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Consideration of climate change mitigation in Canadian environmental assessment: intention and implementation

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ABSTRACT

Quantifying a proposed project's greenhouse gas (GHG) emissions and scrutinizing their effect on climate change are increasingly required in Canadian environmental assessment (EA) processes. This paper investigates to what degree an EA authority's intention for the inclusion of GHG considerations has resulted in implementation into environmental impact statements (EISs) by proponents and how these considerations influence the achievement of GHG reduction targets. Fifteen projects across five Canadian jurisdictions were reviewed. The examination revealed that well-developed intentions by EA authorities did not necessarily result in proponents following guidelines for GHG consideration in their EISs due to the absence of regulation or clearly defined policies. Conversely, even though intentions by an EA authority are underdeveloped in some jurisdictions, EISs sometimes exhibited thorough GHG assessments due to mechanisms in the EA process through which GHG consideration by the proponent could be compelled. The examination did not reveal how GHG consideration in EA currently assists in meeting reduction targets. A GHG emissions limit imposed during the EA process could link EA to success in meeting these targets.

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Climate change; GHG emissions; environmental impact assessment; EA; EIS; Canada; mitigation; reduction targets

Introduction

Climate change is the biggest and most complex environmental issue of the modern era (Dryzek et al. 2011). How, and to what degree, the challenges of climate change should be approached is constantly being debated and discussed by policymakers, environmental organizations, and climate experts (Tompkins and Adger 2005). Global-scale policies, even after adoption, go through cycles of revision and refinement, such as global action plans like the Kyoto Protocol of 1997 (UNFCCC 1998).

As extreme weather events increase in frequency, so does the need for proactively dealing with the realities of a changing climate at a project development level (MacDougall and Valley 2017) and incorporating the consideration of climate change is progressively manifesting in environmental assessment (EA) regimes. Canada, both federally and provincially, is no exception to this trend, with the consideration of climate change becoming more and more prevalent in the EA process. The question remains, however, to what degree the consideration of climate change in the EA process influences the achievement of climate change goals.

Climate change mitigation refers to reducing the amount of heat-trapping greenhouse gases (GHGs) released into the Earth's atmosphere (Shaftel 2017). More precisely, climate change mitigation is a 'human

intervention to reduce the sources or enhance the sinks of greenhouse gases' (IPCC 2013, p.1458).

Climate change mitigation methods can be described as a hierarchy for selecting mitigation options. The Canadian Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment (FPTCCCEA) and the Institute of Environmental Management & Assessment (IEMA) support the following hierarchy for prioritizing mitigation methods: Avoid > Reduce > Substitute > Compensate (IEMA 2010; Ducros 2016).

In addition, the types of GHG emissions that can be considered are either direct or indirect emissions. ISO 14064, the international standard for GHG accounting and verification, defines direct emissions as those under the control of an organization, such as the burning of fossil fuels for heating or other industrial uses. Indirect emissions are not directly under the control of the organization, but are generated because of the project's activities (Wintergreen and Delaney 2007), such as resource extraction for a plastics manufacturer, or the emissions created by workers travelling to and from a work site.

The purpose of this paper is to examine the consideration of climate change mitigation in EA, including the availability of tools and guidance for Canadian EA practitioners, trends in the consideration of GHG emissions in EAs, and the influence of EA on meeting GHG

reduction targets. This paper will endeavour to answer the following research questions:

- How do the different EA regimes in the chosen jurisdictions compare in terms of integrating climate change mitigation?
- How does the actual consideration of GHGs manifest in EISs in the chosen jurisdictions from 2014 to 2017?
- Do GHG emissions levels have any impact on the project design, acceptability or authorization?
- Will considering GHGs in EA help reach emissions reduction goals?

Methods

A selection of Canadian EA jurisdictions was examined to assess if EA authorities are committed to integrating the consideration of climate change mitigation into the EA process. Additionally, a sample of EISs from each jurisdiction was investigated to determine to what degree that commitment translates into action on the part of project proponents. The

results were then used to answer the research questions.

Steps

Step 1. Selection of five EA jurisdictions in Canada based on the likelihood of finding relevant data.

Five EA jurisdictions in Canada were chosen for their likelihood to have produced data relevant to the research questions of this paper (Figure 1). The selection of EA jurisdictions was restricted to Canada as a case study. Mention of these jurisdictions in academic articles, conference proceedings, newspaper articles, and government reports related to climate change, in addition to the availability of guidance materials for practitioners, helped determine that these jurisdictions would be good candidates for this case study (Lee 2001; Agrawala et al. 2011; Ohsawa and Duinker 2014; Groulx 2016; ECCC 2017). The five chosen EA jurisdictions are: Canada (federal), British Columbia, Ontario, Quebec, and Nova Scotia.

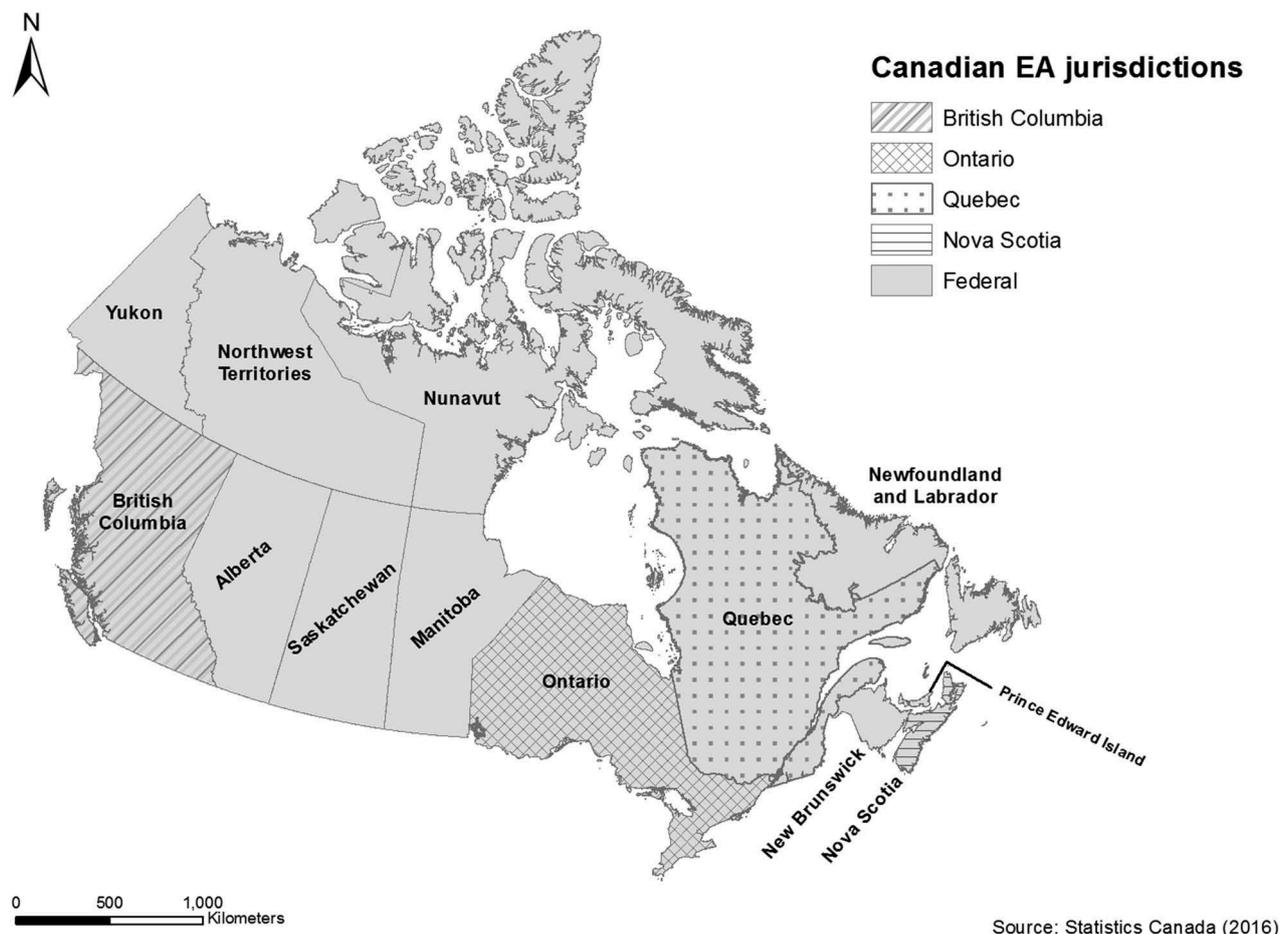


Figure 1. The five EA jurisdictions in Canada chosen for examination to assess if EA authorities are committed to integrating the consideration of climate change mitigation into the EA process: Canada (federal), British Columbia, Ontario, Quebec, and Nova Scotia.

Step 2. Intention: Determination of how developed climate change mitigation consideration is in each of the chosen EA jurisdictions by selecting parameters that characterize the intention of each jurisdiction.

Parameters were chosen to characterize the intention of each EA jurisdiction for the consideration of climate change mitigation. The selection of parameters was based on the Organisation for Economic Co-operation and Development (OECD) concept of commitment levels (Agrawala et al. 2011) and by examining the criteria by which GHG emissions are evaluated in GHG reporting programs. Since GHG emissions can be quantified, the clarity and precision of guidance by the authorizing body will influence the quality of the emissions estimations by proponents. The clearer and more standardized the guidelines are, the more consistent the GHG emissions assessments will be by proponents. Each EA jurisdiction's development of these parameters was determined by their presence or absence in the EA process and guidance documents from the respective authority. The eight parameters selected to characterize the intention for the consideration of climate change mitigation of the chosen EA jurisdictions are listed and described in Table 1.

Step 3. Implementation: Examination of a sample of EISs in the chosen EA jurisdictions over the last four years to determine if the EA authority's intention for GHG consideration was realized.

The purpose of this step is to discover if the intentions and recommendations of the EA authorities resulted in proponents considering climate change mitigation in their assessments. Three EISs per jurisdiction completed during the period of July 2013 to July 2017 were examined to assess if the consideration of GHG emissions was applied. The parameters for characterizing the intention of the EA authorities are shown how they can manifest in an EIS in Table 1. The EISs were examined to determine if these manifestations were present or absent. For EAs that have been completed, an inspection of conditions placed on the project and/or the decision document for the EA gives an indication if GHG emissions were a factor in project approval.

Step 4. Preparation of a table containing presence/absence of the parameters from steps 2 and 3 and analysis of the results to answer the research questions.

A table of combined results is given below (Table 3).

Selection of EISs from each of the chosen EA jurisdictions

Three EISs from each of the chosen EA jurisdictions were analyzed to determine if and how GHG emissions were considered and how they were evaluated by the proponent. Although EISs were chosen based on their submission date from July 2013 to July 2017, not all projects had completed the EA process during

Table 1. Parameters that characterize the intention of an EA authority in the consideration of climate change mitigation and how they can manifest in EISs.

INTENTION Parameters for GHG consideration that characterize the intention of an EA authority	IMPLEMENTATION Manifestation of the parameters for GHG consideration in an EIS
Types of emissions considered (direct/indirect emissions).	Explanation of what types of emissions were considered (direct emissions only, or both direct and indirect emissions), with justification.
Quantification methods (approach, level of detail, and if verification is required).	Specification of quantification method and if GHG emissions estimates have been verified by a third party.
Use of a GHG mitigation hierarchy .	Discussion of how GHG mitigation measures were prioritized.
Thresholds (minimum amount of GHG emissions generated by the project for consideration). Thresholds are typically used in GHG inventory declarations ^a and cap and trade programs ^b . The thresholds in reporting programs capture a desired percentage of total facility emissions. This rationale extended to the EA process would set a threshold that would capture the desired percentage of projects. Examining the effect of the project on GHG reduction targets .	Rationale for considering GHG emissions of the project and/or mention of GHG emissions reporting thresholds for GHG inventories or cap and trade programs.
Entry points for the consideration of GHG emissions (recommended points in the EA process where GHGs can be considered).	Discussion of how the project will affect regional and/or national GHG reduction targets.
Published guidelines for proponents (OECD concept, in the form of documentation or otherwise).	Discussion of how GHG emissions were considered in the following steps of the EA process: scoping, data information collection, analysis of environmental effects, identification of mitigation measures, monitoring and follow-up (FPTCCCEA 2003, p. 14).
Regulations/policies that frame the assessment of GHG emissions in a project (OECD concept, legal or policy basis compelling the consideration of GHGs). This may include Climate Action Plans, GHG reporting requirements, or reduction initiatives that are leveraged for use in the EA process.	Description of jurisdictional (or other) guidance used.
	Description of legislative basis, policies, or plans for considering GHG emissions.

^a Federally, under the GHG Reporting program (<https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/facility-reporting/consultations.html>) and in Quebec under the RDOCECA (http://www.mddelcc.gouv.qc.ca/air/declar_contaminants/index-en.htm), the threshold for reporting is 10 000t CO₂ eq.

^b In Quebec, the threshold for reporting under the *Règlement concernant le système de plafonnement et d'échange de droits d'émission de gaz à effet de serre* (RSPEDÉ) is 25 000 t CO₂ eq. (<http://legisquebec.gouv.qc.ca/fr/ShowDoc/cr/Q-2,%20r.%2046.1>).

this period. Therefore, where available, documentation from the relevant authority (decisions, conditions, directives) was also consulted to see if GHG emissions were considered in the decision-making process. An attempt was made to find similar projects between jurisdictions. However, due to the nature of differing dominant industries, the types of projects subject to EA in each jurisdiction, and being constrained by EISs produced between 2014 to 2017, if similar projects were not found then judgment was used to select projects with expected sources of GHG emissions. The EISs chosen for analysis, along with their principal industry sectors according to the North American Industry Classification System (NAICS) Canada 2017 Version 3.0, are shown in [Table 2](#). An ID was assigned to each EIS and used in the analysis for each jurisdiction.

Results and discussion

The results for the presence or absence of the parameters characterizing the intention by EA authorities and implementation by proponents are shown in [Table 3](#), organized by EA jurisdiction. A list of guidance documents consulted for each jurisdiction is given in [Appendix 1](#). An analysis is presented below for the results of each jurisdiction (with codes CA-1 and BC-2 etc. referring to the first EIS investigated at the federal level and the second from BC, respectively, etc.).

Canada (Federal)

The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment (FPTCCCEA) guide of 2003 references the 2002 *Climate Change Plan for Canada*, in which the federal government states that ‘covenants’ will be used with industrial emitters to achieve GHG emissions reductions. These covenants would also apply to the EA process, and ‘such covenants, targets and/or regulations, should constitute the mitigation required of practitioners subject to these provisions (FPTCCCEA 2003, p. 4).’ The FPTCCCEA guide therefore positions itself as a guide to be used in conjunction with broader climate change policy, which has given it the flexibility to remain in use since its publication in 2003.

Canada has been lauded by the OECD as having made considerable progress in integrating the consideration of climate change in EA, and has identified Canada as having adopted all three levels of the OECD commitment framework (Agrawala et al. 2011; also see [Appendix 2](#) for GHG reduction targets in Canada and [Appendix 3](#) for related EA legislation). This elevated commitment level is reflected in the results for intention; the only absent parameter is recommending a quantification method ([Table 3](#)). It is important to remember that the FPTCCCEA guide

precedes the 2006 Intergovernmental Panel on Climate Change (IPCC) guidelines (IPCC 2015), the Western Climate Initiative (WCI) methods published in 2010 (WCI 2010), and GHG Protocol standard for corporate accounting revised in 2004 (WRI 2004), and would therefore not make mention of any of these methodologies.

A weak aspect of the FPTCCCEA guide, as observed by Ohsawa and Duinker (2014), is the use of undefined thresholds for ‘low’, ‘medium’, and ‘high’ emissions intensity or volume, which leaves it to the proponent to determine what category their project’s emissions may fall into, who may then use this as a justification for not implementing mitigation measures.

The FPTCCCEA guide’s procedural recommendations are structured by entry points in the EA process where GHGs can be addressed. These steps are scoping, data information collection, analysis of environmental effects, identification of mitigation measures, monitoring, and follow-up. According to the FPTCCCEA guide, the consideration of reduction targets should be part of both the scoping and the data information collection steps, where jurisdictional considerations are identified.

The encouraging results for federal engagement regarding climate change are not necessarily reflected in the proponents’ efforts for considering GHG emissions in their EISs. Despite a well-developed intention, it was not always observed that proponents applied this intention to their EIS. Implementation manifested for all the parameters in CA-1; however, five of the eight parameters were addressed in CA-3 and only three of eight of the parameters were addressed in CA-2 ([Table 3](#)). The results also reflect the findings of Ohsawa and Duinker’s (2014) examination of twelve projects subject to federal EA, where the ambiguity in the FPTCCCEA guide regarding thresholds and significance resulted in all the EISs comparing their project’s emissions to provincial and federal GHG inventories. Consequently, all the EISs concluded that the effect of the project on climate change was not significant. Additionally, in absence of defined thresholds in the FPTCCCEA guide, CA-2 and CA-3 referenced GHG inventory reporting thresholds for guidance, illustrating that proponents are willing to make use of thresholds in their assessments.

CA-1, the most recent project and the only project examined under the authority of the CNSC, implemented all the parameters. This is possibly due to the CNSC’s presence on the FPTCCCEA and their efforts in updating the federal guidance for GHG consideration in EA (Ducros 2016).

British Columbia

The EAO’s *Guideline for the Selection of Valued Components and Assessment of Potential Effects of*

Table 2. EISs selected for analysis from five Canadian EA jurisdictions.

ID of EIS	Project name	Industry sector (NAICS CA v.3)	Jurisdiction	Responsible Authority	Date of EIS
CA-1	Near Surface Disposal Facility	Waste treatment and disposal ^a	Federal	Canadian Nuclear Safety Commission (CNSC)	March 2017
CA-2	Blackwater Gold	Mining and quarrying ^b	Federal	Canadian Environmental Assessment Agency (CEAA)	October 2015
CA-3	Côté Gold	Mining and quarrying	Federal	CEAA/(Ontario) Ministry of the Environment, Conservation and Parks (MECP)	May 2014
BC-1	Sukunka Coal Mine	Mining and quarrying	British Columbia	(British Columbia) Environmental Assessment Office (EAO)	March 2017
BC-2	Kootenay West Mine	Mining and quarrying	British Columbia	EAO	August 2015
BC-3	Eagle Mountain-Woodfibre Gas Pipeline	Pipeline transportation ^c	British Columbia	EAO	January 2015
ON-1	Gardner Expressway Reconfiguration	Construction	Ontario	MECP	January 2017
ON-2	Expansion of the Humberstone Landfill	Waste treatment and disposal	Ontario	MECP	June 2015
ON-3	Hammond Reef Gold	Mining and quarrying	Ontario	MECP/CEAA	December 2013
QC-1	Réseau électrique métropolitain (REM)	Construction	Quebec	Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC)	August 2016
QC-2	Expansion of Canadian Malartic Gold Mine and the Deviation of Highway 117	Mining and quarrying	Quebec	MELCC	January 2015
QC-3	North-Shore LNG	Oil and gas extraction ^d	Quebec	MELCC	June 2014
NS-1	Lower Carbon Fuel: Tire Derived Fuel (TDF) System	Non-metallic mineral product manufacturing ^e	Nova Scotia	Nova Scotia Environment (NSE)	March 2017
NS-2	Black Point Quarry	Mining and quarrying	Nova Scotia	NSE	February 2015
NS-3	Bear Head LNG	Oil and gas extraction ^d	Nova Scotia	NSE	2015

^aIndustry under the '56 – Administrative and support, waste management and remediation services sector'.

^bIndustry group under the '21 – Mining, quarrying, and oil and gas extraction' sector.

^cIndustry subsector under the '48-49 – Transportation and warehousing' sector.

^dIndustry subsector under the '21 – Mining, quarrying, and oil and gas extraction' sector. These are multisector projects; this classification was chosen as a major component is natural gas liquefaction installations.

^eIndustry subsector under the '31-33 – Manufacturing' sector. This classification was chosen because although the primary purpose of the project is fuel replacement, it is to be used in cement manufacturing.

Table 3. Results of the intention and implementation analysis (EIS-1, EIS-2, and EIS-3 refer to the three EISs investigated in each jurisdiction, respectively).

Jurisdiction	Parameter	Intention: Developed by EA authority?	Implementation: Manifests in EIS?		
			EIS-1	EIS-2	EIS-3
Canada (CA)	Types of emissions	✓	✓		✓
	Quantification method		✓	✓	✓
	Mitigation hierarchy	✓	✓		
	Thresholds	✓	✓	✓	✓
	Effect on reduction targets	✓	✓		
	Entry points	✓	✓		
	Guidelines	✓	✓		✓
	Regulation/policy	✓	✓	✓	✓
British Columbia (BC)	Types of emissions		✓	✓	✓
	Quantification method		✓	✓	✓
	Mitigation hierarchy		✓	✓	✓
	Thresholds		✓	✓	✓
	Effect on reduction targets	✓	✓	✓	✓
	Entry points	✓	✓	✓	✓
	Guidelines		✓	✓	✓
	Regulation/policy		✓	✓	✓
Ontario (ON)	Types of emissions	✓	✓	✓	
	Quantification method		✓		
	Mitigation hierarchy	✓		✓	
	Thresholds	✓			
	Effect on reduction targets		✓	✓	
	Entry points	✓			
	Guidelines	✓	✓		
	Regulation/policy	✓	✓	✓	
Quebec (QC)	Types of emissions	✓	✓	✓	✓
	Quantification method	✓	✓	✓	✓
	Mitigation hierarchy		✓	✓	
	Thresholds	✓		✓	✓
	Effect on reduction targets	✓	✓	✓	✓
	Entry points	✓	✓	✓	✓
	Guidelines	✓	✓	✓	✓
	Regulation/policy	✓	✓	✓	✓
Nova Scotia (NS)	Types of emissions	✓		✓	✓
	Quantification method	✓	✓	✓	✓
	Mitigation hierarchy	✓			
	Thresholds	✓			✓
	Effect on reduction targets	✓	✓	✓	✓
	Entry points	✓			✓
	Guidelines	✓			✓
	Regulation/policy	✓	✓	✓	✓

2013 states that proponents must review Climate Action Plans during scoping and during the development of the description for existing conditions. This can be interpreted that the proponent must evaluate their project's effect on provincial and federal GHG emissions. Outside of EAO guidance documents, the language is more direct. The EAO states in their document *Expert Panel Review of Federal EA Processes – British Columbia's Submission*, '[a]s required by EAO, proponents must assess their project's greenhouse gas emissions in their application for an EA certificate ... (W)here a project has to [sic] potential to materially impact BC's greenhouse gas (GHG) emissions, EAO will assess the project's effect on greenhouse gas management' (EAO 2016, p. 24).

Despite British Columbia appearing to have a low engagement level based on six of the selected parameters, examination of three EISs showed that these parameters are nonetheless being addressed by proponents (Table 3). One explanation could be that the EAO requires the selection of valued components (VCs), which must be approved by both the

EAO and an advisory working group (EAO 2015). The documentation for both the selection and evaluation of VCs is extremely detailed. If climate change or GHG emissions are chosen as a VC, and the EAO has provided a systematic method to evaluate VCs, it would follow that the EISs examined were found to incorporate all the parameters chosen for this study.

All three EISs examined stated that they consulted the FPTCCCEA guide for assessing GHG emissions.

Also included in the *Expert Panel Review of Federal EA Processes – British Columbia's Submission* is an example of GHG emissions affecting the acceptability of a project: 'The GHG analysis for the substituted EA for the LNG Canada Project led to a finding of significant adverse effects from GHG emissions, and included a condition for a GHG emissions management plan in the provincial EA Certificate, as well as informing the federal Minister's finding and resulting referral to Governor in Council for decision on the Project' (EAO 2016, p. 24).

Ontario

The MECP guide *Consideration of Climate Change in Environmental Assessment in Ontario*, released in a draft version in 2016, notes that it is modelled on the NSE and FPTCCCEA guides. The MECP guide mentions that some projects may also be subject to requirements of the Ontario *Planning Act*, which includes a policy for the consideration of reduced GHG emissions in development. Unlike the guide from the NSE, the MECP guide does not provide clear steps for a proponent to follow; rather, the approaches suggested consist of open-ended questions that a proponent could ask themselves when evaluating their project's GHG emissions.

ON-1 is a road reconfiguration project that includes GHGs in its Social & Health study, along with air quality conditions and noise level, and in an alternatives analysis based on traffic volumes. Opportunities for tree planting and other 'greening' activities are also included in the consideration of alternatives, but not in the context of GHGs (enhancing carbon sinks). Emissions generated from construction activities were not considered. ON-1 is the only Ontario EIS examined that came out after the release of the MECP guide; it is also the EIS which implemented the most parameters (Table 3). ON-1 notes that it took guidance from the Ontario Ministry of Transportation's 2012 document, *Environmental guide for assessing and mitigating the air quality impacts and greenhouse gas emissions of provincial transportation projects*.

ON-2, a landfill project that implemented only a few of the parameters, discusses the feasibility of biogas capture for energy conversion, an activity which could qualify for compliance offset credits under Ontario's cap and trade program.

ON-3 makes no mention anywhere in its EIS of GHGs; combustion emissions are only described in the context of air quality. Climate change is discussed only in the context of the effects of the environment on the project (adaptation). It is worth noting that the owner of the mine in ON-3 was also the proponent of QC-2 before the project changed hands in 2014. The EISs for both projects were produced within a year of each other and differences in the consideration of GHGs between these projects may be attributed to the change in ownership or the more stringent requirements of the project taking place in Quebec.

Quebec

Quebec does not have a guide for proponents for the consideration of climate change in the EA process. However, in published documentation, the *directives sectorielles* (MELCC [date unknown]) were updated in 2016 to require proponents to evaluate their projects' GHG emissions effect on Quebec's GHG inventory,

and to include GHG emissions as a factor in the consideration of alternatives. Internal to the MELCC, the *Direction de l'expertise climatique* (DEC) is consulted on projects where GHG emissions may be a concern, and through their communications in the form of memorandums ('avis'), they provide recommendations to proponents on how GHG emissions should be considered for a given project. These recommendations can compel proponents to perform additional studies, such as in the case of QC-1, which resulted in a report showing the GHG reduction potential of the project.

The guidance provided in the *directives sectorielles* asks proponents to evaluate projects' GHG emissions effect on Quebec's GHG inventory. In Quebec, the requirements for reporting to GHG inventory are determined by provisions in the *Règlement sur la déclaration obligatoire de certaines émissions de contaminants dans l'atmosphère* (RDOCECA). Therefore, proponents in Quebec refer to the RDOCECA for the evaluation of GHG emissions of a project. The RDOCECA includes requirements for types of emissions that must be considered, how emissions must be quantified and thresholds for consideration. The results in Table 3 show that, through the RDOCECA requirements, in addition to the *directives sectorielles* and the recommendations by the DEC, the MELCC has developed almost all the parameters. However, as demonstrated above, the guidance for implementing these parameters is not centralized and requires research and input from different sources.

Despite the seemingly disjointed method for instructing proponents on how to integrate climate change mitigation into their assessments, the EISs examined showed that the process did result in the parameters being reflected in two of the projects. QC-1, which implemented the smallest number of the parameters, is a public transit project that did not provide an assessment of its construction emissions, but did conduct an analysis on how emissions would be reduced based on the replacement of car trips.

QC-2 included both a voluntary compensation plan (tree planting) and a discussion about how the project would not exceed the threshold for the cap and trade program. However, Quebec's cap and trade program does not require the inclusion of a project's mobile emissions (emissions from mobile combustion sources such as vehicles, and certain engines and equipment); mobile emissions constitute the majority of QC-2's emissions, and therefore the project would not be compelled to compensate or offset the bulk of its emissions.

QC-3 included an alternatives analysis with GHG emissions as a factor. Suggestions for including GHG emissions in alternatives analyses have appeared often in recommendations from the DEC prior to being included in the *directives sectorielles*; this illustrates how the DEC helps shape MELCC policy for the consideration of GHG emissions in EA.

Nova Scotia

The NSE published two guides in 2011: a general guide for incorporating climate change into EA, and a more detailed guide with steps for climate change consideration in project development. The latter mentions that its purpose is for, but not limited to, projects subject to the EA process. Further, this guide is applicable to all types of projects and every project should assess their GHG emissions to meet the GHG reductions targets set out in the *Environmental Goals and Sustainable Prosperity Act, 2007*. As a result, the two guides reflect development of all the parameters for characterizing engagement, with detailed steps to follow for including GHG considerations in the EA process.

As with the EAO in British Columbia, the NSE recommends identifying valued environmental components (VECs), but does not specifically mention using GHG emissions or climate change as a VEC. Rather, the NSE recommends examining the effect of climate change on broader categories of VECs (such as fish or fish habitats).

The NSE guides emphasize that a project's GHG emissions should be assessed for their impact and significance as any other environmental effect and provides guidance for steps in the EA process (scoping, information gathering, identifying impacts, and implementing mitigation measures). The project development guide also provides guidance to considering climate change effects on socio-economic sectors, GHG emissions reduction strategies, checklists and templates, and climate change projections. The NSE guides include background information to provide the rationale for their development but mainly comprise concise, actionable information provided in a step-by-step format.

The EISs examined did not all manifest the level of engagement developed by the NSE guides (Table 3). NS-1, a GHG emissions reduction project for an existing cement plant, gave very little detail about its emissions profile and presented its GHG assessment solely in terms of percentage reduction without discussing the effect on Nova Scotia's GHG inventory or its reduction targets. NS-2 provided an analysis of alternatives based on GHG emissions, but only provided the quantification methodology for some of its emissions. NS-3, an LNG project that, by its own estimation, would increase Nova Scotia's total emissions by over 10%, received conditions for the project's approval related to GHGs. The NSE's Terms and Conditions for Environmental Assessment Approval stipulates that the proponent must develop a GHG management plan demonstrating how the best available technology (BAT) for GHG mitigation has been implemented and how the project's emissions compare to similar facilities that are considered 'best-in-class'.

Comparison across jurisdictions

The results revealed that the intentions of EA authorities to include climate change mitigation in projects do not necessarily translate into proponents taking this action while producing an EIS. In absence of regulation compelling proponents to consider GHG emissions in project development, it is up to the EA authorities on a project-by-project basis to determine what level of consideration is acceptable.

In jurisdictions with stronger mechanisms for EA authorities to shape the content and extent of a proponent's analysis, the intent for including climate change mitigation appears to translate more readily into EISs. In places such as British Columbia (where VCs are determined with the approval of the EA authority) and in Quebec (where a dedicated climate change department provides input that compels proponents to justify their choices), the mechanism to encourage the consideration of GHG emissions is 'built in' to the EA process.

The EISs from British Columbia and Quebec had incorporated more of the parameters representing the intention of the EA authority. In the case of British Columbia, which does not have a guide for proponents specifically for the consideration of climate change in EA, all the EISs examined mentioned the use of the FPTCCCEA guide. The British Columbia EISs fared better in implementing the parameters than the federal EISs examined. Therefore, it can be said that a proponent's motivation for considering climate change mitigation in EA does not necessarily come from an EA authority's intention (documented in guidance materials), but from other mechanisms within a jurisdiction's EA process that provides more individual scrutiny of a project (e.g., British Columbia's VC approval system).

A lack of an EA authority's intention leading to consideration of GHG emissions in an EIS can also be seen in Nova Scotia. The NSE has produced two guides to help proponents include climate change mitigation in their project planning, but the clarity and conciseness of these guides did not result in complete GHG assessments in the EISs examined. Both Nova Scotia and Quebec have a high number of parameters developed in their guidance, but it was only in Quebec, which has no specific guide for proponents to integrate climate change considerations, where the translation of the parameters were present in the EISs. This could be due to the mechanisms in the Quebec EA process that allows the EA authority to encourage GHG consideration on an individual project level.

The IEMA acknowledges that there is no agreed upon method of determining the significance of GHG emissions (IEMA and Arup 2017). Thresholds could be a method for determining significance, and thresholds are already used for GHG reporting

requirements outside of the EA process (GHG inventories and cap and trade programs).

In absence of thresholds specific to EA, some proponents in the EISs examined referred to GHG inventory reporting thresholds for guidance (e.g. CA-2, CA-3, QC-2); however, these thresholds were not used to determine significance. Instead, many proponents used a comparison to provincial or national levels to justify that the project's emissions are not significant (e.g. CA-1, CA-2, CA-3, BC-1, NS-2). Therefore, threshold-based significance in GHG reporting programs is neither being used by proponents as measures of significance in EA, and by extension, nor by EA authorities. As GHG inventories are the emissions levels which reduction targets are based on, it should follow that attention should be paid to reporting thresholds for existing projects and extend this attention to projects that will soon be contributing to that inventory.

The results of this case study do not reveal how GHG reduction targets will specifically be met. Some EISs discussed their effect on reduction goals, but paired with the proponent's definition of significance, presented the project's contribution to the provincial or national GHG inventory with percentages and did not provide further discussion or justification. The only project that declared its GHG emissions significant (NS-3, which will generate 10.3% of Nova Scotia's total emissions) also stated that control technologies would be in use for the project and that collaborative work would be undertaken to develop GHG policies for the LNG industry. No mention of compensation was made for this project with 'significant' GHG emissions by the proponent or by the NSE.

Absent from all EISs examined is the maximum quantity of GHGs a project should emit, or any kind of target or threshold for GHG emissions that describes how the project will *help* meet reduction targets, only how it will affect them. Although this quantity is missing from all the EA jurisdictions examined, it does exist outside the EA process. In Quebec, the cap and trade program sets emissions thresholds for projects, however; the program targets projects that are already in operation. This system fractures the management of climate change into two separate phases of the project, planning and operations. This results in dealing with the issue after it has already occurred rather than in a pre-emptive manner. Such a system misses an opportunity to make design changes or alternative technological choices for a planned project. In addition, since compensation measures (credits) in a cap and trade program are not necessarily performed by those generating emissions, an opportunity for emitters to undergo 'sensitization' with regards to fully dealing with GHG emissions is also missed.

Although this study has shown the ability to compare EA documents for intention and implementation across sectors and activities, it was not possible to evaluate parameters that are not explicitly stated by EA authorities in their guidance documents. In Quebec, analysis of a project by the MELCC results in memorandums ('avis') by experts that are published on the website of the *Bureau d'audiences publiques sur l'environnement* (BAPE), which show the rounds of question-and-answer between the MELCC and the proponent. These memorandums reveal de facto requirements by the MELCC that may not be obvious by consulting the sectorial directives for project proponents. In other jurisdictions, there may also be de facto requirements that are demanded by the EA authority (or recommendations as to methodologies, etc.), but they may not be captured in this examination of case studies.

Conclusion and recommendations

This paper examined the consideration of climate change mitigation in EA by determining the intention of EA authorities to include these considerations in the EA process and by observing if GHG assessments have been implemented by proponents into EISs. The results of this case study have provided the following insights to the research questions presented in the introduction:

The case study of five Canadian EA jurisdictions revealed that there were differences in how a jurisdiction conveyed its intention for the integration of climate change mitigation into the EA process. Canada (federal), Ontario, and Nova Scotia have produced guides for proponents to encourage the consideration of GHGs in project planning. British Columbia has very little published guidance mentioning GHG emissions in EA. Quebec has updated its sectorial guidelines to compel GHG assessments and is developing legislation requiring climate change consideration in its EA process.

The intentions of an EA authority do not necessarily translate into equal implementation by the proponent, as seen in the EISs examined from each EA jurisdiction. Federally, proponents do not necessarily perform a full assessment of their GHG emissions. British Columbia, having an underdeveloped intention according to the parameters used in the case study, compels proponents to consider their GHG emissions through the mechanism of VCs, resulting in detailed assessments by proponents. Quebec offers recommendations and encouragement on a per-project basis through the expertise in their dedicated climate change directorate, which is reflected in the GHG considerations included in the EIS. Both Ontario and Nova Scotia's intentions are not currently being reflected in EISs from those provinces.

In the EISs examined where the EA process was complete, almost none indicated that GHG emissions were a factor in the project's acceptability. The exception was an LNG project in Nova Scotia which would generate over 10% of that province's total emissions. Conditions placed on the project included an ongoing GHG management and monitoring program, but the project was nevertheless approved.

It is unclear how GHG consideration in EA, in its present form, will assist in meeting GHG reduction targets. No project studied in this paper determined a limit for its GHG emissions. Many EISs examined compared the project's emissions to provincial or national inventories, minimizing the project's effects on climate change.

Where gaps exist in an EA authority's guidance for considering GHG emissions, proponents will fill in these gaps using their own judgment (such as in the case of determining significance) or by using other resources (e.g. IPCC guidelines), which may not be appropriate for the project/facility level and/or result in ambiguous assessments. Clear, concise and complete guidelines should be provided to a proponent to standardize GHG assessments for EA; these may include the types of emissions considered, specific quantification methods, a mitigation hierarchy, thresholds, and entry points for consideration.

If less GHG emissions are the goal, any new emissions from a project should only make meeting targets more difficult. However, by adopting a mitigation hierarchy including compensation measures, new projects could achieve net negative emissions, thereby reducing overall emissions. Currently, compensation measures are typically fractured from the project development phase in the form of cap and trade programs, which target projects already in operation. Compelling proponents to implement compensation measures directly for their projects would shift GHG emissions from the dollars on a balance sheet (by purchasing compensatory credits) to proponents being responsible for their environmental impacts in a more direct and traditional way, such as with wastewater effluent or particulate matter emissions.

The comparison of a project's GHG emissions to regional, national or global levels does not determine the significance of an effect and should not be used as such. One facility compared to provincial levels will always seem small and will be dwarfed if compared to national emissions levels. This also sidesteps the discussion about how the project will affect GHG reduction targets. All GHG emissions should be considered significant since climate change is a global issue and contribution is not dependant on geography.

Outside of Canada, Enríquez-de-Salamanca et al. (2016) states that despite Spain passing legislation for climate change consideration in environmental assessment in 2013, only 14% of 1713 projects analysed in

their study included mention of climate change, with very few considering the effects. This does not give high expectations for improved results through direct legislation; however, Jiricka et al. (2016) found that EIA consultants in Austria and Germany consider 'the lack of legal requirements to consider climate change as a major barrier,' and that legal requirements in Austria resulted in increased consideration of climate change mitigation by companies. In addition, the EU Directive 2011/92/EU, which incorporates the United Nations Economic Commission for Europe (UNECE) Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), requires Member States to inform other Member States about projects that are likely to have significant effects in their territory. This legislation, which provides for input from those outside the emitting jurisdiction, is a way for GHG's transboundary effects to be dealt with in a transboundary manner (European Union 2013).

Strategic Environmental Assessment (SEA), used to shape policies, programs and plans, could be an effective tool in developing multi-sector GHG mitigation policies, which could then be leveraged in the EA process. However, as seen in the EA process, an SEA does not by default capture the impacts of GHG emissions. Wende et al. (2012) found that SEAs performed in England and Germany considered climate change issues only within a certain geographical boundary, and did not address effects on meeting emissions reduction goals at all. Therefore, there also is a need in SEA for the explicit requirement of the consideration of climate change mitigation.

A paradigm shift may be the only way to meet climate change goals. If an approach is taken to limit GHG emissions, the question of how much an oil refinery can emit versus a landfill must be examined. Comparisons of sectors between provinces (e.g. energy production in Quebec versus Alberta) must also be considered. The exercise becomes complex because each sector may have best practices for particular activities. Guidance documents from industry, for example, can include general best practices for GHG emissions management or the specific activity of tailings management (MAC [date unknown]). However, certain industries are heavy emitters no matter which methods or technologies are applied. The current view appears to be to continue to allow industries with high emissions to operate, as there is no economic or environmental benefit to provinces to letting a project move its operations elsewhere. If a project moves one province over then emissions will still be generated, but economic benefits will transfer to the province accepting the project. If a shift away from fossil fuels is the only true method to decrease GHG emissions, then EA, with its purpose of identifying and mitigating adverse environmental effects before a project begins, is an essential tool for implementing this shift.

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References

- [EAO] British Columbia Environmental Assessment Office. 2013. Guideline for the selection of valued components and assessment of potential effects. [accessed 2017 Jul 17]. <http://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/environmental-assessments/guidance-documents/eao-guidance-selection-of-valued-components.pdf>.
- [EAO] British Columbia Environmental Assessment Office. 2015. Application information requirements template. [accessed 2017 Jul 14]. <http://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/environmental-assessments/guidance-documents>.
- [EAO] British Columbia Environmental Assessment Office. 2016. Expert panel review of federal EA processes - British Columbia's Submission. [accessed 2017 Aug 20]. http://www.eao.gov.bc.ca/pdf/BCEAO_FinalSubmissiontoExpertPanel_20161219.pdf.
- [ECCC] Environment and Climate Change Canada. 2017. Canada's Greenhouse Gas (GHG) emissions reporting program proposed expansion - 2017 - Consultation Document. [place unknown]: Government of Canada.
- [FPTCCCEA] Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment. 2003. Incorporating climate change considerations in environmental assessment: general guidance for practitioners. Federal-provincial-territorial committee on climate change and environmental assessment. [accessed 2017 Jun 20]. http://ceaa-acee.gc.ca/Content/A/4/1/A41F45C5-1A79-44FA-9091-D251EEE18322/Incorporating_Climate_Change_Considerations_in_Environmental_Assessment.pdf.
- [IEMA, Arup] Institute of Environmental Management & Assessment, Arup. 2017. Environmental impact assessment guide to: assessing greenhouse gas emissions and evaluating their significance. Lincoln (UK): IEMA. accessed 2017 Oct 6. <https://www.iema.net/policy/ghg-in-eia-2017.pdf>.
- [IEMA] Institute of Environmental Management & Assessment. 2010. Principles: CCM&EIA - Version 1.1. UK: Institute of Environmental Management & Assessment. [accessed 2017 Sep 8]. <https://www.iema.net/assets/templates/documents/climate20change20mitigation20and20eia.pdf>.
- [IPCC] Intergovernmental Panel on Climate Change. 2013. Climate Change 2013: the physical science basis, contribution of working group I to the fifth assessment report of the intergovernmental panel on climate change, Annex III: glossary. ed., Planton S. Cambridge (UK) and New York (NY): Cambridge University Press.
- [IPCC] Intergovernmental Panel on Climate Change. 2015. IPCC expert meeting: application of 2006 IPCC guidelines to other areas. Hayama (Kanagawa): Institute for Global Environmental Strategies (JP). ISBN 978-4-88788-191-4 .
- [MAC] Mining Association of Canada. [date unknown]. Climate Change. Ottawa (ON): Mining Association of Canada. [accessed 2019 Apr 13]. <http://mining.ca/resources/guides-manuals>
- [MECP] Ontario Ministry of the Environment, Conservation and Parks. 2016. Consideration of climate change in environmental assessment in Ontario. Queen's Printer for Ontario. [accessed 2017 May 20]. <https://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTI2NjY5&statusId=MTkxMjA2>.
- [MELCC] Ministère de l'Environnement et de la Lutte contre les changements climatiques. [date unknown]. Formulaire, directive, guides et documents divers. Quebec (Canada): MELCC. [accessed 2017 Sep 13]. <http://www.mdelcc.gouv.qc.ca/evaluations/publicat.htm>
- [NSE] Nova Scotia Environment. 2011a. Guide to considering climate change in environmental assessments in Nova Scotia. Nova Scotia Environment. [accessed 2017 May 19]. <https://novascotia.ca/nse/ea/docs/EA.Climate.Change.Guide.pdf>.
- [NSE] Nova Scotia Environment. 2011b. Guide to considering climate change in project development in Nova Scotia. Nova Scotia Environment. [accessed 2017 May 19]. <https://novascotia.ca/nse/ea/docs/Development.Climate.Change.Guide.pdf>.
- [UNFCCC] United Nations Framework Convention on Climate Change. 1998. Kyoto protocol to the united nations framework convention on climate change. [accessed 2019 Jan 27]. <https://unfccc.int/resource/docs/covkp/kpeng.pdf>.
- [WCI] Western Climate Initiative. 2010. Final essential requirements of mandatory reporting - amended for Canadian Harmonization. [accessed 2017 May 19]. <http://www2.gov.bc.ca/assets/gov/environment/climate-change/ind/quantification/wci-2011.pdf>.
- [WRI] World Resources Institute/World Business Council for Sustainable Development. 2004. The greenhouse gas protocol - A corporate accounting and reporting standard. Revised. Washington (DC): World Resources Institute; Conches-Geneva (Switzerland): World Business Council for Sustainable Development. [accessed 2017 May 18]. <http://www.ghgprotocol.org/corporate-standard>
- Agrawala S, Matus Kramer A, Prudent-Richard G, Sainsbury M 2011. Incorporating climate change impacts and adaptation in environmental impact assessments, OECD Environment Working Paper No. 24. [place unknown]: OECD Publishing.
- Dryzek JS, Norgaard RB, Schlosbert D, eds. 2011. The Oxford handbook of climate change and society. New York: Oxford University Press. [accessed 2017 Sep 8]. <http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199566600.001.0001/oxfordhb-9780199566600>
- Ducros C. 2016. ECCC-CNCS MOU Workshop (Presentation). Ottawa (ON): Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment. e-Doc: 5122148.
- Enríquez-de-Salamanca Á, Martín-Aranda R, Díaz-Sierra R. 2016. Consideration of climate change on environmental impact assessment in Spain. Environ Impact Assess Rev. 57:31–39.
- European Union. 2013. Guidance on the application of the environmental impact assessment procedure for large-

scale transboundary projects. European Union. [accessed 2019 Mar 18]. <http://ec.europa.eu/environment/eia/pdf/Transboundry%20EIA%20Guide.pdf>.

Groulx E. 2016. Consideration of climate change in environmental assessments under the Canadian Environmental Assessment Act, 2012. Paper Presented at: IAIA 2016. Proceedings of the 36th Annual Conference of the International Association for Impact Assessment. May 8 to 15; Nagoya, Japan.

Jiricka A, Formayer H, Schmidt A, Völler S, Leitner M, Fischer TB, Wachter TW. 2016. Consideration of climate change impacts and adaptation in EIA practice – perspectives of actors in Austria and Germany. *Environ Impact Assess Rev.* 57:78–88.

Lee RJ. 2001. Climate change and environmental assessment - Part 1: review of climate change considerations in selected past environmental assessments. Ottawa (ON): Canadian Environmental Assessment Agency. [accessed 2017 Sep 16]. <http://publications.gc.ca/collections/Collection/En105-69-2002-1E.pdf>

MacDougall A, Valley JM. 2017. Climate Change - Why Boards need to be proactive. Quebec (Canada): Osler, Hoskin & Harcourt LLP. [accessed 2017 Oct 13]. <https://www.osler.com/en/resources/critical-situations/2017/climate-change-why-boards-need-to-be-proactive>.

Ohsawa T, Duinker P. 2014. Climate-change mitigation in Canadian environmental impact assessments. *Impact Assess Project Appraisal.* 32(3):222–233.

Shaftel H. 2017. Responding to climate change. Pasadena (CA): NASA Jet Propulsion Laboratory, California Institute of Technology. [accessed 2017 Jun 16]. <https://climate.nasa.gov/solutions/adaptation-mitigation/>.

Tompkins EL, Adger WN. 2005. Defining response capacity to enhance climate change policy. *Environ Sci Policy.* 8 (6):562–571.

Wende W, Bond A, Bobylev N, Stratmann L. 2012. Climate change mitigation and adaptation in strategic environmental assessment. *Environ Impact Assess Rev.* 32:88–93.

Wintergreen J, Delaney T 2007. ISO 14064, International Standard for GHG Emissions Inventories and Verification. Paper presented at: International Emission Inventory Conference 2007. Proceedings of the 16th Annual International Emission Inventory Conference - Emission Inventories: “Integration, Analysis, Communications; May 14-17; Raleigh, NC.

Appendix 1. List of guidance documents consulted for each jurisdiction

Canada (federal)

- The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners (FPTCCCEA 2003)

British Columbia

- Application Information Requirements Template (EAO 2015)
- Guideline for the Selection of Valued Components and Assessment of Potential Effects (EAO 2013)

- Expert Panel Review of Federal EA Processes – British Columbia’s Submission (EAO 2016)

Ontario

- Consideration of Climate Change in Environmental Assessment in Ontario (MECP 2016)

Quebec

- ‘Directives Sectorielles’ for projects subject to the EA process in Quebec (MELCC [date unknown])
- Various memorandums (‘avis’) by the Direction de l’expertise climatique (DEC) of the MELCC

Nova Scotia

- Guide to Considering Climate Change in Environmental Assessments in Nova Scotia (NSE 2011a)
- Guide to Considering Climate Change in Project Development in Nova Scotia (NSE 2011b)

Appendix 2. Basis for the consideration of climate change in project development - The United Nations Framework Convention on Climate Change

Canada has ratified several United Nations Framework Convention on Climate Change (UNFCCC) commitments such as the Kyoto Protocol and the Paris Agreement. Canada withdrew from the Kyoto Protocol in 2011 but ratified the Paris Agreement in October 2016. In its document of ‘nationally determined contribution’ (NDC), the submission of which is a requirement of the Paris Agreement, Canada states that its commitment to the Agreement’s collective objectives to limit the increase of global temperatures to below 2 degrees Celsius above pre-industrial levels guides the actions laid out in its *Pan-Canadian Framework on Clean Growth and Climate Change*, a climate action plan adopted in December 2016. This action plan sets Canadian GHG reduction targets for 2020, 2030 and 2050. Provinces have also adopted GHG reduction targets stemming from Canada’s commitments to the UNFCCC. These reduction targets are shown in Table A1.

Appendix 3. GHG mitigation in federal and provincial EA frameworks

The cornerstone of EA frameworks in Canada is the legislation on which the EA process is based. GHG mitigation and, more broadly, climate change is not specifically mentioned in EA legislation at neither the federal nor the provincial level. However, general provisions in EA legislation referring to the environmental effects of project activities can be applied to GHG emissions. Groulx (2016) notes that the definition of environmental effects in the Canadian Environmental Assessment Act (S.C. 2012, c. 19, s.5(1)(b)(ii) & s.5(1)(b)(iii)), covers ‘a change that may be caused to the environment that would occur ... in a province other than the one in which ... the project is being carried out, or outside Canada’. The effects of GHG emissions are considered under this provision in the evaluation of a federal EA.

Table A1. Federal and provincial GHG reduction targets with respective climate action plans.

Location	GHG reduction targets by year			Climate action plan
	2020	2030	2050	
Canada	17% below 2005 levels	30% below 2005 levels	80% below 2005 levels	The Pan-Canadian Framework on Clean Growth and Climate Change
British Columbia	33 % below 2007 levels	n/a	80 % below 2007 levels	Climate Leadership Plan
Alberta	n/a	Phase out coal- fired emissions	n/a	Climate Leadership Plan
Manitoba	n/a	33% below 2005 levels	50% below 2005 levels	Climate Change and Green Economy Action Plan
Ontario	15% below 1990 levels	37% below 1990 levels	80% below 1990 levels	Climate Change Action Plan
Québec	20% below 1990 levels	37.5% below 1990 levels	80-90% below 1990 levels	Plan d'action 2013- 2020 sur les changements climatiques
New Brunswick	10% below 1990 levels (14.8Mt output)	Reduce emissions to 10.7Mt	75 to 85% below 2001 levels (5Mt output)	New Brunswick Climate Change Action Plan
Newfoundland and Labrador	10% below 1990 levels	n/a	75-80% below 2001 levels	Climate Change Action Plan 2011
Nova Scotia	10% below 1990 levels	n/a	80% below 2009 levels	Climate Change Action Plan
Prince Edward Island	n/a	n/a	n/a	Climate Change Action Plan

Table A2. Authorities and legislative basis for EA jurisdictions chosen for study.

Jurisdiction	EA authority	Legislative basis for EA	Climate change integration guide for EA
Canada (federal)	Canadian Environmental Assessment Agency (CEAA)	Canadian Environmental Assessment Act (CEAA 2012), including: Regulations Designating Physical Activities Prescribed Information for the Description of a Designated Project Cost Recovery Regulations	<i>Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners</i>
British Columbia	Environmental Assessment Office (EAO)	Environmental Assessment Act, including: Exemption Regulation Reviewable Projects Regulation Concurrent Approval Regulation Prescribed Time Limits Regulation Public Consultation Regulation Public consultation Policy Regulation Transition Regulation Fee Regulation	None available.
Ontario	Ontario Ministry of the Environment, Conservation and Parks (MECP)	Environmental Assessment Act, including: Regulation 334—organizations subject/ exempt from the Act O.Reg. 231/08—Transit Projects O.Reg. 101/07—Waste Management Projects O.Reg. 116/01—Electricity Projects O.Reg. 616/98—EA Deadlines O.Reg. 345/93—Private Sector Developers	<i>Consideration of Climate Change in Environmental Assessment in Ontario</i> (Draft)
Quebec	Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC)	Environment Quality Act (<i>Loi sur la qualité de l'environnement</i> , LQE), including: Règlement sur l'évaluation et l'examen des impacts sur l'environnement	None available. Sectorial guidelines (' <i>directives sectorielles</i> ') provide some detail on how GHGs should be considered.
Nova Scotia	Nova Scotia Environment (NSE)	Environment Act, including: Environmental Assessment Regulations Environmental Assessment Review Panel Regulations Activity Designation Regulations	<i>Guide to Considering Climate Change in Environmental Assessments in Nova Scotia</i> <i>Guide to Considering Climate Change in Project Development in Nova Scotia</i>

Where the jurisdictional legislation lacks the language to specify the consideration of GHG emissions in EA, other components of the EA framework have been leveraged to encourage proponents to analyze their GHG sources and sinks. Procedurally, guidelines in the form of companion documents to be used in conjunction with EA regulations are the most obvious example of this leveraging. Federally, a guide for the consideration of climate change in EA was published in 2003. Several provinces later produced their own guides for provincial EAs; Nova Scotia in 2011 and Ontario (in a draft version) in 2016. Quebec has not released such a guide, but changes to the sectorial guidelines

('*directives sectorielles*') (MELCC [date unknown]) in November 2016 added provisions for the consideration of GHG emissions in EA submissions, including the consideration of alternatives in the context of GHG emissions and the effect the project will have towards Quebec's annual GHG inventory. Quebec's Bill 102 to modernize the environmental authorization scheme, adopted in March 2017, will further enhance climate change consideration in the EA process.

EA legislation for the jurisdictions chosen for study in this paper along with guides for the consideration of climate change in EA, if existing, are detailed in [Table A2](#).