Reconciliation Commission and the Mackenzie Valley Pipeline Inquiry. *Canadian Journal of Law and Society*, 27(1), 81–99. <https://doi.org/10.3138/cjls.27.1.081>
- Stern, P. (2007). Hunting for hydrocarbons: Representations of indigeneity in reporting on the new Mackenzie Valley Gas pipeline. *American Review of Canadian Studies*, 37(4), 417–441. <https://doi.org/10.1080/02722010709481810>
- Stienstra, D. (2015). Northern Crises: Women’s Relationships and Resistances to Resource Extractions. *International Feminist Journal of Politics*, 17(4), 630–651. <https://doi.org/10.1080/14616742.2015.1060695>
- Stienstra, D., Baikie, G., & Manning, S. M. (2018). “My granddaughter doesn’t know she has disabilities and we are not going to tell her”: Navigating Intersections of Indigenism, Disability and Gender in Labrador. *Disability and the Global South*, 5(2), 1385–1406.
- Suprayoga, G. B., Witte, P., & Spit, T. (2020). Identifying barriers to implementing a sustainability assessment tool for road project planning: an institutional perspective from practitioners in Indonesia. *Journal of Environmental Planning and Management*, 63(13), 2380–2401. <https://doi.org/10.1080/09640568.2020.1724083>
- Thompson, S. (2015). Flooding of First Nations and Environmental Justice in Manitoba: Case Studies of the Impacts of the 2011 Flood and Hydro Development in Manitoba. *Manitoba Law Journal*, 38(2), 220–259.
- Tollefson, C., & Wipond, K. (1998). Cumulative environmental impacts and aboriginal rights. *Environmental Impact Assessment Review*, 18(4), 371–390. [https://doi.org/10.1016/S0195-9255\(98\)00011-0](https://doi.org/10.1016/S0195-9255(98)00011-0)
- Treaty 8 First Nations Community Assessment Team. (2012). *Telling a Story of Change the Dane-zaa Way A Baseline Community Profile of: Doig River First Nation, Halfway River First Nation, Prophet River First Nation*.
- Udofia, A., Noble, B., & Poelzer, G. (2017). Meaningful and efficient? Enduring challenges to Aboriginal participation in environmental assessment. *Environmental Impact Assessment Review*, 65, 164–174. <https://doi.org/10.1016/j.eiar.2016.04.008>
- United Nations Environment Programme. (2018). *Assessing Environmental Impacts - A Global Review of Legislation*.
http://wedocs.unep.org/bitstream/handle/20.500.11822/22691/Environmental_Impacts_Legislation.pdf?sequence=1&isAllowed=y
- Vanclay, F. (2002). Conceptualising social impacts. *Environmental Impact Assessment Review*, 22(3), 183–211. [https://doi.org/10.1016/S0195-9255\(01\)00105-6](https://doi.org/10.1016/S0195-9255(01)00105-6)
- Vanclay, F. (2003). International Principles for Social Impact Assessment. *Impact Assessment and Project Appraisal*, 21(1), 5–11. <https://doi.org/10.3152/147154603781766491>
- Vanclay, F. (2006). Principles for social impact assessment : A critical comparison

- between the international and US documents. *Environmental Impact Assessment Review*, 26, 3–14. <https://doi.org/10.1016/j.eiar.2005.05.002>
- Vanclay, F. (2019). Reflections on Social Impact Assessment in the 21st century. *Impact Assessment and Project Appraisal*, 38(2), 126–131. <https://doi.org/10.1080/14615517.2019.1685807>
- Vanclay, F., & Esteves, A. (2011). New Directions in Social Impact Assessment. In *New Directions in Social Impact Assessment*. Edward Elgar.
- Vanclay, F., Esteves, A. M., & Franks, D. M. (2015). *Social Impact Assessment: guidance for assessing and managing the social impacts of projects* (Issue April). International Association for Impact Assessment.
- Waldron, I. R. G. (2018). *There's Something In The Water: Environmental Racism in Indigenous & Black Communities*. Fernwood Publishing.
- Walker, C., Alexander, A., Doucette, M. B., Lewis, D., Neufeld, H. T., Martin, D., Masuda, J., Stefanelli, R., & Castleden, H. (2019). Are the pens working for justice? News media coverage of renewable energy involving Indigenous Peoples in Canada. *Energy Research and Social Science*, 57(August), 101230. <https://doi.org/10.1016/j.erss.2019.101230>
- Waller, L., Dreher, T., & McCallum, K. (2015). The listening key: Unlocking the democratic potential of indigenous participatory media. *Media International Australia*, 154, 57–66. <https://doi.org/10.1177/1329878x1515400109>
- Weber, M., Krogman, N., & Antoniuk, T. (2012). Cumulative effects assessment: Linking social, ecological, and governance dimensions. *Ecology and Society*, 17(2). <https://doi.org/10.5751/ES-04597-170222>
- Wessels, J., Retief, F., & Morrison-saunders, A. (2015). Appraising the value of independent EIA follow-up verifiers. *Environmental Impact Assessment Review*, 50, 178–189. <https://doi.org/10.1016/j.eiar.2014.10.004>
- Westman, C. (2013). Social impact assessment and the anthropology of the future in Canada's Tar Sands. *Human Organization*, 72(2), 111–120. <https://doi.org/10.17730/humo.72.2.e0m6426502384675>
- Westman, C. N., & Joly, T. L. (2019). Oil Sands Extraction in Alberta, Canada: a Review of Impacts and Processes Concerning Indigenous Peoples. *Human Ecology*, 47(2), 233–243. <https://doi.org/10.1007/s10745-019-0059-6>
- Wilson, E. (2008). *What is social impact assessment ?* (Issue November). Árran Lule Sami Centre.
- Wilson, E., Best, S., Blackmore, E., & Kenton, N. (2016). *Meaningful community engagement in the extractive industries Stakeholder perspectives and research priorities*. IIED.
- Windsor, J. E., & McVey, J. A. (2005). Annihilation of both place and sense of place: The experience of the Cheslatta T'En Canadian First Nation within the context of large-scale environmental projects. *Geographical Journal*, 171(2), 146–165. <https://doi.org/10.1111/j.1475-4959.2005.00156.x>
- Wong, C. H. M., & Ho, W. chung. (2015). Roles of social impact assessment practitioners. *Environmental Impact Assessment Review*, 50, 124–133. <https://doi.org/10.1016/j.eiar.2014.09.008>
- Wood, C., Dipper, B., & Jones, C. (2000). Auditing the assessment of the environmental impacts of planning projects. *Journal of Environmental Planning and Management*,

43(1), 23–47. <https://doi.org/10.1080/09640560010757>

Wood, S., Tanner, G., & Richardson, B. J. (2010). What ever happened to Canadian environmental law? *Ecology Law Quarterly*, 37(4), 981–1040.

<https://doi.org/10.15779/Z389P0Q>

York Factory First Nation. (2012). OMA WECHAYWAKANTOWIN: The way forward. In *KIPEKISKWAYWINAN* (pp. 95–140).

APPENDIX

Table S1. Document type breakdown for the sample of hydroelectric plants assessed.

Type of report	Project's name	Number of projects
Comprehensive studies (CS) alone	Keenleyside, East Toba and Montrose, Forrest Kerr, Kwoeik, Pingston, Mittagami dam, Lower Mattagami Complex, Yellow Falls, Angliers, Chute Allard, Innavik, La Romaine, Magpie, Mercier, Peribonka, Saint Marguerite, Toulnoistic, Upper Harrison, and Upper Toba Valley	19
CS with additional documents (socioeconomic or TEKs)	Kokish, McLymont, Mica dam, Narrows Inlet, Revelstoke, Tretheway, Upper Lillooet, Waneta expansion, Wuskwatim, Mactaquac	10
EIA or EIS	Dunvegan, Site C, Keeyask, Pointe du Bois, Lower Churchill, Tazi Twe, Taltson project, Eastmain 1-A	8
		37
Type of additional document		
TEKs	Dunvegan, Kokish, McLymont, Mica dam, Waneta expansion, Lower Churchill	5
Socioeconomic assessment	Mica dam, Narrows Inlet, Revelstoke, Tretheway, Upper Lillooet, Site C, Keeyask, Wuskwatim, Lower Churchill, Mactaquac	10
Public consultation reports	East Toba and Montrose, Kokish, McLymont, Upper Lillooet, Keeyask, Angliers (community comments), Eastmain 1-A and Rupert diversion, Innavik, La Romaine, Saint Marguerite, Upper Toba Valle	10
Community-based assessments	Site C, Keeyask, and Lower Churchill	3
		28

Table S2. Summary of information regarding the use of surveys (questionnaires) and public participation.

Project	Summary of approaches to consultation	Comment about survey method
DUNVEGAN (AB)	Newsletters, open-houses, project website, public notices on newspapers, distribution of EIA material, group meeting, e-mails, telephone with government bodies Question (public hearing and interviews)	No mailed-out or online survey
KEENLEYSIDE (BC)	Mail list to invite stakeholders to open-houses and meetings with stakeholders No questionnaires at the meetings	No mailed-out or online survey
EAST TOBA AND MONTROSE (BC)	Telephone calls, mail letters, meetings, and e-mails. Questionnaires from open houses, e-mails and phone calls as follow up of open houses.	No mailed-out or online survey
FORREST KERR (BC)	Open house and review of comments received	No mailed-out or online survey
KOKISH(BC)	Newsletters, open-houses, project website, newspapers, group meeting, e-mails, telephone calls In person-questionnaires for TEK	No mailed-out or online survey
KWOIEK (BC)	Newsletters, open-houses, project website, newspapers, group meeting, e-mails, telephone calls	No mailed-out or online survey
MCLYMONT (BC)	Mail notification of open houses and meetings with individual stakeholders Stakeholder communication via telephone, letters, and e-mails	No mailed-out or online survey
MICA DAM (BC)	e-mails and telephone calls addressing questions. Questionnaire in the sense of interviews. Questionnaire about fish consumption, abundance, sizes, and preferences.	No mailed-out or online survey
NARROWS INLET (BC)	Open house and review of comments received	No mailed-out or online survey
PINGSTON (BC)	Letters mail out inviting to open houses and communicating about the public review process	No mailed-out or online survey

Project	Summary of approaches to consultation	Comment about survey method
REVELSTOKE (BC)	Letters mail out inviting to open houses, telephone calls, meetings, and mail list notifications. Household interviews input to an online platform to analyze data.	In-person survey
SITE C (BC)	Monitoring plans anticipate interviews and questionnaires with affected people. Questionnaires were used to identify diet preferences and other social issues among Indigenous and non-Indigenous (20 property owners).	In-person and mail out survey
TRETHEWAY (BC)	Open house and review of comments received	No mailed-out or online survey
UPPER LILLOOET (BC)	Website, comment forms, tours, telephone calls, mail letters, meetings, and e-mails, and open houses	No mailed-out or online survey
UPPER HARRISON (BC)	Open house and review of comments received	No mailed-out or online survey
UPPER TOBA VALLEY (BC)	Open houses, website, newspaper, meetings with stakeholders, and e-mails.	No mailed-out or online survey
WANETA (BC)	Open house and review of comments received	No mailed-out or online survey
KEEYASK (MB)	Website, meetings, radio, newsletters, questionnaires, workshops, open houses. 535 out of 700 community questionnaires were completed and returned.	In-person or mail out survey
POINTE DU BOIS (MB)	Newsletters, meetings with government, Indigenous and other stakeholders, open houses, websites.	No mailed-out or online questionnaire
WUSKWATIM (MB)	Website, meetings, radio, newsletters, questionnaires, workshops, open houses	No mailed-out or online questionnaire
MACTAQUAC (NB)	Website, newsletters, workshops, and open houses. An online survey was used to gather information on people's perceptions (support or disapproval) regarding the project.	Online survey

Project	Summary of approaches to consultation	Comment about survey method
LOWER CHURCHILL (NL)	A vague description of consultation methods “a wide range of methods and materials, to support a two-way flow of information throughout the Project planning and EA process” Questionnaire in the sense of interviews with trappers.	No mailed-out or online survey
TALTSON (NT)	Questionnaire in the sense of interviews with Indigenous people and TEK	No mailed-out or online survey
LOWER MATTAGAMI COMPLEX (ON)	Website, public inquires, telephone calls, and open houses to inform the public	No mailed-out or online survey
MATTAGAMI DAM (ON)	Website, newsletters, public inquires, meetings, and open houses. Mail list used to invite stakeholders for open houses and send updates about the project.	No mailed-out or online survey
YELLOW FALLS (ON)	Website, newsletters, public inquires, meetings, and open houses. Mail list used to invite stakeholders for open houses and send updates about the project. Questionnaires and comment cards were distributed during open houses.	No mailed-out or online survey
ANGLIERS (QC)	Open houses to inform the public about the project	No mailed-out or online survey
CHUTE ALLARD (QC)	Open houses to inform the public about the project and meetings with stakeholders	No mailed-out or online survey
EASTMAIN 1-A (QC)	A mix of telephone and postal survey questionnaires with outfitters, hunters, road users, vacationers mostly focused on land use and appreciation of landscape, not the perception of impacts. Questions were provided in the report. Survey with affected Cree Indigenous about land use and diet.	Limited surveys focused on land use and economic benefits
INNAVIK (QC)	Open houses to inform the public about the project and meetings with stakeholders	No mailed-out or online survey

Project	Summary of approaches to consultation	Comment about survey method
LA ROMAINE (QC)	Website, newsletters, radio, TV broadcast, open houses to inform the public. The project claimed to have conducted surveys and questionnaires with community members about the perception of social impacts. Questionnaires are also part of the monitoring plans.	Mailed-out survey and in-person interviews
MEGPIE (QC)	Open houses to inform the public about the project and meetings with stakeholders	No mailed-out or online survey
MERCIER (QC)	Open houses to inform the public about the project and meetings with stakeholders	No mailed-out or online survey
PERIBONKA (QC)	Open houses to inform the public about the project and meetings with stakeholders	No mailed-out or online survey
SAINT MARGUERITE (QC)	Open houses to inform the public about the project and meetings with stakeholders	No mailed-out or online survey
TOULNUSTOUC QC)	Open houses to inform the public about the project and meetings with stakeholders	No mailed-out or online survey
TAZI TWE (SK)	Consultation via meetings, letters and e-mails, and open houses. Surveys with trappers about land use.	No mailed-out or online survey

Table S3. Summary of interviewees and context during Hydroelectric social impact assessment in our sample.

Project	Interviewees	Context
Dunvegan (AB)	Key respondent	Part of methodology
Keenleyside (BC)	Employees	Part of methodology TEK and land use (do not mention public)
Kokish (BC)	Indigenous, experts, residents, and stakeholders	TEK and land use, baseline, socioeconomic.
Kwoeik (BC)	Indigenous	TEK and land use,
Mica dam (BC)	Employees, Indigenous, experts, residents, stakeholders	Wildlife migration, baseline, TEK and land use
Narrows Inlet (BC)	Experts and Indigenous people	Site identification (for TEK) And socioeconomic baseline
Revelstoke (BC)	Indigenous and residents	TEK and land use
Site C (BC)	Farmers, Indigenous, residents, experts, and other stakeholders	Baseline socioeconomic, monitoring plans, land use and traditional knowledge, and CBA
Upper Toba Valley	Business people	Socioeconomic
Waneta (BC)	Indigenous and residents	Mention to fund TEK and identify archaeological sites
Keeyask (MB)	Indigenous and residents	Baseline, socioeconomic, monitoring plans, and CBA
Pointe du Bois (MB)	Key persons	Part of methodology
Wuskwatim (MB)	Key persons	Comment about assessment
Lower Churchill (NL)	Employees, residents, experts, Indigenous	Baseline conditions, Gender challenges, monitoring plans, TEK, and CBA
Taltson (NT)	Indigenous, residents, experts and stakeholders	TEK, project design and planning.

Project	Interviewees	Context
Mattagami dam (ON)	Key persons	General methodology
Eastmain 1-A (QC)	Indigenous and other stakeholders	TEK, socioeconomic profile, monitoring program, Indigenous past experience
Innavik (QC)	Key persons	General methodology
La Romaine (QC)	Indigenous, experts, and stakeholders	Baseline, socioeconomic, monitoring, past experience, planning
Peribonka (QC)	Trappers	Part of methodology
Tazi Twe (SK)	Key persons (Indigenous, experts, and stakeholders)	Baseline, socioeconomic, TEK and land use

Table S4. Predictions of work camp necessity and population increase for a sample of the hydroelectric dams studied.

Name	Workers at camp	Population growth
Dunvegan (AB)	No	Not significant
Keenleyside (BC)	No	1% increase
East Toba and Montrose (BC)	Yes (no metric)	-
Forrest Kerr (BC)	Yes (no metric)	-
Kokish (BC)	No	-
Kwoiek (BC)	60	-
McLymont Creek (BC)	No, use Forrest Kerr	Minimal effect
Mica Dam (BC)	No, use Revelstoke	Small increase in Revelstoke
Narrows Inlet (BC)	50	Low magnitude
Site C (BC)	1372 to 1486 at peak construction ⁴	About 2% (2,985 to 3,020 persons at peak construction)
Pingston (BC)	Yes (no metric)	-
Revelstoke (BC)	No, rentals and hotels	1-2% increase (114 to 165 persons for unit 5 and 130 persons for unit 6 at peak construction)
Tretheway (BC)	Yes (no metric)	-
Upper Lillooet (BC)	150-200	Minimal effect
Upper Harrison (BC)	Yes (no metric)	-
Upper Toba Valley (BC)	Yes (no metric)	-
Waneta (BC)	-	0.5% increase
Pointe du Bois (MB)	If required	-

⁴ The Site C website states that construction camp might accommodate between 1600 and 2200 workers. <https://www.sitecproject.com/business-and-job-opportunities/procurement-update/worker-accommodation> accessed on August 4, 2020

Name	Workers at camp	Population growth
Keyyask (MB)	1500 to 2000	No predicted effect
Wuskwatim (MB)	Yes (no metric)	-
Mactaquac (NB)	No	-
Lower Churchill (NL)	2000 (Gull Island) and 1000 (Muskrat)	-
Taltson (NT)	150 (Twin Gorges), 100 (Nonacho Lake), 50 (Mobile Barges) and use other existing camps	-
Mattagami dam (ON)	No	-
Lower Mattagami complex (ON)	500	-
Yellow River (ON)	-	-
Angliers (QC)	-	-
Chute Allard (QC)	600	-
Eastmain 1-A (QC)	8 camps, 5500 at peak	-
Innavik (QC)	128	-
La Romaine (QC)	Three camps: 300, 2408 and 1744.	-
Magpie (QC)	-	-
Mercier (QC)	No	-
Peribonka (QC)	Yes (no metric)	-
Saint Marguerite (QC)	200 to 300 (CH-4) and 1000 (SM- 3)	-
Toulnustouc (QC)	Yes (no metric)	-
Tazi Twe (SK)	250	-

Table S5. Employment predictions in the sample of hydroelectric projects. Metrics in person-years (PY) unless otherwise stated.

NAME	EMPLOYMENT METRICS CONSTRUCTION	EMPLOYMENT METRICS OPERATION
Dunvegan	1819 workers(total), 500 (direct onsite), 383 (direct offsite)	6-9
Keenleyside	1100 (500-570 at peak construction)	10-13
East Toba and Montrose	650	2
Forrest Kerr	130	4 full time and 4 part-time
Kokish	150 (30-35 trade and technical jobs)	2 full-time and 2 part-time
Kwoiek	70-90	-
Mclymont Creek	350-450 direct, 630 (indirect), 260 (induced)	2 to 4
Mica Dam	<p>Unit 5: 428 (direct) composed of 324 trade and 104 engineering. 80-161 PY locally (20-45% of the population). 14.5-29.0 (induced) and 21.7-43.6 (indirect) PY</p> <p>Unit 6: 371(direct) composed of 335 trade, 36 engineering. (0-10% local hire, which is 0-40 PY). 0-7 (induced) and 0-10.5 (indirect) PY</p>	2 operators each unit
Narrows Inlet	440-495 (total)	1 operator and 3 part-time positions
Site C	10,223 direct workers (2,066 at peak, year 5), 28,228 total direct and indirect	25 full-time (3,270 PY over 100 years of operation)
Pingston	127	1 full-time
Revelstoke	Unit 5: 364 (285 trade, 79 engineering and management) over four years.	No additional worker is expected to operate Revelstoke Dam

NAME	EMPLOYMENT METRICS CONSTRUCTION	EMPLOYMENT METRICS OPERATION
	Unit 6: 436-171PY of direct employment. Totals of 1,189	
Tretheway	800 direct employment (4 years), 250 at peak. 410 indirect employment, and 260 PYs of induced jobs	1 permanent and 1 part-time for each project (three in total)
Upper Lillooet	382 (200 at peak). 1,161 direct and indirect, while 297 of induced employment	3 full-time, 3 part-time, 1.5 management.
Upper Harrison	400 (20 FTE)	-
Upper Toba Valley	400-535 over 2 years	3-4 over 40 years
Waneta	680 (75% local, 50% management and engineering)	4
Pointe Du Bois	4,600 person-month (383 person-year)	2
Keeyask	42,188 totals	46
Wuskwatim	2200 (1800 Manitobans and 700 northern Manitobans)	6 FTE
Mactaquac	1780, 1000, or 300 workers depending on the option chosen	-
Lower Churchill	15,600 (5,600 in Muskrat and 10,000 Gull Island. 65% from the province)	280 totals (80 direct)
Taltson	1014 totals, 530 direct, 232 indirect, and 253 induced	8 to 10
Mattagami Dam	46-60	-
Lower Mattagami Complex	-	-
Yellow River	95 full-time equivalents	2
Angliers	100	4
Chute Allard	660	-
Eastmain 1-A	27,000 totals in Quebec (1,052 for Cree nations, 1,189 in Jamesian communities)	-
Innavik	315,000 man-hours (36 person-year)	10

NAME	EMPLOYMENT METRICS CONSTRUCTION	EMPLOYMENT METRICS OPERATION
La Romaine	18,533 workers (11,224 at site, 14877 indirect, 33,410 totals). 40% region Cote-Nord, 60% regional.	-
Magpie	120 (85 construction, 38 equipment)	5
Mercier	85	-
Peribonka	2,513 totals	-
Saint Marguerite	-	0
Toulnustouc	1000 over 5 years, 222 person-year	9
Tazi Twe	450	8-9

Table S6. Gender-based information covered in the sample of hydroelectric projects.

Project (MW, Year)	Gender/Women/minorities
McLymont (70 MW, 2012)	A historical context of gender roles in the community
Mica Dam (1850 MW, 2010)	Demographic profile Equity hire target: 11.3% minorities A historical context of gender roles in the community
Narrows Inlet (45 MW, 2014)	Anticipate that migration might change the demographic profile
Revelstoke (2480 MW, 2007)	Demographic profile Equity hire target of 16% for minorities A historical context of gender roles in the community Participation in interviewed groups
Site C (1100 MW, 2014)	Demographic profile Charity for programs addressing abuses against women A historical context of gender roles in the community Concerns about employment for women in remote camps, long shifts and lack of parenting by Indigenous women, possible effects of poverty among single parents, high number of unplanned pregnancies, unknown rates of sexually transmitted diseases, money management issues. comment about gender more susceptible to mercury contamination and effects on people diet
Waneta (435 MW, 2007)	Historical context Equity hiring target of 10% for women and minorities
Keeyask (695 MW, 2014)	Demographic profile A historical context of gender roles in the community Concern over groups susceptible to mercury contamination and effects on people diet Concerns about construction workers and increase of abuse of women, employment for women, and the role of women in the community.
Waskwatim (200 MW, 2002)	Concern over groups susceptible to mercury contamination and effects on people diet Equity hiring target: 25% women, 12% women in management, 31% women professionals, 4.6% disabled persons, 3.8% minorities.
Lower Churchill (2800 MW, 2016)	Detailed volume on regulatory requirements, proponent vision and values, gender and employment initiatives and equity targets
Taltson (54 MW, 2013)	Demographic profile Recognize women's lack of representativeness in employment in the past
Lower Mattagami Complex (484 MW, 2009)	Concern over groups susceptible to mercury contamination and effects on people diet

Project (MW, Year)	Gender/Women/minorities
	Employment targets: 375 FTE women per year, 75 FTE Indigenous per year, 50 workers with a disability on-site, 30 workers self-identified as visible minorities (targets are further broken down in the report)
Yellow Falls (5-7 MW, 2009)	Concern over groups susceptible to mercury contamination and effects on people diet
Eastmain 1-A (768 MW, 2004)	Lower participation of women and youth in the interviews. Participation of Cree Indigenous from Eastmain varying from 4 to 15%
Innavik (8 MW, 2010)	The project would establish a compensation plan with the participation of women, elders, and youth representatives.
La Romaine (1550 MW, 2009)	Demographic profile Concern over groups susceptible to mercury contamination and effects on people diet Questioning from the community demanding more information about initiatives to ensure benefits for women
Peribonka (385 MW, 2004)	Demographic profile A prediction that the hydroelectric dam would not impact mercury in fish (p. 71), thus minimize the impact on pregnant women and children
Toulnostouc (526 MW, 2001)	The project would monitor levels of mercury in fish and provide information on “safe” quantity for consumption
Tazi Twe (50 MW, 2014)	Demographic profile Concern about the presence of construction workers and interaction with local women

Table S7. Summary of results demonstrating the way hydroelectric projects addressed impacts on livelihoods, wellbeing, and community cohesion.

PROJECT	SOCIAL LIVELIHOOD, WELLBEING, AND COHESION
DUNVEGAN (50 MW)	The impact from previous development (reduction of animals used for livelihoods) Wellbeing related to the health of the ecosystem
MICA DAM (1,850 MW)	Past developments and lack of consultation about impacts on livelihoods Livelihood linked with TEK and land use
REVELSTOKE (1,980)	Traditional economy and land use Concerns about new induced impacts on the community (fishing, hunting, access to areas) and difficulties faced by members Community identified and aspects of culture, social, economic, governance, and land use necessary to the sense of a healthy social environment Wellbeing is associated with traditional livelihoods, employment, income, health, and culture. Community cohesion equals concern about maintenance of the livelihood, social structure, and community health
SITE C (1,100 MW)	The impact from previous development (reduction of animals used for livelihoods) Concerns about new induced impacts on the community (fishing, hunting, access to areas). Rights of Indigenous people Concern about chief's wellbeing and capacity of governance (deal with external problems cannot work on community issues) decreases access to practice traditional activities and psychosocial effects. Community cohesion equals concern about maintenance of the livelihood, social structure, and community health. Potential interference of Western values and wage economy into Indigenous livelihood and community cohesion
UPPER TOBA VALEY (130 MW)	One mention recognizing the importance of fish as part of the livelihood of the Indigenous community. Wellbeing refers to the health of workers and occurrence of accidents
KEEYASK (695 MW)	Storytelling about culture and impact of previous hydroelectric plants Traditional economy and concerns about loss of resources used for livelihoods Community health (physical, mental, emotional, cultural, and social), traumas from the past, opportunities. Community cohesion equals concern about maintenance of the livelihood, social structure, and community health.
LOWER CHURCHILL (2,800 MW)	Concerns about impacts on traditional land use Mentioned as criteria to assess impacts on traditional communities Participation in the project and enhancement of socioeconomic wellbeing Concerns about psychosocial and health impacts affecting people's wellbeing

PROJECT	SOCIAL LIVELIHOOD, WELLBEING, AND COHESION
TALTON (484 MW)	<p>Concern about demographic effects on local livelihoods.</p> <p>Description of the traditional economy (hunting and trapping)</p> <p>Livelihood sustainability index: human, natural, social, financial, physical capitals.</p> <p>Economic wellbeing and involvement in traditional activities</p> <p>Community cohesion equals concern about maintenance of the livelihood, social structure, and community health.</p>
EASTMAIN 1-A (768 MW)	<p>Interview themes: livelihood associated with hunting, trapping, employment, cost of living, and access to goods.</p> <p>Mention exploring more about social cohesion in the chapter that we did not find online. Social cohesion equals to quality of life for Cree (Indigenous) communities.</p> <p>Impact on culture and livelihood caused by previous development (reduction of animals used for livelihoods) and loss of traditional activities that represented the health of the community</p>
TAZI TWE	<p>Concern about biophysical changes affect the health and wellbeing of communities</p> <p>Social cohesion as a component of socioeconomics</p>

Table S8. Comparison between Site C and Keeyask projects

	Keeyask project	Site C dam
Location	Manitoba	British Columbia
Latitude	56.3647° N	56.1950° N
Power Capacity	695 MW	1,100 MW
Estimated power generation	4,400 GWh	5,100 GWh
Construction commenced	2014	2015
Work camp capacity	1,500 to 2000 workers	1,600 to 2,200 workers
Predicted employment rates	4,218 persons-year construction employment	13,000 persons-year
Baseline unemployment rates (2001 for Keeyask and 2011-2 for Site C)	40% for Keeyask Cree communities Gilliam - 6.4% Thompson - 7.1%	DRFN – 33.3% and 40% (on and off-reserve) HRFN – 83.3% (F) and 66.7 (M) PRFN – 66.7% (F) and 60% (M) WMFN – 33.3%
Average household Income	For years 2001-2006 Cree partners - 35k Gillam – 71-85 K Thompson 61-76 k	No metric
Demographics (2006 for Keeyask, and 2011-2 for Site C)	FLFN – 1,020 YFFN – 1,070 TCN – 3000 WLFN - 235	DRFN – 284 HRFN - 255 PRFN - 260 WMFN – 237
Members living off-reserve (2006 for Keeyask, and 2011-2 for Site C)	FLFN – 73% YFFN – 56% TCN – 28% WLFN – 46%	DRFN – 55% HRFN – 56% PRFN – 60% WMFN – 62%
Education	48.2% less than high school certificate	Not metric, but acknowledge facing hardships
Livelihood characteristics	Fishing, trapping, hunting and employment off-reserve	Fishing, trapping, hunting and employment off-reserve
Predicted population increase	No prediction	2% (2,985 to 3,020 at peak construction)
Reservoir area	4,463 ha	5,340 ha
Other large hydroelectric projects in the watershed	Kelsey, Kettle, Long Spruce, Limestone, Wuskwatim	W.A.C Bennett, Peace Canyon
Costs up to 2020	8.7 billion	12 billion

	Keeyask project	Site C dam
Equity-share	75% Manitoba Hydro, 25% Indigenous partners	100% BC Hydro
Discussion about the project	Since the 1990s	Since midst 1950s
Regulatory approval	Joint Review Panel (province and federal governments)	Joint Review Panel (province and federal governments)
SIA framework	CBIA – storytelling and traditional knowledge	CBIA – storytelling and traditional knowledge
Public and political controversies	Project became political election matter. When the opposition got elected, project was not cancelled	Project became political election matter. When the opposition got elected, project was not cancelled
Lawsuit against the project	Yes (Metis Indigenous federation against the transmission line)	Yes (Indigenous and farmers)
Predicted displacement of people	No new displacements	20 farmers

FLCN: Fox Lake Cree Nation. TCN: Tataskweyak Cree Nation. WLFN: War Lake First Nation. DRFN – Doig River First Nation. HRFN – Halfway First Nation. PRFN – Prophet River First nation. WMFN – West Moberly First Nation.

Table S9. List of news articles analyzed for Keeyask project.

News coverage for Keeyask project	ID-K	Year
Manitoba Hydro, Minnesota Power agree on electricity sale	CBC01	2008
Fox Lake Cree Nation signs on to northern Manitoba dam project	CBC02	2009
Hydro megaprojects need scrutiny, Tories say	CBC03	2012
Review called for Hydro megaprojects	CBC04	2012
Manitoba premier to face budget, hydro issues in new year	CBC05	2012
Where is money going? \ Hydro negotiation cash allegedly spent on electronics	WNS01	2012
Feds sue First Nation \ Claim NCN band council misspent \$4.6M intended for learning centre	WNS02	2012
Hydro dam blockaded	WNS03	2012
Tories demand Hydro answers	WNS04	2012
Hydro hearings a battleground	WNS05	2012
Hydro power struggle \ Provincial Tories want to put cork in billion-dollar megaproject	WNS06	2012
Hydro is Manitoba's \ Get your hands off our Hydro Greg, it's not an NDP toy	WNS07	2012
Manitoba could be out of power by 2022, says energy minister	CBC06	2013
Keeyask hydro dam environmental hearings underway Consumers' association urges Manitobans to attend hearings	CBC07	2013
PUB boss takes hard look at dam building plans	BRS01	2013
Billions for new dams 'power dumb,' Pallister says	BRS02	2013
Manitoba electricity may flow westward	BRS03	2013
Audit shows First Nation misused Hydro funds	BRS04	2013
Big bill for Hydro signing even	BRS05	2013
Hydro fires back at CTF over criticism on spending	BRS06	2013
MMF warns Hydro it'll sue on dams, lines	BRS07	2013
Hydro reveals forecast for Keeyask flooding	BRS08	2013
Pallister adds voice to calls for total review of Hydro construction plans	BRS09	2013
Hydro to boost sturgeon numbers	BRS10	2013
Expert says Hydro's plan for sturgeon will fall short	BRS11	2013
Manitoba Hydro, Saskatchewan ink \$100-M deal	BRS12	2013
POWER SMARTS \ Massive investments are worth the sticker shock, the province insists	WNS08	2013
Community centre just a money pit, Tories claim	WNS09	2013
Manitoba, Saskatchewan close to signing hydro deal	WNS10	2013
Lights out? \ Province needs new dam to meet future energy demands: Report	WNS11	2013
POWER HUNGRY \ Consultants 'gorging' off Manitoba Hydro, says Taxpayers Federation	WNS12	2013
Hydro makes \$100M deal with Sask	WNS13	2013
Independent panel, not PUB, should rule on Hydro dams: Pallister	BRS13	2014

News coverage for Keeyask project	ID-K	Year
Hydro hikes cost of northern dams	BRS14	2014
No decision on hydro gas plant for 4 years	BRS15	2014
Metis criticize proposed hydro dam, Manitoba government for lack of consultation	BRS16	2014
CEC OKs licence for Keeyask	BRS17	2014
Province coy on timetable for Keeyask hydro plan	BRS18	2014
Taxpayers group raises questions about Hydro spending CFT says audit shows utility spent \$5.4 million on First Nation's expenses during talks	BRS19	2014
Manitoba grants environmental licence for construction of controversial dam	BRS20	2014
Licence issued for Keeyask dam construction	BRS21	2014
Hydro gets green light for Keeyask dam	BRS22	2014
PUB had no choice in approving dam: Tories	BRS23	2014
Construction of Keeyask generating station kicks off	BRS24	2014
Coalition calls on province to suspend Bipole III, Keeyask	BRS25	2014
Manitoba Hydro dams a done deal, claims CTF \ \$1B already spent before official approvals	WNS14	2014
Hydro's information dam is leaking	WNS15	2014
Band plays on with Keeyask dam	WNS16	2014
Partnerships or gifts?	WNS17	2014
Blueberry River First Nations lawsuit threatens Site C, fracking in B.C. Suit alleges government violated Treaty 8 rights with cumulative impacts of oil and gas development	CBC26	2015
Manitoba: Home of cost overruns	WNS18	2015
HYDRO HIKES \ Crown corporation says annual rate increases tied to province's credit rating	WNS19	2015
Letters to the Editor Column	WNS20	2015
Four decades later, settlements outstanding	WNS21	2015
Hydro makes deal with Sask	WNS22	2015
Letters to the Editor Column	WNS23	2015
Manitoba Hydro honours payments owing to First Nations impacted by Keeyask: report	CBC08	2016
Manitoba Hydro losses from Bipole III, Keeyask 'are going to be huge,' warns former PUB chair Graham Lane calls for government bailout and public inquiry into financial situation	CBC09	2016
Manitoba Hydro's Keeyask dam was 'risky investment strategy,' says U.S. energy expert Even 5 years ago, U.S. energy market was leaning toward natural gas, says Ian Goodman	CBC10	2016
NDP sitting on damning audit: PCs	WNS24	2016
NDP leave Hydro mess for PCs	WNS25	2016
Public deserves Hydro inquiry	WNS26	2016
Proper Payout; But Manitoba Hydro needs to improve its claims process: Auditor	WNS27	2016

News coverage for Keeyask project	ID-K	Year
Shut dam down; Despite sunk costs, former PUB chair wants Keeyask kiboshed, public inquiry launched	WNS28	2016
Keeyask dam cost estimate balloons by \$2.2B Dam project now expected to cost \$8.7B; in-service date pushed back 21 months	CBC11	2017
Keeyask dam cost could reach \$10.5 billion, report warns	CBC12	2017
'Significant increase'; Cost of Hydro's Keeyask dam project rises \$2.2 billion	WNS29	2017
Tory missteps crushing Manitoba's finances	WNS30	2017
'This is crazy'; Keeyask price tag could soar to \$10.5 billion: Consultant	WNS31	2017
Hydro on the hook; Flawed contract paves way for cost overruns in Keeyask project	WNS32	2017
Why no Hydro inquiry?	WNS33	2017
Pallister plans review of Hydro megaprojects	BRS26	2018
Commission heard sexual-assault	CBC13	2018
Keeyask-atraz' workers describe prison-like conditions, racism, substance abuse at site	CBC14	2018
Former security guard at northern Manitoba Hydro site says he saw sexual harassment, substance abuse	CBC15	2018
Chair resigns from Hydro's Keeyask board as First Nation calls for inquiry over abuse allegations	CBC16	2018
Cracks form in Keeyask dam partnership as Hydro exec remains on board following review	CBC17	2018
First Nations rally over allegations of racism, sexual violence from Hydro workers	CBC18	2018
9 cases of sexual assault investigated at Keeyask dam site since 2015 'tip of the iceberg,' says prof	CBC19	2018
Manitoba chief hopes Senate committee sees link between resource development, violence	CBC20	2018
Manitoba's deep dark secret; Muskrat Falls and Keeyask projects both in trouble	WNS34	2018
Garbage in, garbage out: Regulatory failures	WNS35	2018
Our people have been oppressed'; Human rights complaint filed over alleged Hydro abuse	WNS36	2018
Shock to the system; Keeyask, bipole iii hydro probe: a necessary evil	WNS37	2018
Metis 'have to sue'; MMF accuses Tories of deceit, threatens end to hydro support	WNS38	2018
The right call; No legal basis for Hydro to compensate MMF	WNS39	2018
MMF to sue province over cancelled \$20M agreement	WNS40	2018
Alarms Bells; Chief: Hydro project sex assault probe sounds	WNS41	2019
Chief to Senate: Listen up!; First Nations leader hopes committee sees link between resource development, violence	WNS42	2019
Reconciliation at Risk; MMF says Indigenous rights threatened by hydro deal	WNS43	2019
Manitoba Hydro pulls hundreds of workers, suspends travel to and from Keeyask project	CBC21	2020

News coverage for Keeyask project	ID-K	Year
Northerners fear outbreak at Keeyask generation project	BRS27	2020
Tataskweyak community members close highway into Manitoba Hydro's Keeyask site to prevent COVID-19 spread	CBC22	2020
First Nations partners of Keeyask 'not backing down' from blockades over COVID-19 fears	CBC23	2020
Tataskweyak Cree Nation chief tears up court injunction at Keeyask blockade	CBC24	2020
Amnesty International backs northern Keeyask protesters	BRS28	2020
Manitoba Hydro pulls majority of workers from Keeyask project amid blockades	CBC25	2020
Deal reached over Keeyask blockades	BRS29	2020
Protest shut down; Hydro project blockade preventing shift change for workers	WNS44	2020
Blockade to end; MKO, Cree reach agreement with Manitoba Hydro over power station	WNS45	2020

Table S10. List of news articles analyzed for Site C project

News coverage for Site C project	ID S-	Year
BC Hydro resurrects Site C dam proposal: It would flood thousands of hectares, force Peace families to move and affect fish habitat	VCS01	2004
Some dam good reasons to revive Site C	VCS02	2004
Site C dam was shelved for good reasons	VCS03	2004
Water powers the future at Site C: BC Hydro's decision to resurrect a 30-year-old plan for a third dam on the Peace River isn't sitting well, again, with residents in the northeast	VCS04	2004
Alberta natives vow to fight Site C: BC HYDRO I Proposed third Peace River dam would be the 'death of the delta'	VCS05	2004
Site C dam plan back on the table	CBC01	2005
Oh, dam. Liberals would rather not talk about Site C right now	VCS06	2005
Tab for Site C dam could hit \$6.6 billion; BC Hydro says cost of facility won't be known until final bid is accepted	VCS07	2007
BC Hydro dips its toe into the controversial waters of the Site C dam	VCS08	2008
Peace wants say on massive dam; Region wants consideration before any studies on \$6-billion Site C	TCT01	2009
Site C would flood Peace but wind power is OK	TCT02	2009
Little green about Site C dam	TCT03	2009
Site C dam site fails the green test	TCT04	2009
Site C criticized by environmental groups	CBC02	2010
Farmer vows to fight Site C Dam	CBC03	2010
Northerners weigh in against Site C proposal	VCS09	2010
Northerners weigh in against Site C proposal	VCS10	2010
B.C. nearing Site C decision; Questions persist about wisdom of \$6.6-billion hydro megaproject	TCT05	2010
Liberals commit to building Site C dam; Review will determine impacts of project expected to exceed \$6 billion	VCS11	2010
Northeast residents wary of a future with Site C dam; Leaders weigh benefits and drawbacks of massive project on the Peace River	VCS12	2010
Final cost of Site C ready by 2011; Deadline relatively tight on project expected to be complete by 2020	TCT06	2010
How Site C will turn northern B.C. into an economic powerhouse	VCS13	2010
\$8B Site C dam goes to environmental review	CBC04	2011
Dam plan frustrates 5 first nations; United Nations intervention sought in proposed Site C dam project	VCS14	2011
Site C benefits outweigh problems	TCT07	2011
Cost of Site C dam too high, says critic	CBC05	2012
BC Hydro prepares for Site C assessment	VCS15	2012
Hydro expands development legacy; Site C project would provide clean, reliable, cost-effective electricity for more than 100 years, while contributing to the economy through job creation and business opportunities	VCS16	2012

News coverage for Site C project	ID S-	Year
BC Hydro poll shows strong public backing for Site C dam; 80 per cent support hydroelectric project on the Peace River	VCS17	2012
Site C dam support would crumble if public knew facts	VCS18	2012
Site C project would add jobs, economic benefits	VCS19	2012
Coalition says no to Site C dam; Groups argue Peace region has suffered from unrestrained resource development	VCS20	2012
Site C dam would displace B.C. property owners	CBC06	2013
BC Hydro submits information on impact of Site C dam	CBC07	2013
BC Hydro depending on Site C Dam, conservation, says draft plan	CBC08	2013
Controversial B.C. Hydro Site C dam hearings underway	CBC09	2013
B.C.'s Site C dam threatens Athabasca Delta, Alberta says The massive hydroelectric project will be the third dam on the Peace River	CBC10	2013
B.C. Hydro presses case for Site C megaproject; Dam would flood agricultural land, displace 20 families, utility says in major environmental impact statement	TCT08	2013
Site C dam on peace river will do more harm than good	VCS21	2013
Time to crunch the numbers on Hydro's Site C	VCS22	2013
Site C in B.C.'s long-term interest; Project would provide clean, inexpensive and renewable energy for more than a century	VCS23	2013
What the public needs to be asked about Site C dam	VCS24	2013
Group decries timing, locations of hearings; Talks on Site C dam planned for December	VCS25	2013
Battle for the peace river valley; BC Hydro's planned Site C dam pits need for electrical power against threat to prime farmland	VCS26	2013
First Nations split over Site C dam; Some want to fight the BC Hydro megaproject; other want to negotiate for millions in compensation	VCS27	2013
Site C hearings underway	TCT09	2013
BC Hydro prefers Site C over smaller dams; Decision was based on most effective use of topography and geology, including access to gravel	VCS28	2013
Site C dam decision makers are out of touch	VCS29	2013
Federal Site C dam review to be released to public he \$8B hydroelectric project is needed to power B.C.'s natural gas industry, says Premier Christy Clark	CBC11	2014
Joint review of Site C dam make 50 recommendations The \$8B hydroelectric project is needed to power B.C.'s natural gas industry, says Premier Christy Clark	CBC12	2014
Site C or LNG: pick one, say B.C. First Nations Final government decision on Site C dam is expected in November	CBC13	2014
Site C dam granted environmental assessment approval B.C. environment ministry issues certificate to B.C. Hydro but government must still approve funding	CBC14	2014
Site C: Peace River landowners seek judicial review of hydro dam plan BC Hydro says the new dam is needed to meet long-term power demand	CBC15	2014

News coverage for Site C project	ID S-	Year
2 Alberta First Nations file suit against Site C dam project Mikisew Cree, Athabasca Chipewyan say government failed to consult or consider downstream effects	CBC16	2014
B.C. government approves Site C dam Massive hydro dam would flood a large area of the Peace River Valley in northern B.C.	CBC17	2014
B.C. government decision on Site C dam expected Provincial Energy Minister Bill Bennett has called a news conference in Victoria	CBC18	2014
Site C dam: Bill Bennett defends approval of Peace River project Bill Bennett says Site C is the cheapest option for power, and money is set aside to fight court challenges	CBC19	2014
B.C. Premier Christy Clark defends Site C as a 100-year plan Clark sat down for an exclusive interview with CBC Vancouver host Andrew Chang	CBC20	2014
We'll fight Site C regardless of review; Impact of 'archaic' mega-energy project too much for community to bear	VCS30	2014
Review stops short of backing Site C dam; Hydroelectric dam would harm environment, but also help meet B.C.'s future energy needs, panel says	TCT10	2014
Joint Review Panel revives Site C dam's core issues; BC Hydro hasn't proven need for project at this time, report says	VCS31	2014
Horgan, Bennett do the Site C tango	TCT11	2014
Site C not in public interest	VCS32	2014
Site C an opportunity for clean energy	TCT12	2014
Treaty 8 opposed to Site C	VCS33	2014
First Nations chiefs to stage Site C showdown; Group argues flooding valley would diminish hunting, fishing opportunities	VCS34	2014
First Nations tell B.C. to choose LNG or Site C	TCT13	2014
Five reasons to say no to Site C dam	TCT14	2014
Site C dam: What about a meeting?	VCS35	2014
Site C dam gets environmental nod	TCT15	2014
Site C dam clears hurdle; more to come	TCT16	2014
Site C dam construction could begin as early as January; Environmental hurdles cleared, final decision up to B.C. cabinet	VCS36	2014
Issues & Ideas On Site C, is First Nations approval Plan A?; Energy: Native groups, empowered by Tsilhqot'in decision, remain staunchly opposed	VCS37	2014
Is Victoria all-in on Site C? No, Bill Bennett insists; BC Hydro: Energy minister opens the door a crack to alternatives	VCS38	2014
Fort St. John anticipates Site C real estate bump; Area's sizzling market could get even hotter if \$7.9-billion dam project is approved	VCS39	2014
Landowners go to court to put brakes on Site C dam	VCS40	2014
Lawsuit says Site C approval is flawed	TCT17	2014
Landowners launch court action over dam; Environmental approvals for Site C called invalid, project 'destructive'	TCT18	2014
First Nations launch court challenge over Ottawa's approval of Site C dam	VCS41	2014
Alberta bands file lawsuit over Site C project	TCT19	2014

News coverage for Site C project	ID S-	Year
Make Site C compete against private clean-energy projects; Not just electrons: Clean energy is about sustainable jobs spread across the province	VCS42	2014
Site C sound bites saved for Big Apple; Energy: Premier Christy Clark gives Bloomberg news service the scoop on new cost estimate	VCS43	2014
Site C approval ruins Christmas, birthday	TCT20	2014
Site C dam unions won't be blocked by BC Hydro, says Christy Clark Union has accused Crown corporation of trying to bar unions from organizing at project worksites	CBC21	2015
Blueberry River First Nations lawsuit threatens Site C, fracking in B.C. Suit alleges government violated Treaty 8 rights with cumulative impacts of oil and gas development	CBC22	2015
Site C dam: landowners challenge government in B.C. Supreme Court Massive hydro project would flood a large area of the Peace River Valley in northern B.C.	CBC23	2015
Site C dam: B.C. has right to approve project, court told Province is battling opponents in court who say approval broke the la	CBC24	2015
Site C dam could create lucrative real estate market, says B.C. Realtor Aman Brah says the population of Fort St. John is expected to double as workers flock to city	CBC25	2015
Site C labour deal promises labour stability for megaproject During the peak of construction, the dam will need about 1,700 workers	CBC26	2015
Site C construction project for \$9-billion dam approved by B.C. government Two dozen permits issued, even though lawsuits against the hydroelectric project are before the courts	CBC27	2015
Farmland under pressure with development of Site C, LNG: former Agricultural Land Commission chair' Huge pressure put on those lands particularly in the northeast with LNG and oil,' says Richard Bullock	CBC28	2015
B.C. First Nations lawyer says Crown didn't consult on specific Site C permits ² First Nations will suffer 'irreparable harm' if old growth forest cleared	CBC29	2015
Work begins on massive work camp for Site C dam Work camp will eventually house 2,200 construction workers	CBC30	2015
Site C work camp construction upsets local residents About 9,000 cubic metres of trees have been logged so far to make room for the work camp	CBC31	2015
BC Hydro set to sign Site C dam construction contract worth \$1.5B Contract is the largest of the controversial \$8.3-billion project	CBC32	2015
Do review on Site C, says joint panel chief	TCT21	2015
B.C. asserts authority for Site C dam approval; Province claims right to ignore environmental recommendations	TCT22	2015
Hydro reveals offers to First Nations; Big money: Land, \$6.5 million up front to 'accommodate residual impacts' of Site C on First Nations opposed to it	VCS44	2015
Legal actions could still delay Site C dam construction	TCT23	2015
Contaminated fish brought to legislature as First Nation warning about Site C dam	TCT24	2015

News coverage for Site C project	ID S-	Year
Peace landowners fight Site C decision	TCT25	2015
First Nations lawyer slams lack of Site C consultation	VCS45	2015
Site C stop-work order denied, courts dismiss judicial review; First Nations argued they weren't properly consulted on permits for \$9-billion project	TCT26	2015
Liberals love to talk about Site C dam	TCT27	2015
Site C lodge to house 1,600 workers; The 'comforts of home' will include a movie theatre, gym, and licensed lounge	VCS46	2015
First Nations fighting for more than just Site C; B.C. Supreme Court: Contentious dam also a symptom of a larger problem	VCS47	2015
NDP pledges energy retrofits, second thoughts on Site C	VCS48	2015
Province slammed for site C leap; Critics maintain mega-dam future	TCT28	2015
Pictures tell tale of Site C work; Forest gives way to cleared area as dam work proceeds	VCS49	2015
B.C. Hydro signs \$1.75B Site C deal; Consortium to build components; at peak, 1,500 to be employed	TCT29	2015
B.C. Site C dam protesters dig in and prepare for arrest Long-time former politician Arthur Hadland among those arrested at the work site	CBC33	2016
Site C dam protest joined by David Suzuki Members of Treaty 8 First Nations have been camped out in the Peace Valley since New Year's Eve	CBC34	2016
BC Hydro seeks injunction against Site C dam project protesters Protesters say they're 'shocked' as they were expecting to negotiate with BC Hydro	CBC35	2016
Site C dam impact mitigated by BC Hydro-Fort St. John agreement Fort St. John gets new housing, a police officer and \$1M per year according to the agreement	CBC36	2016
BC Hydro seeks injunction against Site C protesters David Suzuki, Grand Chief Stewart Phillip rally in opposition to controversial project	CBC37	2016
Site C job fairs draw thousands from B.C., Alberta More than 1,000 people lined up in Prince George alone, as job fairs rolled out in B.C. towns	CBC38	2016
Ruling on Site C protest camp expected today Site C protesters, who set up the camp in late December, say they don't intend to break any laws	CBC39	2016
BC Hydro granted injunction against Site C protesters Site C protesters set up camp in December preventing workers from clearing land slated for dam construction	CBC40	2016
Site C protesters end blockade Local farmer says protesters are crying and emotional but packing up "as law abiding citizens"	CBC41	2016
First Nations-led environmental assessment needed for B.C. projects like Site C, says coalition Another environmental assessment means projects may have 3 tests -- provincial, federal and First Nations	CBC42	2016
Site C dam: landowners back in court The Peace Valley Landowners Association is challenging the province's approval of the \$8.8 billion project	CBC43	2016
Site C protesters to dismantle camp outside Vancouver BC Hydro office Camp in place since mid March, will be taken down by Monday, May 9, 2016	CBC44	2016

News coverage for Site C project	ID S-	Year
BC Hydro acknowledges dark past of W.A.C. Bennett dam in new exhibit One First Nations chief says BC Hydro is about to repeat the mistakes of the past with Site C	CBC45	2016
Vancouver protest of Site C dam at Vanier Park Hundreds 'grab a paddle' at Vanier Park to oppose energy project and raise money for court challenges	CBC46	2016
Unmasked: The face of Anonymous activist shot dead by RCMP James McIntyre a 'gentle, innocent' who loved model trains, concerned by Site C	CBC47	2016
Federal approval for Site C dam draws criticism from First Nations, advocacy groups Project would create an 83-kilometre reservoir and is the subject of multiple legal challenges	CBC48	2016
B.C. Hydro CEO refuses to halt Site C, says Amnesty report wrong B.C. Hydro president Jessica McDonald says some First Nations groups approve Site C	CBC49	2016
B.C. First Nations Site C dam challenge plays out in Federal Court in Montreal Hearing one of several lawsuits against the \$8.8 billion dam	CBC50	2016
Site C worker lodge ready to house 1,600 employees in Fort St. John New \$470-million building features movie theatre, spiritual centre, convenience store, gym	CBC51	2016
N.W.T. Dene leaders call for halt to B.C.'s Site C dam construction Water flowing from the dam area into Dene territory protected under agreements, says Bill Erasmus	CBC52	2016
Landowners fight Site C deadline from BC Hydro Earlier this month, Ken and Arlene Boon received a letter from BC Hydro telling them time is running out	CBC53	2016
First Nations challenge of Site C permits denied by B.C. Supreme Court First Nations behind challenge have 3 more pending	CBC54	2016
Site C dam an 'outdated solution,' says ex-premier More economical, less disruptive alternatives to B.C. Hydro's energy project available, says Mike Harcourt	CBC55	2016
Site C dam project forces expropriation of B.C. family farm this spring Ken and Arlene Boon, who have been high-profile critics of the dam for years, signed an agreement last week	CBC56	2016
Hydro orders protesters off Site C dam logging site	TCT30	2016
Site C dam protesters prepare for arrests	TCT31	2016
Government takes dangerous road on Site C	TCT32	2016
B.C. Hydro seeks injunction against Site C dam protesters	TCT33	2016
B.C. Hydro can remove protesters at Site C	TCT34	2016
Protesters target Liberal meeting; Opponents of Site C dam want federal government to halt \$9-billion project	TCT35	2016
Site C protesters to dismantle camp outside B.C. Hydro office; Fight against dam will continue, spokeswoman says	TCT36	2016
Royal Society, academics want Site C dam project to be halted	TCT37	2016
Site C dam work should be halted, academics say	VCS50	2016
Protesters undeterred by start of Site C dam; Opponents scorn river closure signs as they await several appeal rulings	VCS51	2016

News coverage for Site C project	ID S-	Year
NDP government would give site C another look; Clark setting up taxpayers for '70year contract for a flip phone'	VCS52	2016
Site C Development Remains Dam Risky; Liberal 'point-of-no-return' plans encountering shaky ground	VCS53	2016
Site C clears hurdles; Ottawa issues crucial permits at last minute for dam project	VCS54	2016
Site-C approval sparks outrage	TCT38	2016
Construction of Site C on time and on budget; First year has been smooth for the project, writes Chris O'Riley	VCS55	2016
The construction of Site C dam must stop; Rights of indigenous peoples must be respected	VCS56	2016
First Nations' Site C dam resistance playing out in Quebec court	TCT39	2016
Indigenous MP breaks ranks on Site C dam	TCT40	2016
Auditor-general's work won't help site C critics; Office will not have a full report finished before provincial election	VCS57	2016
Local businesses slow to see benefits from Site C project	VCS58	2016
Site c's prospects have minister full of energy; Bennett says it's the right thing - but will it be a sure thing?	VCS59	2016
Site C comes with too many costs and too few benefits; It's a recipe for destruction, write Stewart Phillip and Ben Parfitt	VCS60	2016
Site C too far advanced to put a halt on it now; Tour of the massive site reveals that work is well underway for 2024 opening	VCS61	2016
Annual Amnesty International campaign targets Site C dam	VCS62	2016
Home to be expropriated for Site C dam; Family opposed to project must vacate house by May 31: B.C. Hydro president	TCT41	2016
Site C ruling shows Canadian courts don't take reconciliation seriously, says law professor Government doesn't need to determine if projects infringe treaty rights	CBC57	2017
Worried about downstream impacts, Northern leaders urge action on Site C dam'Site-C is just increasing the damages that have already been done on the river system,' says Francois Paulett	CBC58	2017
Site C dam project has become 'uneconomic' and should be suspended: UBC report Analysis says project is no longer going to benefit the provincial economy as once expected	CBC59	2017
Site C petition delivers 120K signatures asking feds to halt dam construction A coalition of groups opposed to dam want immediate stop to hydroelectric project	CBC60	2017
B.C. election could determine if ranchers get to keep home or lose it to highway Ken and Arlene Boon's farmland is in the way of a contentious election issue: the Site C dam	CBC61	2017
John Horgan calls on BC Hydro not to finalize Site C contracts The NDP leader wrote a letter to its CEO expressing concern about expropriating people's homes	CBC62	2017

News coverage for Site C project	ID S-	Year
Christy Clark gives opposition 4 days to provide input on Site C dam	CBC63	2017
Government advises Site C delays could cost ratepayers \$600 million		
1 year delay of Site C dam project would cost \$630 million says BC Hydro	CBC64	2017
NDP wants to send the project to the province's utilities commission to review its economic viability		
Site C highway will destroy gravesite, sweat lodge say First Nations West	CBC65	2017
Moberly First Nation Chief Roland Willson wants Hydro to use alternate route		
Supreme Court of Canada refuses to hear B.C. First Nations' Site C dam appeal	CBC66	2017
Prophet River and West Moberly First Nations argued approval of project violated treaty rights		
B.C. asks utilities commission to review \$8.8-billion Site C dam mega project	CBC67	2017
Commission asked to confirm if BC Hydro on target to complete project on budget and by 2024		
United Nations panel calls for halt of B.C.'s Site C dam The recommendation comes 3 weeks after British Columbia's NDP government requested a review	CBC68	2017
Cheaper to cancel Site C dam than delay B.C. megaproject until 2025, report says More than 2,400 people are employed by the project; construction continues while review is underway	CBC69	2017
B.C. Utilities Commission needs more info from Hydro to complete Site C review Preliminary report can't say if hydroelectric dam is on track to meet its \$8.3B budget	CBC70	2017
Scrapping Site C and developing wind and solar could save billions, analyst says B.C. doesn't need all Site C's power, other options cheaper, export market will not materialize	CBC71	2017
Alternative energy sources as good or better than Site C dam, report finds - British Columbia	CBC72	2017
Q&A: Green Leader Andrew Weaver on utilities commission report and the future of Site C - British Columbia	CBC73	2017
B.C. grapples with future of Site C, as Premier Horgan sends ministers north - British Columbia	CBC74	2017
B.C. Utilities Commission admits mistakes in Site C report but says conclusions still valid - British Columbia	CBC75	2017
West Moberly, Prophet River First Nations warn Site C approval could lead to billion dollar treaty violation - British Columbia	CBC76	2017
Indigenous groups in Alberta, N.W.T. say they've borne 'enormous costs' from B.C. dams, call for end to Site C - British Columbia	CBC77	2017
After decades of division, those closest to Site C are tired of the fight - British Columbia	CBC78	2017
Group says Site C approval will have 'grave consequences' for NDP - British Columbia	CBC79	2017
John Horgan's Site C choice a political loss, but a win may not have been possible - British Columbia	CBC80	2017

News coverage for Site C project	ID S-	Year
A reconciliation fail': B.C. First Nations promise court action over NDP's approval of Site C - British Columbia	CBC81	2017
Not the outcome I would have liked': B.C. energy minister addresses broken Site C promises - British Columbia	CBC82	2017
Site C approval a 'Christmas present' says McLeod Lake Indian Band chief - British Columbia	CBC83	2017
Andrew Weaver defends Green Party's choices on Site C - British Columbia	CBC84	2017
Point of no return looming at site c dam; Even new ruling party might conclude there's no turning back	VCS63	2017
Site C dam public relations controlled from top	TCT42	2017
BC Hydro to pay \$1 million to Site C dam municipality	TCT43	2017
Federal court dismisses Site C dam challenge	TCT44	2017
Court denies First Nations 'veto' on Site C; Ruling likely to be appealed to the Supreme Court of Canada	VCS64	2017
Examining the facts; Court vindications of Site C set the record straight, Caroline Elliott writes	VCS65	2017
SFU's Site C critic says the work should go on; Dam was a bad idea, but it's cheaper to finish it than scrap it, Shaffer says	VCS66	2017
Site C is not past the point of no return; If this is the wrong project, now is the time to alter course, writes Eoin Finn	VCS67	2017
Job count is critical at Site C dam	TCT45	2017
Take no pride in Site C job numbers	TCT46	2017
Site C megaproject rouses campaign debate	TCT47	2017
Horgan tells B.C. Hydro: Don't sign new pacts; Site C dam project faces political hurdles	TCT48	2017
Leaders battle over fate of Site C dam project; Premier Christy Clark says suspending evictions brings risk of \$600M cost jump	TCT49	2017
If Haste Makes Waste, Rushing Review Is Risky; A snap judgment on Site C project may please the Greens, but is it best for B.C.?	VCS68	2017
It's Not The Right Time To Boot Site C Residents; Hydro would have been wise to push for more leeway in construction plans	VCS69	2017
Time to cut our losses and stop Site C; The experts agree the business case just isn't there, Mike Harcourt writes	VCS70	2017
Site C Project Passes Latest Legal Challenge; B.C. Hydro's actions in consulting with First Nations upheld by court	VCS71	2017
Site C future uncertain after call for project review	TCT50	2017
Site C options: Continue, cancel or pause project; B.C. Utilities Commission to focus on economics in NDP-requested review	VCS72	2017
NDP Leaves All Options Open On Site C Project; Mothballing dam the middle ground would be a shrewd political move	VCS73	2017
Site c submissions must be relevant and polite; Review panel guidelines indicate both narrow scope and very tight timelines	VCS74	2017
United Nations panel calls for halt of Site C dam project	TCT51	2017

News coverage for Site C project	ID S-	Year
Scrapping Site C dam project would cost \$7.3 billion: Hydro	TCT52	2017
Strong Case For Site C; B.C. Hydro submits a 900-page defence with arguments for \$8.4-billion mega dam	VCS75	2017
Indigenous people need place around Site C table: new report	TCT53	2017
Reports of lost Site C farmland simply not true; River will be deeper, but not much wider; small part of flood area used for crops	TCT54	2017
A Peace River trust could offset Site C impact; Benefits to the region would be long term, say Marvin Shaffer and John Richards	VCS76	2017
Site C faces legal battles: premier	TCT55	2017
Lose-Lose A Possibility In NDP Site C Decision; Economic, fiscal, political challenges in play as government weighs options	VCS77	2017
Site C running over budget: BCUC; Regulator's 299-page report questions dam timeline, Hydro's forecasts	VCS78	2017
B.C. shouldn't double down on Site C mistakes; Pricey decision could soon cost more, Roland Willson and Lynette Tsakoza write	VCS79	2017
Site C benefits workers and communities	TCT56	2017
Province OKs Site C project; opponents gird for battle	TCT57	2017
Making the best decision on Site C for the people; Choice not made lightly, writes Premier John Horgan	VCS80	2017
NDP unhappy, but will make best of tough call on Site C; Horgan says task now is to hit budget and make use of electricity to 'do more'	VCS81	2017
Site C decision ignores indigenous Canadians; Environment also harmed, write David Schindler and Faisal Moola	VCS82	2017
West Moberly and Prophet River First Nations file court claim to stop Site C	CBC85	2018
Work on Site C suspended prior to First Nations lawsuit	CBC86	2018
B.C. Supreme Court to decide whether to stop Site C dam work	CBC87	2018
Injunction application hearing pitting treaty rights against Site C wraps in Vancouver	CBC88	2018
First Nations 'deeply frustrated' after B.C. Supreme Court dismisses Site C injunction	CBC89	2018
Anti-Site C NDPers vow to continue fight; Bid by 'progressive political and social activists' to have party council reopen dam debate defeated	VCS83	2018
Lawsuit tests our commitment to treaty rights; Governments must respect challenge to Site C dam, Shin Imai and Sheryl Lightfoot say	VCS84	2018
Site C behind schedule, troubled: expert	TCT58	2018
First Nations seek court injunction to halt Site C	TCT59	2018
Site C Dam Is Still Far From Point Of No Return; Courts may still have the final say, Alex Neve and Sarah Morales write	VCS85	2018
UN committee warns that Site C dam may violate Indigenous rights agreement	CBC90	2019
Site C dam could still be cancelled at '11th hour' if First Nations successful in court	CBC91	2019
First Nations renew legal fight against Site C dam after talks end with B.C. government	CBC92	2019

News coverage for Site C project	ID S-	Year
UN group says Site C project is breaking international agreements	TCT60	2019
Parallel Tracks On Site C Legal Conflict; NDP and First Nations ready for trial, but in the meantime are willing to talk	VCS86	2019
Expensive Site C Dam Litigation Continues; B.C. NDP is presiding over a 'self induced catastrophe,' says West Moberly chief	VCS87	2019
UBCIC, Fort St. John city councillors call for shutdown of Site C project during COVID-19	CBC93	2020
Number of workers at B.C.'s Site C dam project rises, as some call for shutdown over COVID-19	CBC94	2020
Site C budget, schedule facing 'serious concerns' due to COVID-19, BC Hydro reports	CBC95	2020
Prophet River First Nation pulls out of lawsuit over Site C dam in northeastern B.C.	CBC96	2020
2nd Site C worker tests positive for COVID-19, BC Hydro says	CBC97	2020
B.C. government must halt Site C dam project to review cost and geotechnical risks, open letter says	CBC98	2020

Table S11. Actors found during the news paper analysis.

Actors	Keeyask	Site C
<i>Affected people</i>		
Indigenous groups	Nisichawayasihk Cree Nation; Tataskweyak Cree Nation; Band councillor York Factory; Grand chief Northern Manitoba; Manitoba Metis Federation	Blueberry River FN, Doig River FN councillor; Doig River FN Chief; Mikesew Cree Chief; West Moberly Chief; Saulneau FN; Prophet River FN Chief; Tribal Chief of the Treaty 8 First Nations; Union of B.C. Indian Chiefs
Non-Indigenous	Graham Lane (Former PUB chair and now head of Manitoba Forward)	Farmers Arlene and Keen Boon NGOs: David Suzuki from David Suzuki Foundation; Peace River Association; Amnesty International
<i>Decision-maker</i>		
Proponent	Manitoba Hydro CEO, president, or spokesperson	BC Hydro CEO and Spokesperson
Public	Public Utility Board (PUB) Spokesperson Canadian Taxpayers Federation Director or Spokesperson	
Politicians and Ministers	Energy Minister Dave Chomiak; Aboriginal Affairs Minister John Duncan; Crown Services Minister Ron Schuler	Minister of Energy and Mines Blair Lekstrom; Minister of Energy and Mines Dan Miller former Energy Minister Richard Neufeld; Environment Minister Mary Polak; Environment Minister Leona Aglukkaq; Fisheries Minister Dominic Leblanc; Energy Minister Michelle Mungall; Robert-Falcon Ouellette (Member of Parliament)
Premier	Greg Selinger (New Democratic Party, 2009-2016); Brian Pallister (2016-current)	Gordon Campbell (Liberal – 2001-2011); Christy Clark (Liberal– 2011-2017); John Horgan (New Democratic Party – 2017 - current)

Table S12. Proportional distribution of themes in news articles per year for Keeyask project.

	Affected people				Decisionmakers			
	CD	PE	CEDL	SE	CD	PE	CEDL	SE
2008	-	-	-	-	-	-	-	2%
2009	-	-	-	2%	-	-	-	-
2010	-	-	-	-	-	-	-	-
2011	-	-	-	-	-	-	-	-
2012	7%	-	-	-	4%	-	-	-
2013	2%	-	2%	2%	2%	-	-	4%
2014	4%	2%	2%	4%	-	-	-	2%
2015	-	-	-	-	-	-	-	4%
2016	-	-	-	2%	-	-	-	-
2017	-	-	-	2%	-	-	-	-
2018	9%	16%	11%	-	16%	13%	2%	-
2019	2%	4%	7%	-	2%	-	2%	-
2020	9%	7%	-	2%	-	-	-	-

Proportion is calculated as the rate of number of news covering that theme by total number of news articles for the project. CD: conflicts and disputes. PE: psychosocial effects. CEDL: cumulative effects on daily life. SE: socioeconomics.

Table S13. Proportional distribution of themes in news articles per year for Site C project.

	Affected people				Decisionmakers			
	CD	PE	CEDL	SE	CD	PE	CEDL	SE
2004	1%	-	-	-	-	-	-	-
2008	1%	-	-	2%	1%	-	-	-
2009	1%	1%	-	2%	-	-	-	-
2010	1%	2%	1%	2%	2%	-	-	2%
2011	1%	1%	-	-	-	-	-	-
2012	1%	-	1%	4%	1%	-	-	1%
2013	4%	3%	1%	2%	-	1%	2%	3%
2014	6%	2%	3%	7%	4%	-	-	3%
2015	5%	1%	-	4%	3%	-	-	3%
2016	13%	3%	3%	9%	6%	-	1%	2%
2017	8%	6%	5%	2-	5%	5%	2%	2%
2018	4%	1%	2%	-	3%	-	-	-
2019	2%	1%	1%	-	2%	-	-	-
2020	1%	-	-	2%	-	-	-	-

Proportion is calculated as the rate of number of news covering that theme by total number of news articles for the project. CD: conflicts and disputes. PE: psychosocial effects. CEDL: cumulative effects on daily life. SE: socioeconomics.

Table S14. Comparison of social impacts from CBIA and news coverage for Keeyask and Site C projects

CBIA	News media
Socioeconomics	
Future of their children in accessing jobs, training, better housing, cultural programs, and other opportunities	Cheap electricity, Provincial economic benefits, economic reconciliation with Indigenous groups, employment
Unequal opportunities for Indigenous people; high unemployment and turnover rates; previous developments did not contribute to wealth distribution; youth leaving school to access jobs within the industry; high poverty rates among communities; a sense of exchanging economic gains for environmental degradation; lack of choice in signing the agreement, negative effects on the traditional economy of hunting, fishing, and trapping	Expenses with consultation and lawsuits; overrun costs, political debates about economics, lack of choice in signing the agreement;
Disputes and chronic issues	
Consultation, infringement of rights, environmental degradation	Court cases, protests, and problems with consultation, and environmental degradation
Psychosocial effects	
Anger at the proponent, physical and mental pain when seeing dam landscape impacts, fear about changes in the region or of a dam collapse, concerns about increases in drug consumption, past negative experiences with the project proponent, feeling forgotten, sad, stressed, and hopeless.	Frustration, disappointment, concerns, anger, fear
Hopes to improve the relationship with Manitoba Hydro and heal from past social effects and traumas	Hopes associated with socioeconomic benefits
Cumulative effects on daily life	
Discrimination, sexual harassment, increasing access to drugs and other illicit substances, future loss of livelihoods with reservoir flooding, culture, loss of language, desecration of burial sites, influx of non-local populations	Localized situations within workcamp (Keeyask), increase in rental prices, displacement of farmers (Site C) and future loss of livelihoods. Quality of workcamps

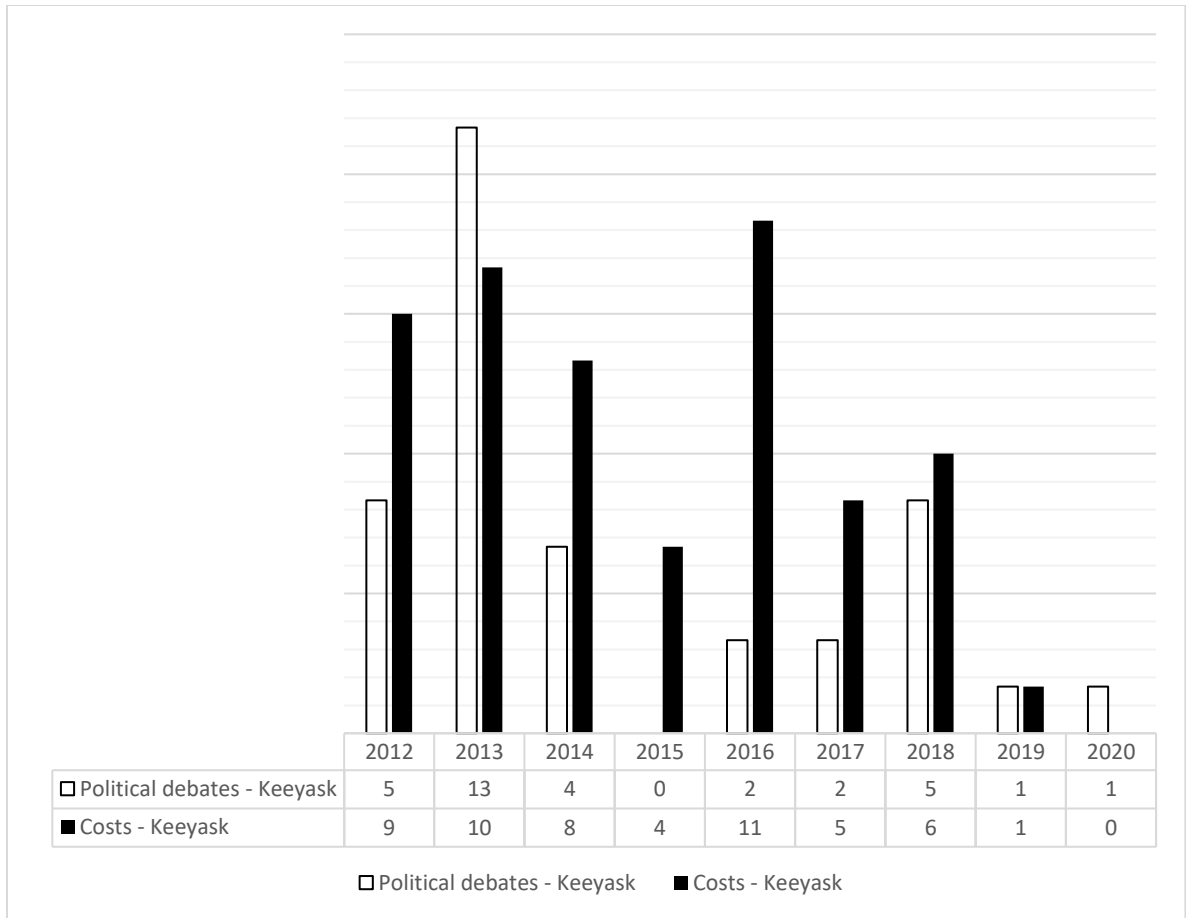


Figure S1. Number of news media articles covering political debates and costs associated with Keeyask project.

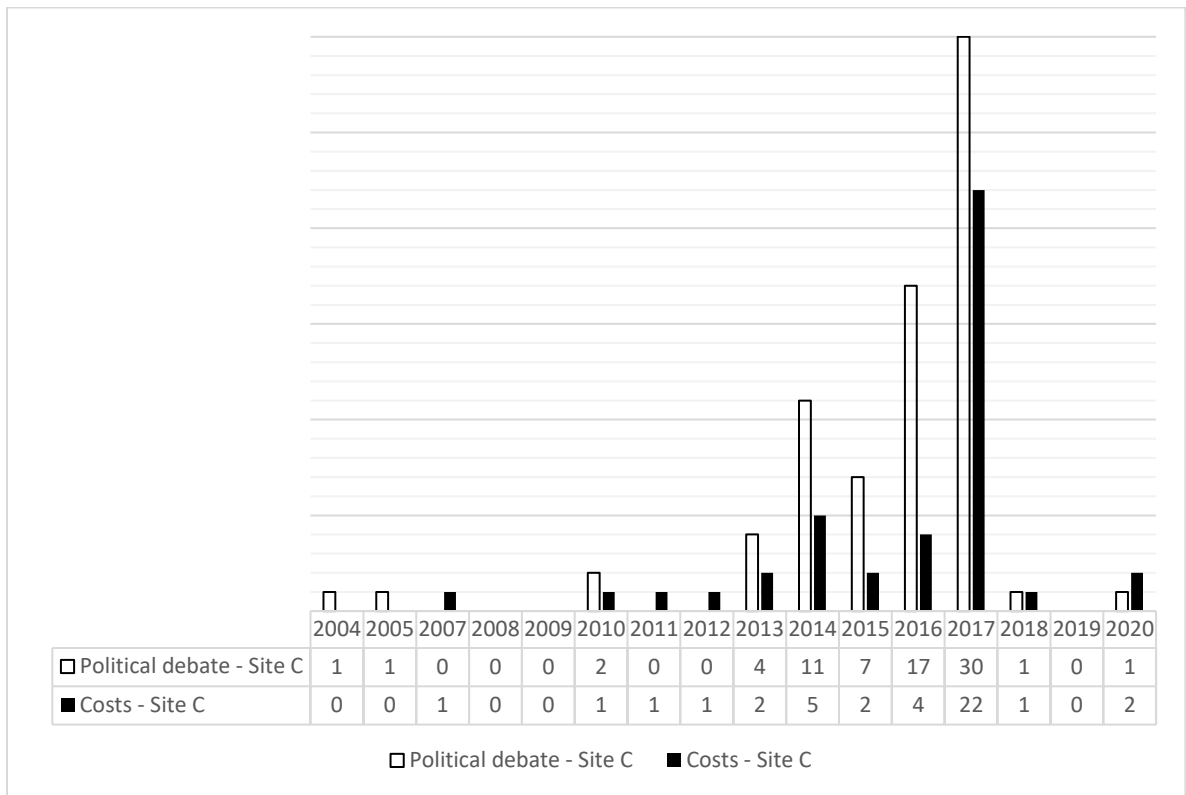


Figure S2. Number of news media articles covering political debates and costs associated with Site C project

Publishing Agreement

Do methods used in social impact assessment adequately capture impacts? An exploration of the research-practice gap using hydroelectricity in Canada

Corresponding author	Mr. Gardenio Diogo Pimentel da Silva
E-mail address	gardenio@dal.ca
Journal	Energy Research & Social Science
Article number	102188
Our reference	ERSS_102188
PII	S2214-6296(21)00281-4

Your Status

- I am one author signing on behalf of all co-authors of the manuscript
- I am signing on behalf of the corresponding author.
 - **Name/Job title/Company:** Gardenio Pimentel da Silva, graduate student, Dalhousie University
 - **E-mail address:** gardenio@dal.ca

Assignment of Copyright

I hereby assign to Elsevier Ltd the copyright in the manuscript identified above (where Crown Copyright is asserted, authors agree to grant an exclusive publishing and distribution license) and any tables, illustrations or other material submitted for publication as part of the manuscript (the "Article"). This assignment of rights means that I have granted to Elsevier Ltd, the exclusive right to publish and reproduce the Article, or any part of the Article, in print, electronic and all other media (whether now known or later developed), in any form, in all languages, throughout the world, for the full term of copyright, and the right to license others to do the same, effective when the Article is accepted for publication. This includes the right to enforce the rights granted hereunder against third parties.

Supplemental Materials

"Supplemental Materials" shall mean materials published as a supplemental part of the Article, including but not limited to graphical, illustrative, video and audio material.

With respect to any Supplemental Materials that I submit, Elsevier Ltd shall have a perpetual worldwide, non-exclusive right and license to publish, extract, reformat, adapt, build upon, index, redistribute, link to and otherwise use all or any part of the Supplemental Materials in all forms and media (whether now known or later developed), and to permit others to do so.

Research Data

"Research Data" shall mean the result of observations or experimentation that validate research findings and that are published separate to the Article, which can include but are not limited to raw data, processed data, software, algorithms, protocols, and methods.

With respect to any Research Data that I wish to make accessible on a site or through a service of Elsevier Ltd, Elsevier Ltd shall have a perpetual worldwide, non-exclusive right and license to publish, extract, reformat, adapt, build upon, index, redistribute, link to and otherwise use all or any part of the Research Data in all forms and media (whether now known or later developed) and

to permit others to do so. Where I have selected a specific end user license under which the Research Data is to be made available on a site or through a service, the publisher shall apply that end user license to the Research Data on that site or service.

Reversion of rights

Articles may sometimes be accepted for publication but later rejected in the publication process, even in some cases after public posting in "Articles in Press" form, in which case all rights will revert to the author (see <https://www.elsevier.com/about/our-business/policies/article-withdrawal>).

Revisions and Addenda

I understand that no revisions, additional terms or addenda to this Journal Publishing Agreement can be accepted without Elsevier Ltd's express written consent. I understand that this Journal Publishing Agreement supersedes any previous agreements I have entered into with Elsevier Ltd in relation to the Article from the date hereof.

Author Rights for Scholarly Purposes

I understand that I retain or am hereby granted (without the need to obtain further permission) the Author Rights (see description below), and that no rights in patents, trademarks or other intellectual property rights are transferred to Elsevier Ltd.

The Author Rights include the right to use the [Preprint](#), [Accepted Manuscript](#) and the [Published Journal Article](#) for [Personal Use](#) and [Internal Institutional Use](#). They also include the right to use these different versions of the Article for [Scholarly Sharing](#) purposes, which include sharing:

- the Preprint on any website or repository at any time;
- the Accepted Manuscript on certain websites and usually after an embargo period;
- the Published Journal Article only privately on certain websites, unless otherwise agreed by Elsevier Ltd.

In the case of the Accepted Manuscript and the Published Journal Article the Author Rights exclude Commercial Use (unless expressly agreed in writing by Elsevier Ltd), other than use by the author in a subsequent compilation of the author's works or to extend the Article to book length form or re-use by the author of portions or excerpts in other works (with full acknowledgment of the original publication of the Article).

Author Representations / Ethics and Disclosure / Sanctions

I affirm the Author Representations noted below, and confirm that I have reviewed and complied with the relevant Instructions to Authors, Ethics in Publishing policy, Declarations of Interest disclosure and information for authors from countries affected by sanctions (Iran, Cuba, or Syria). Please note that some journals may require that all co-authors sign and submit Declarations of Interest disclosure forms. I am also aware of the publisher's policies with respect to retractions and withdrawal (<https://www.elsevier.com/about/our-business/policies/article-withdrawal>).

For further information see the publishing ethics page at <https://www.elsevier.com/about/our-business/policies/publishing-ethics> and the journal home page. For further information on sanctions, see <https://www.elsevier.com/about/our-business/policies/trade-sanctions>

Author representations

- The Article I have submitted to the journal for review is original, has been written by the stated authors and has not been previously published.
- The Article was not submitted for review to another journal while under review by this journal and will not be submitted to any other journal.
- The Article and the Supplemental Materials do not infringe any copyright, violate any other intellectual property, privacy or other rights of any person or entity, or contain any libellous or other unlawful matter.
- I have obtained written permission from copyright owners for any excerpts from copyrighted works that are included and have credited the sources in the Article or the Supplemental Materials.
- Except as expressly set out in this Journal Publishing Agreement, the Article is not subject to any prior rights or licenses.
- If I and/or any of my co-authors reside in Iran, Cuba, or Syria, the Article has been prepared in a personal, academic or research capacity and not as an official representative or otherwise on behalf of the relevant government or institution.
- If I am using any personal details or images of patients, research subjects or other individuals, I have obtained all consents required by applicable law and complied with the publisher's policies relating to the use of such images or personal information. See <https://www.elsevier.com/about/our-business/policies/patient-consent> for further information.
- Any software contained in the Supplemental Materials is free from viruses, contaminants or worms.
- If the Article or any of the Supplemental Materials were prepared jointly with other authors, I have informed the co-author(s) of the terms of this Journal Publishing Agreement and that I am signing on their behalf as their agent, and I am authorized to do so.

Governing Law and Jurisdiction

This Agreement will be governed by and construed in accordance with the laws of the country or state of Elsevier Ltd ("the Governing State"), without regard to conflict of law principles, and the parties irrevocably consent to the exclusive jurisdiction of the courts of the Governing State.

For information on the publisher's copyright and access policies, please see <http://www.elsevier.com/copyright>. For more information about the definitions relating to this agreement click [here](#).

I have read and agree to the terms of the Journal Publishing Agreement.