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From Paris to Projects: Clarifying the Implications of Canada's Climate Change Mitigation Commitments for the Planning and Assessment of Projects and Strategic Undertakings (Full Report)

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Full Report

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Clarifying the implications of Canada's climate change mitigation commitments for the planning and assessment of projects and strategic undertakings

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Note to readers

A summary report is available online at https://uwaterloo.ca/paris-to-projects/publications-0/reports-journal-papers-and-book-chapters

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Glossary of Acronyms

AFOLU = Agriculture, forestry and other land use
BLM = Bureau of Land Management
CAT = Climate Action Tracker
CERP = Climate Equity Reference Project
C&C = Contraction and Convergence
CBDRRC = Common but differentiated responsibilities and respective capabilities
CCS = Carbon capture and storage
CEAA = Canadian Environmental Assessment Agency
CO_2 = Carbon dioxide
CPC = Cumulative equal Per Capita
DDPP = Deep Decarbonization Pathways Project
EA = Environmental assessment
EIB = European Investment Bank
EMRG = Energy and Materials Research Group
EPBC Act = Environment Protection and Biodiversity Conservation Act
EPC = Equal Per Capita (equivalent to CPC except neglects historic emissions)
EPS = Emissions Performance Standard
ETIA = Energy Transition Information Administration
GDR = Greenhouse Development Rights
GHG = Greenhouse gas
HFC = Hydrofluorocarbons
IA = Impact Assessment
IPCC = Intergovernmental Panel on Climate Change
LCFS = Low Carbon Fuel Standard
LULUCF = Land use, land-use change and forestry
MAC = Marginal abatement cost
NDC = Nationally determined contributions
NEB = National Energy Board
NEPA = National Environmental Policy Act
OPGEE = Oil Production Greenhouse Gas Emissions Estimator
POGG = Peace order and good government
UN = United Nations
UNDRIP = United Nations Declaration on the Rights of Indigenous Peoples
UNFCCC = United Nation Framework Convention on Climate Change
SCC = Social cost of carbon
SDG = Sustainable Development Goals
SLCP = Short-lived climate pollutants
SRM = Solar radiation management
TEFP = Trottier Energy Futures Project

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Table of Contents

Table of figures, boxes and tables

Brief summary

Canada has signed the *Paris Agreement* and made other international commitments to doing our fair share of what is needed to keep overall global warming to the *Paris Agreement* limit of well below 2ºC, and to aim for 1.5ºC, to avoid devastating climate change. However, we have not yet progressed far in translating these commitments into implications for decision making on proposed undertakings with significant implications for meeting those commitments.

Clarifying those implications and determining how best to incorporate them in deliberations and decision making is overdue and now imperative. The federal government's new *Impact Assessment Act,* which is now proceeding through Parliament's legislative process, stands to require that all assessments decisions be based in part on evaluation of

> the extent to which the effects of the designated project hinder or contribute to the Government of Canada's ability to meet its environmental obligations and its commitments in respect of climate change. (*Impact Assessment Act,* section 93(e)).

In this report we present the findings of an initial effort to delineate and address the gap between Paris and projects. We set out the needed steps and their main implications, especially for new assessment law, regulation and policy. The steps are not fully defined and many components include a range of possible options. Our intent and expectations have not been to deliver final answers but to establish a firm basis for informed conversation of a matter of pressing importance. The challenges identified in this report are numerous and demanding but reasonably clear.

Our main findings and recommendations are summarized in part 5, the concluding section of the report.

The key findings about the overall implications of our commitments are as follows:

- Keeping overall global warming to the *Paris Agreement* limit of well below 2ºC and aiming for 1.5ºC will require immediate and sustained best efforts, especially by the most advantaged countries.
- Even under the most marginally equitable fair share option for allocating national responsibilities for GHG mitigation, Canada would exhaust its share of the global carbon budget within a decade if our GHG emissions continue at current levels.
- Research into decarbonization pathways and earliest possible achievement dates is at an early stage. The limited number of existing exploratory studies identify different routes to and timelines for decarbonization. So far, the earliest technologically feasible date identified in any of the studies for decarbonization in Canada is 2050. Given that our fair share decarbonisation deadline is most likely passed or, at best, looming in the next decade, 2050 as the earliest feasible achievement date should be adopted as Canada's latest possible

deadline for achieving decarbonisation.
- Reconsidering what is politically, culturally, and behaviorally possible could bring the feasible decarbonization deadline closer to the short term and reduce the gap between mitigation efforts in Canada and what is considered to be our fair share under *the Paris Agreement*.
- Any working deadline for decarbonization must be accompanied by always attempting to do better and by international assistance in support of mitigation and adaptation abroad to compensate for our past inaction and domestic lateness.

Very briefly, Canada's domestic efforts need to set 2050 as the working deadline for decarbonisation, and adopt best efforts to do more and to make substantial contributions beyond Canada to meet international commitments.

The needed package of targets, frameworks and applied tools to facilitate planning and evaluations, including assessments, should combine

- delineation of and comparative evaluation of viable pathways to decarbonisation by the overall as well as interim deadline;
- a carbon budgeting system to clarify expectations and track accomplishments over time;
- long range energy policies;
- effective mobilization of economic and regulatory tools using both carbon pricing and the social cost of carbon, and strengthening financial motives for meeting GHG reduction and offset commitments;
- climate- and sustainability-based matrices to compare alternative policy, planning, program or project options with different GHG implications;
- advanced GHG accounting, covering specific qualities of sinks as well as emissions, fair attribution of negative and positive effects, critical evaluation of offsets, and recognition of just transition imperatives;
- enhanced public understanding, including through transparency and convenient public accessibility of climate-relevant information; and
- improved coordination among federal, provincial, territorial, Indigenous and municipal governments.

Finally, for application of the new *Impact Assessment Act,* extensive direction in regulations and policies will be needed to establish expectations and clarify means of compliance with the climate-related requirements of the law. The guidance must bridge the currently wide gap between the broad *Paris Agreement* commitments and the determination of whether project-level proposals and alternatives will hinder or contribute to meeting those commitments.
Guidance supporting the new law will need to combine identification of the key requirements for meeting the Paris commitments as outlined above, with elaboration of means of evaluating a specific options at the project level. The needed guidance includes the following:

- climate-specific criteria and trade-off rules for evaluations and decisions, tied to

particular delineations of required steps, targets, deadlines for meeting the Paris commitments (such as consistency with available delineated pathways for meeting the 2050 decarbonization deadline noted above) and also integrated into a comprehensive set of other sustainability-based criteria needed for application of the broader sustainability-based public interest test established in the new Act;

- means of ensuring attention beyond immediate effects of GHG emissions and sinks through, for example methods for determining whether proposed undertakings would
    - contribute to just transitions to a low-GHG future that are respectful of human rights including Indigenous rights,
    - avoid or offset GHG emissions or sink impairments past the Canadian deadline for GHG neutrality,
    - avoid entrenchment of climate-inappropriate structures, practices and dependencies,
    - ensure "best efforts" for GHG mitigation and sink enhancement, and
    - favour capacity to meet increasingly ambitious future national commitments;
- means of applying a suite of climate tests, based on the findings of this report, incorporating the range of tools identified above (see Box 5 in the report),
- associated information requirements, and standards for analyses and evaluations;
- means of ensuring that all climate-significant project and strategic level undertakings are subject to the legislated assessment requirements;
- provision of basic interim direction for reasonably consistent and effective evaluations of climate commitment compliance while the more specific guidance is being developed; and
- means of fostering public learning and interjurisdictional collaboration.

While none of this promises to be easy, the needed transitions likely offer as much positive opportunity as challenging disturbance. Also many climate-centred efforts would combine in mutually reinforcing ways with other initiatives to enhance prospects for lasting wellbeing.

Introduction

The December 2015 *Paris Agreement* established new and more ambitious global goals for greenhouse gas (GHG) emission abatement. In signing this agreement, Canada committed us to do our fair share to reduce GHG emissions sufficiently "to limit global average temperature rise to well below 2°C above pre-industrial levels, and to pursue efforts to limit the increase to 1.5 °C."[1]

Meeting the *Paris Agreement* commitments is crucial if we are to avoid disastrous climate change. The commitments are also ambitious. For Canada, the implications require more substantial effort than our previous and current national commitments to GHG abatement, which we are not on track to meet. However, the federal government has not yet clarified the implications of the Paris commitments, including what we need to accomplish and by when.

One key area where clarification is needed is the planning and approval of new undertakings that are subject to assessment requirements. Even since the signing of the *Paris Agreement*, federal authorities have continued to approve major long-term projects that will contribute to increased GHG emissions and further entrench fossil energy in the economy. The gap between climate commitments and approvals of particular undertakings is also evident at the strategic level of climate-significant policies, plans and programs, which include federal subsidies to the fossil industry and major infrastructure funding programs that have been approved and maintained with no apparent consideration for how they may influence the country's ability to contribute its fair share to the goals established in the *Paris Agreement.*

The gap between Canada's *Paris Agreement* commitments and decisions made on projects and strategic level undertakings therefore requires significant consideration. To spur and inform serious public policy attention to this issue, this report provides an initial exploration of what is needed

- to clarify what Canada's international commitments on climate change entail for domestic goals and compliance efforts in Canada, and
- to ensure that assessment processes do what is possible within their ambit to enable Canada to meet those commitments.

The following discussion considers how to understand, specify and translate the broad implications of mitigation measures in the *Paris Agreement* into clear guidance for deliberations and decision making about projects and other undertakings subject to legislated assessment requirements.

[1] *The Paris Agreement*, 22 April 2016, UNTS (entered into force 4 November 2016), online:

Assumptions and working positions

We begin with the assumption that Canada intends to honour its *Paris Agreement* commitments on GHG mitigation. We assume that Canada is serious about doing our fair share to achieve the *Paris Agreement* objective of reducing GHG emissions sufficiently "to limit global average temperature rise to well below 2°C above pre-industrial levels and to pursue efforts to limit the increase to 1.5 °C". We also recognize that national emissions targets, including Canada's, will evolve and strengthen over time in response to the global stocktaking and ratcheting mechanisms included in the *Paris Agreement*.[2]

These international commitments are appropriate, if belated, responses to the increasingly compelling evidence from climate science of the consequences of failing to act. If we fail to meet our commitments, continuing climate change will deliver its own implacable form of enforcement. Given the substantial challenges involved in making the necessary economic and other transformations required to meet these commitments, we need to move as quickly as possible to act on our responsibilities.

To its credit, the federal government has recognized the need to prepare climate change guidance for assessment decision making. In its June 2017 *Environmental and Regulatory Reviews Discussion Paper,*[3] the government indicated that it would carry out a "strategic assessment" to "provide guidance on how to determine how life-cycle greenhouse gas emissions associated with individual projects are assessed."[4] Whether, when and how this assessment will proceed remains uncertain. In any event, the *Paris Agreement* commitments will loom over any such exercise.

In anticipation of this strategic assessment and broader attention to the issues surrounding assessment of individual projects in the era of climate change, this paper considers the basics of what is involved in translating the *Paris Agreement*'s climate change commitments into practical implications for planning and assessing proposals for climate-significant projects and strategic-level undertakings such as policies, plans and programs in Canada. Our initial aim here is simply to delineate the gap between the *Paris* commitments and the assessment of individual undertakings. It involves identifying the key questions and the most important evident components of the answers needed to bridge the gap between *Paris* and these undertakings.

For many of the questions, definitive answers are not currently available and may not be possible. Often the most we can expect are working positions based on our best

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[2] The global stocktaking mechanisms included in the *Paris Agreement* require the Parties to consider periodically what has been accomplished and what remains to be done in achieving *Paris* commitments. Canada (and other signatories) will need to bring their national climate mitigation policies in line with what is required to meet the global goals agreed to in the *Paris Agreement*.

[3] Government of Canada, *Environmental and Regulatory Reviews Discussion Paper*, June 2017, online: <https://www.canada.ca/content/dam/themes/environment/conservation/environmental-reviews/share-your-views/proposed-approach/discussion-paper-june-2017-eng.pdf>; in French, online: <https://www.canada.ca/content/dam/themes/environment/conservation/environmental-reviews/share-your-views/proposed-approach/discussion-paper-june-2017-fra.pdf> [*Discussion Paper* (June 2017)]

[4] *Discussion Paper* (June 2017), p. 9.

understanding of what is responsible (likely to meet our commitments) and feasible (practically doable). There is no single correct strategy for translating the climate commitments into implications for project assessments. However, given that climate change mitigation is an increasingly desperate imperative and that delays are likely to increase the challenges and minimize the time for smooth transitions, developing and acting on the basis of well-considered and regularly reviewed working positions is necessary.

We also recognize that any discussion of climate change mitigation commitments and their implications for mitigation targets and initiatives will raise questions about feasibility. Matters of political, technical, economic, institutional, social and other aspects of feasibility are unavoidably important. But while they must be faced, this paper assumes that first we must think clearly about what is needed, to establish a foundation for identifying the most feasible ways of getting there.

Finally, we recognize that the *Paris Agreement* also covers climate change adaptation and international financial transfers, which we do not address in this paper. Adaptation needs are significant in Canada. They are linked to mitigation issues and options, inadequately considered in Canadian assessment law and practice, and certainly worthy of careful attention. We have chosen to focus here on climate change mitigation, given the urgency of eliminating anthropogenic GHG emissions that have resulted in part from three decades of national inaction. However, synergies between mitigation and adaptation options should be sought wherever possible.

The structure of the report

This report is organized into four sections. First, we review key concerns and overarching principles that are central to the discussion at hand. Second, we examine the multiple implications of the goals of the *Paris Agreement* and address what the implications are for Canada under different interpretations of "fair share". Third, we describe Canada's current approach to climate policy and pathways, and then highlight existing gaps within this approach. We also provide recommendations for how to fill these gaps, first in policy and then in assessments. Fourth, we specify the key components of assessment legislation that will be needed to help Canada meet its *Paris Agreement* duties in light of the bill introduced by the federal government in February 2018. Finally, we summarize the key recommendations made throughout the report.

Part 1. The overarching context and basic principles

Climate change has been described as a "super wicked problem".[5] Super wicked problems are characterized by four key elements: "time is running out; those who cause the problem also seek to provide a solution; the central authority needed to address them is weak or non-existent; and irrational discounting occurs that pushes responses into the future".[6] Policies implemented by governance institutions typically fail to properly solve these problems. This is due in part to the fact that government actions often respond only to "short-term time horizons", an approach that is unfit to address problems at a much larger temporal scale, such as climate change. Solutions to super wicked problems need to find strategies to constrain our future selves by bypassing the tendency of our political and economic institutions to only take into account short-term problems. This is no easy feat.

The *Paris Agreement* reflects and approach that is both people-centric and grounded in the concept of climate justice. On one hand, it addresses issues of "human rights, just transition, Indigenous peoples, and gender"[7] as well as intergenerational equity. It is the first time these concepts are recognized in a legally binding agreement under the international climate regime.[8] At the same time, the *Paris Agreement* responds to calls from climate justice advocates who have pushed for the recognition that the burdens of climate change are not felt equally. Such advocates argue there is a need "to promote more equitable allocation of the burdens of these impacts at the local, national, and global levels by drawing on international human rights and domestic environmental justice theories".[9] In this regard, the preamble to the *Paris Agreement* notes "the importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity, recognized by some cultures as Mother Earth," and "the importance for some of the concept of 'climate justice', when taking action to address climate change".[10]

With these core concepts in mind, there are several key concerns and principles that should be considered throughout this exercise. Many, if not all of them, are increasingly entrenched in international law and law at other levels. It is worthwhile to understand the connection between these concepts and the *Paris Agreement*, as they underscore the discussion presented in this report.

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[5] Kelly Levin and others, "Overcoming the Tragedy of Super Wicked Problems: Constraining Our Future Selves to Ameliorate Global Climate Change", *Policy Sciences*, 45.2 (2012), 123–52, online: <https://doi.org/10.1007/s11077-012-9151-0>.

[6] Kelly Levin and others, "Overcoming the Tragedy of Super Wicked Problems: Constraining Our Future Selves to Ameliorate Global Climate Change", *Policy Sciences*, 45.2 (2012), p. 126

[7] Daniel Klein, Jane Bulmer, and Meinhard Doelle, "Negotiating History of the Paris Agreement", in *The Paris Agreement on Climate Change: Analysis and Commentary*, ed. by Daniel Klein and others, Oxford (Oxford University Press, 2017), p. 53.

[8] Meinhard Doelle, "Assessments of Strengths and Weaknesses", in *The Paris Agreement on Climate Change: Analysis and Commentary*, ed. by Daniel Klein and others (Oxford: Oxford University Press, 2017), p. 377.

[9] Randall S. Abate, "Introduction", in *Climate Justice: Case Studies in Global and Regional Governance Challenges*, ed. by Randall S. Abate (Washington, D.C.: Environmental Law Institute, 2016), p. xxxiii.

[10] *Paris Agreement*, preamble.

1.1 Human rights, climate justice and governance

It is evident that climate change has already and will continue to have an impact on the enjoyment of human rights. The impacts of climate change are already being felt, often by the most vulnerable in the more vulnerable parts of the world that are least responsible for the problem. It has been widely recognized that "climate change has a range of negative implications for the rights to life, food, health, housing, and self-determination, among others, and its consequences will be felt most acutely by vulnerable groups, such as Indigenous peoples, the world's poor, women, youth, low-lying regions, and small-island states".[11] In other words, the *Paris Agreement* must be considered in the context of global climate injustice.

From an international human rights law standpoint, it is widely accepted that States have the obligation to protect human rights from violations caused or contributed to by non-state actors, such as businesses. They also have the obligation to regulate, to adjudicate and to provide access to remedy when rights are violated. In fact, an international environmental law informed interpretation of human rights obligations in the climate change context would align with the "do no harm" aspect of Principle 2 of the *Rio Declaration*[12] (an expectation, at a minimum, that states would undertake due diligence to ensure that the resource extraction undertaken in accordance with sovereignty over natural resources would not harm the territory of other states, or areas beyond the jurisdiction of any state).

The *Paris Agreement* reference to human rights implies that Canada should be mindful of the international consequences of projects and programs put forward in Canada, including on the rights of vulnerable populations in foreign countries. This global dimension makes climate under national assessment regime unique amongst "effects" for its international scope. At the same time, the human rights of people within Canada, especially Indigenous peoples, will need to be taken carefully into account in designing and operationalizing the massive transformation at hand.

Nationally, section 7 of the *Canadian Charter of Rights and Freedoms* states that "everyone has the right to life, liberty and security of the person and the right not to be deprived thereof except in accordance with the principles of fundamental justice."[13] Scholars have argued that section 7 safeguards environmental rights[14] and that it could

[11] Sébastien Duyck, Sébastien Jodoin, and Alyssa Johl, *Integrating Human Rights in Climate Governance: An Introduction*, Routledge Handbook of Human Rights and Climate Governance, (Abingdon-on-Thames: Routledge, Forthcoming), 1 September 2017, pp. 1–2, online: <https://papers.ssrn.com/abstract=3033581>.

[12] United Nations, *Rio Declaration on Environment and Development*, August 12 1992, A/CONF.151/26, online: <www.un.org/documents/ga/conf151/aconf15126-1annex1.htm>.

[13] *Canadian Charter of Rights and Freedoms, Part I of the Constitution Act, 1982, being Schedule B to the Canada Act* 1982 (UK), 1982, c 11.

[14] David R. Boyd, *Unnatural Law: Rethinking Canadian Environmental Law and Policy*, Law and Society (Vancouver: UBC Press, 2003); Lynda M. Collins and Meghan Murtha, "Indigenous Environmental Rights in Canada: The Right to Conservation Implicit in Treaty and Aboriginal Rights to Hunt, Fish, and

serve as a foundation to invalidate laws and regulations (and potentially even government inaction) that allow pollution at levels significant enough to interfere with human health and increase the risk of death, thus violating the right to life and security.[15]

Those disproportionately impacted by climate change, such as youth, future generations, the elders, the disabled and the homeless, could arguably claim that their right to equality, enshrined in section 15 of the Charter, has been infringed upon. Furthermore, the Supreme Court confirmed that, in certain contexts, the State is under a positive duty to extend legislative protections where it fails to do so inclusively.[16] In the US, a court allowed a case brought forward by a group of children against the federal government to proceed on the basis that the state has failed in its duty to protect their fundamental constitutional rights, including the right to life, from the threats of climate change stating:

> Exercising my "reasoned judgment", I have no doubt that the right to a climate system capable of sustaining human life is fundamental to a free and ordered society. Just as marriage is the "foundation of the family," a stable climate system is quite literally the foundation of "society, without which there would be neither civilization nor progress."[17]

In November 2018, a class action on behalf of all young Quebecers was filed against the federal government for failing to take adequate action on climate change, arguing that successive failures to set adequate greenhouse gas reduction targets and meet them violate the members' constitutionally protected human rights to life and equality.[18]

Trap", *Alberta Law Review*, 47.4 (2010), 959; Sophie Thériault, "La justice environnementale au Québec et les droits fondamentaux : analyse des potentiels écologique et distributif des chartes en lien avec la pollution toxique diffuse", in *Un regard québécois sur le droit constitutionnel: Mélanges en l'honneur d'Henri Brun et de Guy Tremblay*, ed. by Patrick Taillon, Eugénie Brouillet, and Amélie Binette (Cowansville: Éditions Yvon Blais, 2016).

[15] Nathalie J. Chalifour and Jessica Earle, *Feeling the Heat: Climate Litigation Under the Charter's Right to Life, Liberty and Security of the Person*, Legal Studies Working Paper (Ottawa: University of Ottawa, Faculty of Law, 20 November 2017), pp. 39–43, online: <https://ssrn.com/abstract=3080379>; Karine Péloffy, "Indigenous People Bringing Climate Justice to Canada", in *Climate Justice: Case Studies in Global and Regional Governance Challenges*, ed. by Randall S. Abate (Washington, D.C.: Environmental Law Institute, 2016), p. 659; See also dissidence by Arbour J. in *Gosselin* v. *Québec (Attorney General)*, 4 SCR 429, at para. 327: "state inaction—the failure of the state to exercise its legislative choice in connection with the protected interests of some societal group, while exercising it in connection with those of others—may at times constitute 'affirmative interference' with one's Charter rights."

[16] *Dunmore* v. *Ontario (Attorney General)*, [2001] 3 S.C.R. 1016.

[17] *Juliana* v. *United States*, No. 6:15-CV-01517-TC, 2016 WL 6661146 (D. Or. Nov. 10, 2016), p. 32, online: <https://static1.squarespace.com/static/571d109b04426270152febe0/t/5824e85e6a49638292ddd1c9/1478813795912/>.

[18] *ENvironnement JEUnesse v. Attorney General of Canada*, Motion for Authorization to Institute a Class Action and Obtain the Statut of Representative, No. 500-06 (Nov. 26, 2018), online: < http://tjl.quebec/wp-content/uploads/2018/11/2018-11-26-ENJEU-unoffiocial-English-translation.pdf>.

As international and national climate justice court cases unfold, they will doubtlessly offer much needed guidance on the duties of states and corporate actors regarding the human rights implications of climate injustice.[19]

Human rights can be infringed upon through disproportionate climate impacts brought about by insufficient mitigation, but they can also be violated through ill-conceived and implemented mitigation action. In the past, the single-minded focus on climate outcomes within climate change treaty implementation and domestic implementation strategies have also sometimes led to negative human rights repercussions "by failing to abide by the participatory rights of marginalized peoples and communities and restricting their access to the lands, food, energy, and resources on which their livelihoods depend".[20]

Internationally, the human rights implications of focussing on outcomes at the expense of participatory processes have been particularly problematic with regard to flexibility or market-based mechanisms (e.g. Clean Development Mechanism), biofuels and energy, and forest preservation.[21] Thus, it is imperative that human rights considerations henceforth guide both the process and outcome of global responses to climate change.[22]

1.2 Specific rights of Indigenous Peoples

The specific rights of Indigenous Peoples bear particular relevance in the context of climate mitigation internationally, and especially nationally. Even if some have narrowly interpreted Canada's human rights obligations as owed solely to those within Canadian territory and jurisdiction, it is still the case that human rights issues have arisen with respect to Northern Indigenous peoples and climate change.[23] Canada warms faster than

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[19] See generally Michael Burger and Justin Gundlash, *The Status of Climate Change Litigation: A Global Review* (United Nations Environment Programme Law Division, May 2017), online: <http://columbiaclimatelaw.com/files/2017/05/Burger-Gundlach-2017-05-UN-Envt-CC-Litigation.pdf>.

[20] Sébastien Duyck, Sébastien Jodoin, and Alyssa Johl, *Integrating Human Rights in Climate Governance: An Introduction*, Routledge Handbook of Human Rights and Climate Governance, (Abingdon-on-Thames: Routledge, Forthcoming), 1 September 2017, p. 2; Naomi Roht-Arriaza, "'First, Do No Harm': Human Rights and Efforts to Combat Climate Change", *Ga. J. Int'l & Comp. L.*, 38.3 (2014), p. 595, online: <https://digitalcommons.law.uga.edu/gjicl/vol38/iss3/6>.

[21] Naomi Roht-Arriaza, "'First, Do No Harm': Human Rights and Efforts to Combat Climate Change", *Ga. J. Int'l & Comp. L.*, 38.3 (2014), p. 595

[22] Naomi Roht-Arriaza, "'First, Do No Harm': Human Rights and Efforts to Combat Climate Change", *Ga. J. Int'l & Comp. L.*, 38.3 (2014), p.605-610;see also "Environment and Human Rights: The Link Is There, and so Is the State's Obligation to Protect Them", *Press Release*, 2013, online: <https://reliefweb.int/report/world/environment-and-human-rights-link-there-and-so-states%E2%80%99-obligation-protect-them-%E2%80%93-un> and John H. Knox, *Report of the Independent Expert on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment* (United Nations, Human Right Council, 24 December 2012), online: <https://www.ohchr.org/Documents/HRBodies/HRCouncil/RegularSession/Session22/A-HRC-22-43_en.pdf>.

[23] See Sheila Watt-Cloutier, *The Right to Be Cold: One Woman's Story of Protecting Her Culture, the Arctic and the Whole Planet* (Toronto: Penguin Random House Canada, 2016); "Petition to the Inter-American Commission on Human Rights Seeking Relief from Violations Resulting from Global Warming Caused by Acts and Omissions of the United States", in *Global Warming and Climate Change*, 2005, II,

other regions of the world due to its northern latitudes. Average annual temperatures in Canada have increased by 1.6°C between 1948-2013,[24]with strongest warming in the North (2.2°C),[25] across the homelands of northern Indigenous populations. Moreover, Indigenous peoples in Canada are disproportionately vulnerable to climate change impacts due to their reliance on the land for food and cultural practices.[26] Changing migratory wildlife patterns, thinning sea ice resulting in dangerous crossing conditions, the arrival of new pests and increasingly unpredictable weather patterns due to climate change are already having dire impacts on Indigenous peoples in Canada, in ways that could be argued to already infringe upon their constitutionally protected rights.

At the international scale, the *United Nations Declaration on the Rights of Indigenous Peoples* (UNDRIP) enshrines many rights specific to Indigenous peoples that are relevant in a climate context, including the principle of Free, Prior and Informed Consent.[27] This principle requires that Indigenous groups be consulted and give consent prior to the initiation of a project that may affect their rights and interests, including indirect effects such as climate change impacts due to GHG emissions.[28] Given the federal government's endorsement without qualification of UNDRIP, its commitment to the Declaration's full implementation, and its support for Bill C-262, it would seem that the federal government would therefore be obligated to ensure that all future laws, including those related to GHG mitigation, be consistent with UNDRIP.[29]

On February 14, 2018, the Government of Canada announced that it will develop a Recognition and Implementation of Rights Framework in partnership with First Nations, Inuit and Métis Peoples.[30] As part of this initiative, the government released a set of *Principles respecting the Government of Canada's Relationship with Indigenous peoples* that will guide the government's implementation of UNDRIP through a review

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online: <https://www.taylorfrancis.com/books/9781439843444/chapters/10.1201/b11007-40 >; art 8(2)a) UNDRIP (cultural integrity).

[24] Environment and Climate Change Canada, "Impacts of Climate Change", 2015, online: <https://www.canada.ca/en/environment-climate-change/services/climate-change/impacts.html>.

[25] Government of Canada, *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy* (Gatineau: Environment and Climate Change Canada, 2016), p. 54, online: <http://publications.gc.ca/collections/collection_2017/eccc/En4-291-2016-eng.pdf>.

[26] See for example, Karine Péloffy, "Indigenous People Bringing Climate Justice to Canada", in *Climate Justice: Case Studies in Global and Regional Governance Challenges*, pp. 651–653.

[27] UN General Assembly, *United Nations Declaration on the Rights of Indigenous Peoples*, 2 October 2007, A/RES/61/295.

[28] Gwich'in Tribal Council submission, NEB Modernization Expert Panel, 30 March 2017, p.4;"Elders' Statement of the Advisory Committee on Climate Action and the Environment", 28 October 2018, online: <http://www.afn.ca/uploads/files/climate_change_fmm/16-12-09_accae_elders_statement_fe.pdf>.

[29] John Paul Tasker, "Liberal Government Backs Bill That Demands Full Implementation of UN Indigenous Rights Declaration", *CBC News*, 21 November 2017, online: <https://www.cbc.ca/news/politics/wilson-raybould-backs-undrip-bill-1.4412037>.

[30] Office of the Prime Minister, "Government of Canada to Create Recognition and Implementation of Rights Framework", *News Release*, February 14, 2018, online: <https://pm.gc.ca/eng/news/2018/02/14/government-canada-create-recognition-and-implementation-rights-framework>.

of policies and laws.[31] Principle #6, which enshrines Free, Prior and Informed Consent, provides that "the Government of Canada will look for opportunities to build processes and approaches aimed at securing consent" and "ensure that Indigenous peoples and their governments have a role in public decision-making".[32]

Further, Canadian constitutional law protects Indigenous Peoples' title, rights and treaties.[33] The constitutional nature of treaties and the government's obligation to conduct itself in accordance with the Honour of the Crown when fulfilling obligations under a modern treaty have recently been affirmed by the Supreme Court of Canada.[34] Indigenous rights, specifically Aboriginal title, can be established on unceded territory.[35] These constitutionally protected rights and interests could underline a claim to specific mitigation that would be ambitious and minimize impacts on Indigenous peoples. Indigenous groups must be engaged and consulted on climate mitigation action as a component of "reconciliation".[36]

The law should allow for meaningful Indigenous participation in and throughout project assessment and development.[37] Meaningful participation means "adequate notice, access to information and data, funding mechanisms, opportunities for review and comment, face-to-face hearings, early and ongoing participation throughout process stages".[38] "[T]he burden imposed on Indigenous groups' already limited capacity by having multiple governments departments consulting at the same time"[39] should also be considered. Indigenous groups have also stressed the importance of traditional knowledge and Indigenous oral evidence being heard and accepted in assessments.[40] This need is affirmed in the proposed federal impact assessment legislation.

The link between Indigenous rights and climate change is increasingly being made explicit. For example, at least one Indigenous group has put forward a position linking their specific rights based on Land Claim Agreements and specific aspects of climate change mitigation consideration in environmental assessment processes by recommending that project assessment should include upstream and downstream GHG emission and climate change impacts as mandatory evidence to be considered.[41] Thus,

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[31] Department of Justice Canada, *Principles Respecting the Government of Canada's Relationship with Indigenous Peoples*, 2018, p.3, online: <http://www.justice.gc.ca/eng/csj-sjc/principles.pdf>.
[32] Department of Justice Canada, *Principles Respecting the Government of Canada's Relationship with Indigenous Peoples*, 2018, pp.12-13, online: <http://www.justice.gc.ca/eng/csj-sjc/principles.pdf>.
[33] For rights protected by s.35 of the Canadian constitution see Karine Péloffy, "Indigenous People Bringing Climate Justice to Canada", in *Climate Justice: Case Studies in Global and Regional Governance Challenges*, pp. 653-657; for individual rights protected by the Charter see Karine Péloffy, "Indigenous People Bringing Climate Justice to Canada", in *Climate Justice: Case Studies in Global and Regional Governance Challenges*, pp.657-661.
[34] *First Nation of Nacho Nyak Dun* v. *Yukon*, 2017 SCC 58
[35] *Tsilhqot'in Nation v. British Columbia*, [2014] 2 S.C.R. 257.
[36] Gwich'in Tribal Council submission, NEB Modernization Expert Panel, 30 March 2017, p.3.
[37] *Ibid.,* p.3.
[38] *Ibid.,* p.4.
[39] *Ibid.,* p.3.
[40] *Ibid.*, p.4.
[41] *Ibid.*, p.7.

Indigenous rights will have to be taken into account in all processes and decisions relating to assessments and approvals of projects and programs going forward.

1.3 Interrelationships among climate, biodiversity, sustainability

The United Nation Framework Convention on Climate Change (UNFCCC) negotiated in 1992 sets the foundations for global responses to climate change. As summarized by Carazo and Klein, the UNFCCC

> provides that responses to climate change should be "coordinated with social and economic development in an integrated manner" (preambular clause 21), that the stabilization of GHG concentrations in the atmosphere "should be achieved within a time frame sufficient… to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner" (Article 2), and that Parties have a right to, and should, promote sustainable development (Article 3.4).[42]

The *Paris Agreement* further conceives of mitigation actions as having the co-benefit of sustainability and biodiversity.[43] The Agreement is "fully cognizant of the SDGs [(United Nations Sustainable Development Goals)][44] and recognizes sustainable development explicitly and repeatedly in many of its provisions as providing the context in which parties are expected to implement their actions".[45] UNFCCC Decision 1/CP.21, which adopted the *Paris Agreement,* sets the context for implementation with "an explicit reference to the 2030 Agenda for Sustainable Development, indicating the linkage between the climate regime and the Sustainable Development Goals".[46] Carazo and Klein note, "The inclusion of sustainable development in Article 2.1 in particular sets clear expectations on how the objectives of the Agreement should be pursued, which points to an integrated and synergetic approach to implementation".[47] The *Paris Agreement* also refers to complementary notions such as "poverty eradication", "ending hunger", biodiversity, preserving forests, oceans and ecosystems.[48]

There are a number of ways in which sustainability, specifically the SDGs, can be incorporated into pathways for combating climate change through an integrated approach, notably in the areas of land degradation (SDG 15.3), adaptation (Article 7.9

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[42] María Pía Carazo and Daniel Klein, "Implications for Public International Law: Initial Considerations", in *The Paris Agreement on Climate Change: Analysis and Commentary*, ed. by Daniel Klein and others (Oxford: Oxford University Press, 2017) p. 402.

[43] Harald Winkler, "Mitigation (Article 4)", in *The Paris Agreement on Climate Change: Analysis and Commentary*, ed. by Daniel Klein and others (Oxford: Oxford University Press, 2017), p. 153.

[44] United Nations, "About the Sustainable Development Goals", online: <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>.

[45] *Paris Agreement*, especially articles 2.1, 4.1, and 6.8; Preambular recital, para 8; Carazo and Klein p.408.

[46] UNFCCC, *Decision 1/CP.21* Adoption of the Paris Agreement (December 2015), online: <https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf>; Carazo and Klein, p. 402.

[47] Ibid., p. 402.

[48] *Paris Agreement,* especially the preamble and Articles 5-7.

e); SDG 1.5), the protection of forests and carbon sinks (Article 5; SDG 15.2), the protection of oceans (SDG 14, 14.3), food security, and renewable energy.[49]

Further, the *Paris Agreement* enshrines the principle of a just transition of the workforce.[50] The *Paris Agreement* requires "[n]ational plans on climate change that include just transition measures with a centrality of decent work and quality jobs".[51] A just transition "ensures environmental sustainability as well as decent work, social inclusion and poverty eradication".[52] These objectives are entrenched in the UN Sustainable Development Goals 1, 7, 8 and 13.[53] According to the International Labour Organization's guidelines, the *Paris Agreement*'s principle of "just transition" "can become a strong driver of job creation, job upgrading, social justice and poverty eradication. Greening all enterprises and jobs by introducing more energy and resource efficient practices, avoiding pollution and managing natural resources sustainably leads to innovation, enhances resilience and generates savings which drive new investment and employment".[54]

Ecosystem integrity, the relationship between biodiversity, sustainability, and climate is a critical consideration. Indeed, the SDGs deem biodiversity as "essential to sustainable development" with biodiversity and ecosystems prominently featured across many of the goals themselves and associated targets. The agendas of several international frameworks, such as the Convention on Biological Diversity, are tightly linked with that of UNFCCC[55]. The then Deputy Executive Secretary of the UN Climate secretariat, Richard Kinley, remarked: "The policy frameworks for action on climate change and biodiversity are largely in place. Now, the overarching priority is accelerated implementation. The interrelation between climate change, biodiversity and human well-being is clear and compelling. Together we can generate extraordinary outcomes towards the safe and sustainable future envisioned in the UN's Sustainable Development Goals".[56] With this in mind, it bears restating that wherever possible, synergies between sustainability, biodiversity protection and climate mitigation and adaptation should be

[49] Ibid., pp. 408-409.
[50] *Paris Agreement,* preambular recital, para 10.
[51] Sharan Burrow, *Foreword: The Imperative of a Just Transition* (Just Transition Centre, May 2017), p. 1, online: <https://www.oecd.org/environment/cc/g20-climate/collapsecontents/Just-Transition-Centre-report-just-transition.pdf>.
[52] Ibid., p. 1.
[53] UN General Assembly, *Transforming Our World: The 2030 Agenda for Sustainable Development*, 21 October 2015, A/RES/70/1, online: <https://www.refworld.org/docid/57b6e3e44.html>.
[54] International Labour Organization, *Guidelines for a Just Transition towards Environmentally Sustainable Economies and Societies for All* (Geneva: International Labour Organization, 2015), p. 4, online: <http://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_432859.pdf>.
[55] See, for example, the recognition that these various international conventions (agreements) and commitments are tightly linked and must work together, United Nations Convention to Combat Desertification, "UNCCD, CBD and UNFCCC Joint Liaison Group", online: <https://www.unccd.int/convention/about-convention/unccd-cbd-and-unfccc-joint-liaison-group>.
[56] United Nations Framework Convention on Climate Change, "Climate Change and Biodiversity: Opportunities and Risks", *IPBES News* (Bonn, Germany, 7 March 2017), online: <https://unfccc.int/news/climate-change-and-biodiversity-opportunities-and-risks>.

sought.

1.4 Precaution guiding consideration of and responses to the technological and socio-political challenges of meeting mitigation obligations

In light of the uncertainties associated with climate science, mitigation approaches and technologies, the principle of precaution should be the cornerstone of action. This principle has been part of the climate framework from the very start, as evidenced by the UNFCCC's commitment to take precautionary measures.[57] In a sense, the global community has already passed the opportunity to deal with climate change in a precautionary manner. In many ways, climate mitigation is now an emergency and rapid action is necessary. In undertaking this ambitious mitigation, precaution to avoid doing further harm and respect for human rights should guide the way.

In summary, these considerations provide the fundamental backdrop of climate mitigation action in Canada and must provide the foundation for the new national paradigm as the country moves towards meeting its *Paris Agreement* commitments.

Conclusions and recommendations from Part 1

Climate inaction and poorly planned and implemented climate action have human rights implications. Consequently, human rights considerations must guide the global response to climate change, including the implementation of the *Paris Agreement*. Unfolding climate justice court cases will provide some clarity regarding the duties of states and corporate actors.

Indigenous rights and their broader context (self-determination; nation-to-nation relationships, etc.) will have to be respected in all processes and decisions relating to assessments and approvals of projects and programs in Canada.

The tendency of our political and economic institutions to only take into account short-term problems is a critical barrier to addressing the "super wicked problem" of climate change.

In many ways, climate mitigation is now an emergency and rapid action is necessary. In undertaking this ambitious mitigation, precautionary avoidance of further harm and respect for human rights should guide the way.

[57] United Nations Framework Convention on Climate Change, 9 May 1992, 1771 UNTS 107, 31 ILM 849 art 3.3 (1992) (entered into force 21 March 1994) [UNFCCC (1992)], online: <https://unfccc.int/resource/docs/convkp/conveng.pdf>.

Part 2. Implications of Paris: Understanding Canada's fair share of climate mitigation

Part 2 focuses on global GHG mitigation targets and deadlines, and their overall implications for Canadian targets and deadlines. It surveys key terminology and analytical approaches – how best to conceptualize and frame the national obligations arising from the *Paris Agreement* objectives while incorporating our best understandings of climate change phenomena and system responses to mitigation efforts. The discussion also involves history, law, capacities and ethics and raises fundamental questions of justice at multiple scales. Responses to the questions involved entail judgments about the merits of various approaches to determining each country's fair share of the needed efforts, and the practical implications of choosing one approach (and its potential effects) over another. Finally, the range of potentially defensible responses to many of the questions requires identification of responsible and feasible working positions.

The *Paris Agreement* "is a dynamic climate governance system that aspires to be durable and to achieve its purpose and long-term goals through a process of iterative increases in individual and collective ambition".[58] Hence, by its very design, the *Agreement* is meant to act as a mechanism for driving up global efforts over time. Given the past record of missed climate mitigation targets, the aspirational quality of some of the Paris commitments, and evidence that climate changes may be occurring faster than predicted,[59] we assume in the discussion below that policy making must anticipate more ambitious international targets and deadlines in the coming years. This also applies to any present conclusions about the Canadian fair share of effort required to meet the *Paris Agreement* objectives. Consequently, conclusions made today about the implications of the *Paris Agreement* and Canada's fair share of responsibilities are interim, and representative of a minimum requirement for what is to be accomplished in the foreseeable future. Where we can do more, we should.

2.1 Implications of Paris for GHG emissions reduction

The international climate framework aims to avoid a dangerous interference with the climate system, which is understood as limiting total warming to a certain temperature threshold that hopefully avoids the most egregious risks and impacts. The *Paris Agreement* is the most ambitious international agreement in terms of temperature goal, aiming to keep overall global warming to "well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial

[58] Lavanya Rajamani and Emmanuel Guérin, "Central Concepts in the Paris Agreement and How They Evolved", in *The Paris Agreement on Climate Change: Analysis and Commentary*, ed. by Daniel Klein and others (Oxford: Oxford University Press, 2017), p. 74.

[59] See for example, Arctic Monitoring and Assessment Programme, *Snow, Water, Ice and Permafrost in the Arctic (SWIPA) Assessment Summary for Policy-Makers*, 2017, online: <http://s3.documentcloud.org/documents/3677458/SNOW-WATER-ICE-AND-PERMAFROST-SUMMARY-FOR-POLICY.pdf>.

levels."[60] It aims to achieve this ambitious temperature goal 1) by rapidly reaching peak greenhouse gas emissions (to happen earlier in developed countries), and 2) through achieving "a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century."[61]

There is still significant uncertainty concerning the specification of these two goals and implications for national GHG reductions. Models of how to keep global warming within the new temperature limits are few and tentative, and new reports on compliant mitigation pathways as well as methodologies and procedures are not to be developed under the *Paris Agreement* until later in 2018. Important questions will remain even after that work is completed. For needed immediate action, however, we must prepare basic working answers. We start with the first big question: *how do the Paris temperature goals translate into global and national GHG reduction targets?*

In the 1992 *United Nations Framework Convention on Climate Change* (UNFCCC), the international community aimed to "stabiliz[e] greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" knowing that "such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner".[62]

The 2015 *Paris Agreement*, an international treaty adopted under the umbrella of the UNFCCC, introduced a temperature-based threshold, rather than a threshold based on greenhouse gas levels in the atmosphere, which underpinned most previous international efforts. It requires mitigation achievements sufficient to keep the GHG-driven rise of global temperatures "well below 2°C and to pursue efforts to limit the increase to 1.5°C above pre-industrial levels"[63], the most ambitious temperature goal to date in international climate law. The agreement also explains that the aim is "to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty".[64]

Establishing those points in an agreement with 197 countries was a significant accomplishment.[65] Also notable is the reiteration of the UNFCCC's principle that action is to occur "on the basis of equity" (reiterating "fair share" obligations), and that mitigation must be enacted early enough to adaptation of ecological, human and food systems. The fact that the *Paris Agreement* integrates mitigation efforts with other objectives to serve broader sustainability imperatives speaks to the comprehensive nature of the agenda. Not surprisingly, however, the *Paris Agreement* has left some substantial uncertainties about the target and the deadline for the global GHG emission

[60] *Paris Agreement*, art 2(1)(a).
[61] *Paris Agreement*, art 4(1).
[62] UNFCCC (1992), art. 2
[63] *Paris Agreement*, art 2.
[64] *Paris Agreement*, art 4.1.
[65] At the time of writing, 175 out of the 195 signatories had ratified the *Paris Agreement*.

reductions needed to meet the Paris commitments. Moreover, the *Agreement* itself does not establish binding targets for individual countries - those are determined by countries themselves in domestic processes, subject to iterative "ratcheting" through *Paris Agreement* provisions.

Two key considerations do seem clear. First, the global objective has been tightened (from 2°C to "well below 2°C and pursuing efforts to limit the increase to 1.5°C above pre-industrial levels") and could tighten further in light of better scientific understanding of climate change mechanisms and perils, and more enlightened attention to global responsibilities.

Second, the overall objective has major implications for the pace of needed mitigation achievement.[66] Consequently, the temperature target, timing of emissions peak and the ultimate deadlines need to be considered together.

Concerning the target, the most obvious question is as follows.

2.1.1 What qualifies as limiting global warming "well below 2°C and pursuing efforts to limit the increase to 1.5°C above pre-industrial levels" in climate science?

In the history of the UNFCCC, efforts to understand how to avoid dangerous climate change through evolving climate science and reports developed by the Intergovernmental Panel on Climate Change (IPCC) have at least partially informed the political goal-setting process throughout the negotiations.

Developed countries, starting with the European Council in 2005, have been advocating that temperature increase should not exceed 2°C above pre-industrial levels, whereas vulnerable countries have since 2009 consistently asked for the upper limit to be set at 1.5°C.[67] In 2015, Canada also endorsed this more ambitious target as the global goal and pushed for its inclusion in the final *Paris Agreement*.[68]

The *Paris Agreement* clearly implies that 2°C is too high to be a hard limit on global

[66] United Nations Environment Programme, *The Emissions Gap Report 2015* (Nairobi, November 2015), p. 28, online: <http://uneplive.unep.org/media/docs/theme/13/EGR_2015_301115_lores.pdf>. See also International Energy Agency and International Renewable Energy Agency, *Perspectives for the Energy Transition: Investment Needs for a Low-Carbon Energy System*, 2017, pp. 7–8, online: <https://www.energiewende2017.com/wp-content/uploads/2017/03/Perspectives-for-the-Energy-Transition_WEB.pdf>.

[67] Halldór Thorgeirsson, "Objective (Article 2.1)", in *The Paris Agreement on Climate Change: Analysis and Commentary*, ed. by Daniel Klein and others (Oxford: Oxford University Press, 2017), pp. 125–26. See also "1.5°C Temperature Limit - Key Facts", *Climate Analytics*, online: <https://climateanalytics.org/briefings/15c-key-facts/>.

[68] The Canadian Press, "COP21: Catherine McKenna Endorses Goal of Limiting Warming to 1.5 Degrees C", *CBC News*, 8 December 2015, online: <https://www.cbc.ca/news/politics/mckenna-cop21-paris-goal-1.3355409>.

warming – a "defence line"[69] – and efforts should "be made to push the defence line as low as possible"[70] towards 1.5°C.

The Paris objective implies making efforts towards greater probability of keeping temperatures as close to 1.5°C and as far away from 2°C as possible. Even if there are 1.5°C scenarios available, clarifying the implications of the *Paris Agreement* was a challenge because some climate modelling agencies have used low end scenarios "with a limit for global warming of 2°C but rarely below".[71] However, we can gain a reasonable working understanding on the basis of existing information.

An important recent finding of modelling exercises and scientific observations so far is that "warming responds approximately linearly to cumulative CO_2 [carbon dioxide] emissions over time".[72] The hard limit on temperature rise in the *Paris Agreement* implies near-zero emissions at some point in the future,[73] and this likewise implies a hard cap on cumulative emissions. Based on this understanding, climate scientists have proposed the concept of a "carbon budget", which is equal to the total amount of emissions that can be allowed without surpassing a given temperature increase (see Box 1 for more details).

Box 1. Carbon Budget

A ***"carbon budget"*** is the amount of GHG emissions that can be emitted without exceeding, or with exceeding and subsequently returning to, a specified increase in global temperature[74].

[69] Technical Summary, Report on the Structured Expert Dialogue on the 2013-2015 Review of the UNFCCC (2015 FCCC/SB/2015/INF.1, UNFCCC, Subsidiary Body for Implementation (SBI) and Subsidiary Body for Scientific and Technological Advice (SBSTA), Bonn, Germany) 9, online: <https://unfccc.int/resource/docs/2015/sb/eng/inf01.pdf> (last accessed 18 January 2019), 4-34, cited in Andreas Fischlin, "Background and Role of Science", in *The Paris Agreement on Climate Change: Analysis and Commentary*, ed. by Daniel Klein and others (Oxford: Oxford University Press, 2017), p. 14.

[70] Technical Summary, Report on the Structured Expert Dialogue on the 2013-2015 Review of the UNFCCC (2015 FCCC/SB/2015/INF.1, UNFCCC, Subsidiary Body for Implementation (SBI) and Subsidiary Body for Scientific and Technological Advice (SBSTA), Bonn, Germany) 9, online: <https://unfccc.int/resource/docs/2015/sb/eng/inf01.pdf> (last accessed 18 January 2019), 4-34, cited in Fischlin, p. 14.

[71] Fischlin, p. 16. See also IPCC, *Climate Change 2014, Synthesis Report Summary for Policymakers*, 2014, p. 22, online: <https://www.ipcc.ch/site/assets/uploads/2018/02/AR5_SYR_FINAL_SPM.pdf>.

[72] H. Damon Matthews and others, "Estimating Carbon Budgets for Ambitious Climate Targets", *Current Climate Change Reports*, 3.1 (2017), 69, online: <https://doi.org/10.1007/s40641-017-0055-0>. See also IPCC, *Climate Change 2014, Synthesis Report Summary for Policymakers*, 2014, p. 8. It should be highlighted that linearity of warming doesn't mean linearity of impacts, given the behaviour of complex systems, in which linearity is observed up to a threshold after which change can be seriously non-linear.

[73] H. Damon Matthews and Ken Caldeira, "Stabilizing Climate Requires Near-Zero Emissions", *Geophysical Research Letters*, 35.4 (2008) , online: <https://doi.org/10.1029/2007GL032388>.

[74] See Joeri Rogelj and others, "Differences between Carbon Budget Estimates Unravelled", *Nature Climate Change*, 6 (2016), 245, online: <https://doi.org/10.1038/nclimate2868> for an in-depth review of carbon budgets and their nuanced differences:

It is important to note that a carbon budget should not be interpreted as a license to pollute. Climate scientist, Ken Caldeira, cautions people against misinterpreting what a carbon budget means:

"There are no such things as 'allowable CO_2 emissions'. There are only 'damaging CO_2 emissions' or 'dangerous CO_2 emissions'."[75]

In other words, there is no safe amount of warming or interference with the climate. Mitigation should be as ambitious as possible, and there should be no illusions that there is a "safe amount of allowable emissions" that follows from a carbon budget estimation.

It is important to note that as of 2010, there was no carbon budget left for a very high likelihood of avoiding 2°C — we have already used up our 90% probability of remaining below 2-degree budget[76]. In this sense, it is highly dubious that there even exists such a thing as a "fair share" of the carbon budget, since 1) there is really nothing to be shared and 2) emissions result in exacerbating inequalities between those who have caused climate change and those who are and will suffer from its impacts the most[77].

Critics of the budget framing suggest that the carbon budget represents an emergency measure. For example, Spratt makes the argument that framing the carbon quota in the language of the budget will encourage policymakers to use up and increase the likelihood of overusing the carbon budget, as is often the convention with financial budgets[78]. Perhaps using the term "quota" rather than "budget" would help dissuade policymakers of the rationale that if there is a budget, it is intended, and indeed safe to be used.

Each unit of carbon dioxide warms the atmosphere an equal amount, regardless of the time and location of its emission.[79] Cumulative carbon dioxide emissions can therefore be used as a more robust way of quantifying targets than sparsely spread out annual targets, usually in the distant future, as the later do not prescribe a specific emissions trajectory, and hence can lead to a wide range of cumulative emissions and

[75] See David Spratt, *Recount: It's Time to "Do the Math" Again* (Breakthrough Institute, April 2015), online: <https://docs.wixstatic.com/ugd/148cb0_bb2e61584dbb403e8e33fd65b1c48e30.pdf>for further discussion on the dangerous thinking of bargaining and for atmospheric capacity with carbon budget thinking.

[76] Joeri Rogelj, and others, "Emission Pathways Consistent with a 2 °C Global Temperature Limit", *Nature Climate Change*, 1 (2011), 413, online: <https://doi.org/10.1038/nclimate1258>.

[77] Glenn Althor, James E. M. Watson, and Richard A. Fuller, "Global Mismatch between Greenhouse Gas Emissions and the Burden of Climate Change", *Scientific Reports*, 6.20281 (2016), online: <https://doi.org/10.1038/srep20281>.

[78] David Spratt, *Recount: It's Time to "Do the Math" Again* (April 2015)

[79] H. Damon Matthews, Nathan P. Gillett, and others, "The Proportionality of Global Warming to Cumulative Carbon Emissions", *Nature*, 459 (2009), 829–32, online: <https://doi.org/10.1038/nature08047>.

corresponding warming outcomes.[80] By instead using cumulative emissions over a given period of time, i.e. the sum of annual emissions over said interval, policymakers ensure that national emissions abide by a fixed contribution to warming.

The larger the allowed temperature increase in the models, the larger the carbon budget may be. Similarly, the larger the acceptable probability of failure to stay within this temperature threshold is, the larger the budget can be. A further dimension is whether temperatures are allowed to go past, or "overshoot" a given temperature threshold before returning to that limit at a specified date.[81] However, ethical question may rise on whether it's appropriate for us, today, to commit future generations to pay back our carbon debt.

There is some debate about the remaining global carbon budget. The scenarios currently used by the latest IPCC reports indicate that the 1.5°C and well below 2°C targets can be quantified using the standard probabilities in the modelling community. Although ultimately arbitrary, it could be said that the most generous possible Paris-compliant window would be the range from 50% chance of returning to 1.5°C by 2100 and 66% chance of staying below 2°C.[82] Any 2°C target that allowed overshoot or a higher likelihood of failure could not justifiably be read as "well-below 2°C." Well-below 2°C would warrant using a higher likelihood of avoidance, meaning a higher chance (e.g., 75% or 99%) of avoiding crossing the 2°C threshold, which would make the target much more stringent and level of action required much more pronounced.

The IPCC's Special Report on 1.5°C released in October 2018 includes scenarios with 66% probability of returning to 1.5°C[83]. The pre-existing IPCC suite of scenario models did not tell us enough about keeping within the 1.5°C limit.[84]

Based on recent analyses, it appears that "while the CO_2-only carbon budget is a robust upper bound on allowable emissions for a given climate target, the size of the effective

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[80] Matthews H. Damon, Solomon Susan, and Pierrehumbert Raymond, "Cumulative Carbon as a Policy Framework for Achieving Climate Stabilization", *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 370.1974 (2012), 4365–79, online: <https://doi.org/10.1098/rsta.2012.0064>.

[81] Allowing for overshoot could be analogized to taking on debt whilst also seemingly growing the remaining budget. Precisely, allowing for overshoot increases the amount of (gross) emissions that can be put into the atmosphere (if matched by a promise to take them back out, permanently, later) but not the total amount of cumulative net emissions. Joeri Rogelj and others, "Differences between Carbon Budget Estimates Unravelled", (2016).

[82] IPCC, *Climate Change 2014, Synthesis Report Summary for Policymakers*, 2014, p. 20

[83] IPCC, "Summary for Policymakers", in *Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*, 2018, online: <https://www.ipcc.ch/sr15/>.

[84] Only the IPCC's RCP 2.6 scenario ensemble presents a less than 50% chance of not exceeding 2°C and no scenario with a higher than 50% chance of not exceeding 1.5°C and is probably insufficiently consistent with the precautionary principle. Intergovernmental Panel on Climate Change, "Assessing Transformation Pathways", in *Climate Change 2014: Mitigation of Climate Change: Working Group III Contribution to the IPCC Fifth Assessment Report* (Cambridge: Cambridge University Press, 2015), p. 431, online: <https://doi.org/10.1017/CBO9781107415416.012>.

carbon budget is dependent on the how quickly we are able to mitigate non-CO_2 greenhouse gas and aerosol emissions".[85] Therefore the overall GHG mitigation goal should be further specified to recognize the differences among GHGs' persistence in the atmosphere and global warming potential, and their different implications for abatement targets and other response options. This will be explored in the Canadian context in Part 3.[86]

Table 1. Global Carbon Budgets for an Even Chance of 1.5°C and a Likely Chance of 2°C.

	1.5°C (50%)	2°C (66%)
Carbon Budget (Remaining after 2011) [Gt CO_2][87]	550	1000
Emissions from 2011 to 2017 [Gt CO_2][88]	234	234
Post-2017 Carbon Budget [Gt CO_2]	316	766
Estimated global emissions rate [Gt CO_2/year][89]	41	41
Years remaining at current emissions rate	**8**	**19**

Data found in Table 1 are from the IPCC AR5 and Global Carbon Project. All emissions are in carbon dioxide only, from the burning of fossil fuels and other industrial processes. Note that these budgets are smaller when factoring in the emissions from non-CO_2 greenhouse gases.

The IPCC's AR5 estimate of a global carbon budget for 1.5°C, even with the most lenient chance of success (50% likelihood of staying below), would be exhausted in eight years at current global emissions rates and even the 2°C budget would be

[85] H. Damon Matthews and others, "Estimating Carbon Budgets for Ambitious Climate Targets", (2017).
[86] The main GHGs are usually listed as carbon dioxide, methane, nitrous oxide, and several categories of fluorinated gases. See Environment and Climate Change Canada, "Global Warming Potentials", 2017, online: <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/quantification-guidance/global-warming-potentials.html>.
[87] IPCC 2014, *Climate Change 2014: Synthesis Report*. Table 2.2; This work was undertaken before the release of the IPCC SR1.5 (2018) report therefore does not include these latest and larger carbon budgets that also show greater uncertainty.
[88] "CO2 Emissions", *Global Carbon Atlas*, 2017, online: <http://www.globalcarbonatlas.org/en/CO2-emissions>.
[89] See Jeff Tollefson, "World's Carbon Emissions Set to Spike by 2% in 2017", *Nature News*, 551.7680 (2017), 283, online: <https://doi.org/10.1038/nature.2017.22995>.

exhausted within 20 years.

The recent IPCC special report on global warming of 1.5°C suggests carbon budgets of 750GtCO_2 and 550GtCO_2 respectively for the 50% and 66% non-exceedance probabilities.[90] According to the report, if global emissions decline linearly starting in 2018, net zero emissions would need to be achieved somewhere between 25 and 35 years (though considering uncertainties, this might be as little as 5 and 15 years, respectively).[91]

There are no decarbonization pathways that would allow us to not exceed the 1.5°C carbon budget without imposing restrictions on people's consumption or lifestyle. Without rapidly phasing out the use of fossil fuels and other GHG-emitting activities, substantial negative emissions, yet to be proven possible, are the only way to meet the 1.5°C limitation objective[92].

It is not the place of this report to determine the size of the carbon budget that most appropriately reflects the *Paris Agreement* targets; however, the most suitable figure is likely somewhere between the two estimates of the remaining carbon budget in Table 1. Thus, while there is some debate about the remaining budget, it is much smaller than is recognized in current policy making.

Being clear about the specific goal is important. The difference, even between 1.5°C and 1.6°C or the length and magnitude of a possible overshoot, is likely to have a substantial effect on the implications for what level of mitigation needs to be achieved by what date. Such differences also have important practical consequences. Less ambitious goals with later deadlines entail more damage and risk for future generations and especially on people who are already disadvantaged (poor, vulnerable, reliant on the land for sustenance, living in areas already stressed by conflict, etc.). Still, setting ambitious goals and early deadlines without contemplating serious restructuring of energy and economic systems encourages a delusional reliance on untested negative emissions technologies being deployed on an industrial scale in the long term, with potentially serious adverse global side effects.[93]

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[90] IPCC, "Chapter 2 Mitigation pathways compatible with 1.5°C in the context of sustainable development," *Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*, 2018, online: <https://www.ipcc.ch/sr15/> , p. 2-5.

[91] *Ibid*. p. 2-21.

92 See, for example, Arthur Neslen, "EU Says 1.5C Global Warming Target Depends on 'Negative Emissions' Technology", The Guardian, 14 December 2015, section Environment, online: <https://www.theguardian.com/environment/2015/dec/14/eu-says-15c-global-warming-target-depends-on-negative-emissions-technology>.

[93] IPCC 2014, "Summary for Policymakers", in *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press), p.10, online: <https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_summary-for-policymakers.pdf>. With current levels of reduction ambition towards 2020, all global pathways

Many questions in determining GHG targets and deadlines remain, however.

2.1.2 How is the ultimate global GHG mitigation goal to be defined?

There is the matter of translating the chosen temperature stabilization point to a goal for global emission mitigation. Article 4.1 of the *Paris Agreement* states:

> "In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach **global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties**, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a **balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century**, on the basis of **equity**, and in the context of sustainable development and efforts to eradicate poverty." (Our emphasis)

In any definition, the time frame for getting to global net zero emissions is key. The deadline for decarbonisation has major implications for many long-existing projects and programs with long-term effects. It would affect, for example, the selection of a cut-off period beyond which proposals for new fossil fuel exploration and extraction initiatives will stop being considered. Moreover, the requirements to act with "equity, and in the context of sustainable development and efforts to eradicate poverty" demand greater achievements from advantaged countries such as Canada.

The *Paris Agreement* requires reduction of net anthropogenic GHG emissions to zero (GHG neutrality, such that emissions must be balanced by deliberate removals from the atmosphere) in time to prevent overall warming from crossing the well below 2°C or 1.5°C threshold.[94] That means reaching the point at which any remaining human-caused GHG emissions are offset (in effect captured and retained in perpetuity) by human enhancements of and additions to natural GHG sinks (e.g., forests, bogs and soils) or engineered facilities (using negative emissions technologies or more specific carbon dioxide removal technologies; e.g., direct air capture and storage in geological formations).[95]

Many different ways of expressing the objective – deep decarbonisation, net-zero GHG

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remaining under 2°C overshoot the budget and rely on negative emission technology. United Nations Environment Programme, *The Emissions Gap Report 2015*, p. 28.

[94] *Paris Agreement,* art 4.1.

[95] Sink enhancement options are subject to debate about whether and which enhanced sinks sequester carbon/GHGs in perpetuity (e.g., forests burn and GHGs may leak from geological formations). Kelly Levin, Jiawei Song, and Jennifer Morgan, "COP21 Glossary of Terms Guiding the Long-Term Emissions-Reduction Goal", *World Resources Institute*, 2015, online: <https://www.wri.org/blog/2015/12/cop21-glossary-terms-guiding-long-term-emissions-reduction-goal>.

emissions, carbon neutrality, climate neutrality – were suggested and rejected during the final phase of the Paris negotiations, although referring to the balance between anthropogenic sources and sinks can be interpreted as an oblique reference to "net-zero GHG emissions".[96] Each of these terms has distinct complexities and drawbacks, we review each of them to provide basic lexical guidance.

Greenhouse gas emissions neutrality implies annual zero net anthropogenic greenhouse gas emissions by a certain date. By definition, greenhouse gas emissions neutrality means every tonne of anthropogenic GHGs emitted is compensated with an equivalent amount of GHGs removed through human action (e.g., via carbon sequestration).[97]

Confusion can arise at the domestic level since "neutrality can be achieved at the domestic level with offsets from other jurisdictions, while net zero emissions does not have the same connotation (though theoretically could be met via offsets). Both terms risk overshooting the carbon budget unless complemented by short-term emissions reduction targets."[98]

Given the complexity and potential confusion of the GHG neutrality concept[99], and the relatively untested nature of anthropogenic GHG removals by sinks, it may be preferable, to continue considering alternatives that convey a more easily understood basic target, e.g., use of the terms "decarbonisation" and/or "fossil fuel phase-out".

Decarbonization literature focuses on decreasing carbon dioxide emissions from anthropogenic sources – especially energy systems and energy use in industrial production, transportation, agriculture and other sectors. When it is used to cover all GHGs, the accessible term is slightly misleading as some GHGs are not carbon based. Decarbonization "implies a shift away from burning carbon-containing fossil fuels. This can be made firmer with 'full decarbonization"',[100] which "means zero unabated (not captured by carbon sequestration or storage) CO2 emissions from energy generation and industrial processes."[101] The Canadian government does refer to decarbonization in its Mid-Century Long-Term Low-Greenhouse Gas Development Strategy.[102]

Decarbonization calls for a decrease in the ratio of carbon dioxide or all GHG emissions

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[96] Lavanya Rajamani and Emmanuel Guérin, "Central Concepts in the Paris Agreement and How They Evolved", (2017), p.76.

[97] Kelly Levin, Jiawei Song, and Jennifer Morgan, "COP21 Glossary of Terms Guiding the Long-Term Emissions-Reduction Goal", 2015.

[98] Ibid.

[99] "GHG neutrality" seems to have introduced openings for serious misunderstandings, such as in the mitigation commitment declarations of some nations that confuse neutrality with stabilizing emissions. See Kelly Levin, Jiawei Song, and Jennifer Morgan, "COP21 Glossary of Terms Guiding the Long-Term Emissions-Reduction Goal", 2015

[100] Simon Evans, "Explainer: The Long-Term Goal of the Paris Climate Deal", *Carbon Brief*, 2015, online: <https://www.carbonbrief.org/explainer-the-long-term-goal-of-the-paris-climate-deal>.

[101] Kelly Levin, Jiawei Song, and Jennifer Morgan, "COP21 Glossary of Terms Guiding the Long-Term Emissions-Reduction Goal", 2015

[102] Government of Canada, *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy* (2016), p. 6 and 75.

related to primary energy production.[103] More specifically,

> "In all national scenarios, the deep decarbonization of energy systems involves strong action on three pillars of decarbonization: (i) energy efficiency and conservation; (ii) decarbonization of energy carriers (electricity and fuels); and (iii) fuel switching toward low-carbon energy carriers in end-use sectors."[104]

Although a less inclusive terminology, "fossil fuel phase-out" may be preferable for focused and saleable policy. The combustion of fossil fuels "accounts for about 90.5% of total global CO2 emissions, excluding those from forest fires and the use of wood fuel".[105] The full exploitation of existing fossil fuel reserves severely threatens the goals of the *Paris Agreement*.[106] In the Canadian context, fossil fuels are responsible for over 80% of Canadian GHG emissions.[107] Hence, defining the goal as fossil fuel phase out could be a clearer reference point. Already, Canada played a leadership role at the 2017 COP by co-founding the Powering Past Coal Alliance and leading nations towards a coal phase-out in energy generation.[108]

A study found that a total phase-out of fossil fuel use worldwide by 2025-30 is required to limit warming to 1.5°C,[109] while another found such a feat to be achievable.[110]

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[103] See Frank Jotzo, "Decarbonizing the World Economy", *The Solutions Journal*, 7.3 (2016), pp. 74–83, online: <https://www.thesolutionsjournal.com/article/5698/>.

[104] High-Level Commission on Carbon Prices, *Report of the High-Level Commission on Carbon Prices* (Washington, D.C.: World Bank, 29 May 2017), p. 31, online: <https://static1.squarespace.com/static/54ff9c5ce4b0a53decccfb4c/t/59b7f2409f8dce5316811916/1505227332748/CarbonPricing_FullReport.pdf>.

[105] Olivier Jos G.J and others, *Trends in Global CO2 Emissions: 2016 Report* (The Hague: PBL Netherlands Environmental Assessment Agency, 2016), p. 48, online: <http://edgar.jrc.ec.europa.eu/news_docs/jrc-2016-trends-in-global-co2-emissions-2016-report-103425.pdf>.

[106] Greg Muttitt, *The Sky's Limit: Why the Paris Climate Goals Require a Managed Decline of Fossil Fuel Production* (Washington, D.C.: Oil Change International, September 2016), p. 7, online: <http://priceofoil.org/content/uploads/2016/09/OCI_the_skys_limit_2016_FINAL_2.pdf>.
In fact, "[t]he potential carbon emissions from the oil, gas, and coal in the world's currently operating fields and mines would take us beyond 2°C of warming. The reserves in currently operating oil and gas fields alone, even with no coal, would take the world beyond 1.5°C" (Muttitt, p. 5).

[107] Environment and Climate Change Canada, *Environment and Climate Change Canada. (2016). National Inventory Report 1990–2014: Greenhouse Gas Sources and Sinks in Canada*, 2016, online: <http://publications.gc.ca/collections/collection_2016/eccc/En81-4-1-2014-eng.pdf>; see also Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 7, online: < http://sustainablecanadadialogues.ca/pdf_2017/ReEnergizing_Final.pdf >.

[108] Government of Canada, "Powering Past Coal Alliance Declaration", 2017, online: <https://www.canada.ca/en/services/environment/weather/climatechange/canada-international-action/coal-phase-out/alliance-declaration.html>.

[109] Megan Darby, "Scientists: 1.5C Warming Limit Means Fossil Fuel Phase-out by 2030", *Climate Home News*, 7 December 2015, online: <http://www.climatechangenews.com/2015/12/07/scientists-1-5c-warming-limit-means-fossil-fuel-phase-out-by-2030/>.

[110] The possibility of achieving a complete global phase-out of fossil fuels by 2026 has been shown in a study commissioned by the University of Sussex (See Benjamin K. Sovacool, "How Long Will It Take? Conceptualizing the Temporal Dynamics of Energy Transitions", *Energy Research & Social Science*,

Current policies, however, are not aimed at meeting this goal. On the contrary, in many jurisdictions fossil fuel extraction and/or use still benefit from substantial subsidies: "If unpriced pollution and other externalities associated with the use of fossil fuels are regarded as implicit subsidies, then overall post-tax subsidies can be estimated at over US$5 trillion per year".[111] Such subsidies also discourage investments in clean energy.

Regardless of the terminology, however, a profound transformation of energy and economic systems is implied – one that will severely constrain global GHG emissions, notably by reducing combustion of fossil fuels, and open major creative opportunities for alternatives. However the ultimate goal is defined, respecting the *Paris Agreement* implies a radical transformation of energy and economic systems. For example, in early 2017, the International Energy Agency (IEA) in cooperation with the International Renewable Energy Agency released its first ever energy forecast compliant with the Paris Agreement. In the context of the 2017 German G20 presidency, Germany requested a report to explore an energy transition that would be consistent with limiting the rise in global temperature to well below 2°C (understood as a 66% chance of limiting temperature increase to 2°C without overshoot). This exercise was the first of its kind for the IEA since all previous energy forecasts were premised on scenarios that would overshoot the "well below 2°C" threshold and are therefore inconsistent with the *Paris Agreement* goal. The Agencies' report concluded as follows:

> "Limiting the global mean temperature rise to below 2°C with a probability of 66% would require an energy transition of exceptional scope, depth and speed. Energy-related CO2 emissions would need to peak before 2020 and fall [globally] by more than 70% from today's levels by 2050. The share of fossil fuels in primary energy demand would halve between 2014 and 2050 while the share of low-carbon sources, including renewables, nuclear and fossil fuel with carbon capture and storage (CCS), would more than triple worldwide to comprise 70% of energy demand in 2050."[112]
>
> "A deep transformation of the way we produce and use energy would need to occur to achieve the 66% 2°C Scenario. By 2050, nearly 95% of electricity would be low-carbon, 70% of new cars would be electric, the entire existing building stock would have been retrofitted, and the CO2 intensity of the industrial sector would be 80% lower than today."[113]

Beyond this deep transformation of the energy sector, GHG neutrality also includes attention to sinks and reservoirs, which will likely be further elaborated in the future.

Energy Transitions in Europe: Emerging Challenges, Innovative Approaches, and Possible Solutions, 13 (2016), 202–15, online: <https://doi.org/10.1016/j.erss.2015.12.020>.)

[111] David Coady and others, "How Large Are Global Fossil Fuel Subsidies?", *World Development*, 91 (2017), 11–27, online: <https://doi.org/10.1016/j.worlddev.2016.10.004>; High-Level Commission on Carbon Prices, *Report of the High-Level Commission on Carbon Prices* (29 May 2017), p. 12.

[112] International Energy Agency and International Renewable Energy Agency, *Perspectives for the Energy Transition: Investment Needs for a Low-Carbon Energy System*, 2017, p. 7.

[113] Ibid., p. 8.

2.1.3 What will mitigation imply for GHG sinks and reservoirs?

Since the objective of the *Paris Agreement* is anthropogenic GHG neutrality or net zero emissions, accounting for anthropogenic GHG emissions and lasting human enhancements of and additions to natural sinks is a key concern.

Paris Agreement Article 4.1 focuses on limiting human-caused or "anthropogenic" emissions, and also identifies "removals by sinks" as a key factor. The default reading suggests that natural sinks do not count towards mitigation; i.e., that the qualifier "anthropogenic" in applies to both emissions by sources and removals by sinks. Only additional human-induced removals are accounted for. Any losses from destroying or impairing natural carbon sinks and reservoirs are properly counted as the equivalent of additional emissions.

Hence, there should be no consideration of reductions due to a country's natural forest endowment, and only additional human-induced removals are accounted for. However, destroying or impairing natural carbon sinks and reservoirs should count as additions to a country's national emissions.

As will be seen below, enhanced sequestration in forests and peatlands should be part of Canada's mitigation efforts, as the country is well endowed in both. Yet, it remains to be determined what human enhancements of or additions to natural sinks provide sufficiently reliable and permanent carbon sequestration to qualify as contributions to GHG reduction.[114]

This is largely due to the fact that none of the current accounting approaches can be put forward as "ideal" in real-world circumstances. In the interim, methodologies for defining the diverse (and imperfectly understood) actions and interactions of both emissions and removals of GHGs for accounting purposes should be in keeping with and informed by the precautionary principle.

For example, when and how should we count the increased emissions and/or decreased sequestration resulting from land use changes, forestry operations and other human interventions that impair natural sinks?

Large quantities of carbon are stored in land-based ecosystems (in vegetation, dead organic matter in soils and in wetlands and permafrost) and the agriculture, forestry and other land use (AFOLU) sector represents roughly 24% of anthropogenic GHG

[114] Determining how peatland and forest conservation fits into the GHG accounting under the *Paris Agreement* is highly complex. See, for example, James Watson and others, "The Exceptional Value of Intact Forest Ecosystems", *Nature Ecology & Evolution*, 2.4 (2018), online: <https://doi.org/10.1038/s41559-018-0490-x>.

emissions globally.[115] Consequently, the question of natural sinks and reservoirs is specifically addressed in Article 5 of the *Paris Agreement*:

> "1. Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1 (d), of the Convention, including forests.
>
> 2. Parties are encouraged to take action to implement and support, including through results-based payments, the existing framework as set out in related guidance and decisions already agreed under the Convention for: policy approaches and positive incentives for activities relating to reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries; and alternative policy approaches, such as joint mitigation and adaptation approaches for the integral and sustainable management of forests, while reaffirming the importance of incentivizing, as appropriate, non-carbon benefits associated with such approaches."[116]

Under UNFCCC Article 4, paragraph 1(d), sinks and reservoirs include biomass, forests, oceans and other terrestrial, coastal and marine ecosystems.[117] A "reservoir" is a "component or components of the climate system where a greenhouse gas or a precursor of a greenhouse gas is stored' whereas a 'sink' is 'any process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere."[118]

The AFOLU sector is unique given its importance for food security, sustainable development, livelihoods of local communities and the rights of indigenous peoples, including the spiritual and cultural values of ecosystems, as well as the fact that AFOLU activities can act as both sources and sinks of emissions.[119] The particular focus on "forests" in article 5.1 sends a strong political signal of their importance as ecosystems and synergistic roles in climate mitigation and adaptation as well as a recognition of pre-existing forest mitigation approaches.[120]

Further, international organizations have recognized the role of peatland ecosystems in

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[115] Antonio G M La Viña and Alaya de Leon, "Conserving and Enhancing Sinks and Reservoirs of Greenhouse Gases, Including Forests (Article 5)", in *The Paris Agreement on Climate Change: Analysis and Commentary*, ed. by Daniel Klein and others (Oxford: Oxford University Press, 2017), p. 166.
[116] *The Paris Agreement*.
[117] *The Paris Agreement*, article 4.1(d).
[118] *The Paris Agreement*, article 1.7, 1.8
[119] Antonio G M La Viña and Alaya de Leon, "Conserving and Enhancing Sinks and Reservoirs of Greenhouse Gases, Including Forests (Article 5)", (2017), pp. 166-167.
[120] Antonio G M La Viña and Alaya de Leon, "Conserving and Enhancing Sinks and Reservoirs of Greenhouse Gases, Including Forests (Article 5)", (2017), pp. 171-172.

atmospheric carbon dioxide attenuation[121]. When compared to forests that are recognized to increase carbon sequestration, peatlands are less affected by natural disturbance (fire and insects outbreaks). Their total areas over the planet represent about 1/10th of the land covered by forests but they have stored almost the same amount of carbon since the last glaciation[122]. Preservation of our natural sinks – such as forests and peatlands – has to be part of Canada's mitigation efforts since the country is well endowed in both (see section 3.3.4).

How to deal with reduced emissions from deforestation, forest degradation and land use change has a long history in the UNFCCC context[123] and is not without controversies, notably because it is extremely difficult if not impossible to guarantee the long-term storage of carbon. Caution should be exercised in counting offsets arising from sequestration that depends on land use changes and forestry operations, given the great challenges associated with biodiversity offsets.[124] Important issues around comprehensive land-use accounting remain to be tackled.[125]

Article 5.1 maintains the pre-existing distinction between developed and developing countries when it comes to reducing emissions from deforestation and forest degradation, as the pressures on forests are not the same. Moreover, there should be no incentive to avoid reducing industrial emissions in developed countries. As a general rule, the conservation of existing forests in developed countries should not count towards anthropogenic reductions; rather, only restoration should count.

The most robust accounting methodology for developed countries was achieved under the Kyoto Protocol, which defined the information pertaining to land use, land-use change and forestry (LULUCF) that had to be reported. The requirements covered emissions by sources and removals by sinks of carbon dioxide and other greenhouse gases resulting from LULUCF activities (e.g., afforestation, reforestation and deforestation that occurred since 1990) and elected human-induced activities (e.g., forest management, re-vegetation, cropland management and grazing land management).[126]

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[121] T. Hiraishi and others, *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands* (Switzerland: IPCC, 2014), online: <https://www.ipcc-nggip.iges.or.jp/public/wetlands/pdf/Wetlands_Supplement_Entire_Report.pdf>.

[122] C. Le Quéré and others, "Global Carbon Budget 2014", *Earth System Science Data*, 7.1 (2015), 47–85, online: <https://doi.org/10.5194/essd-7-47-2015>; Zicheng Yu and others, "Global Peatland Dynamics since the Last Glacial Maximum", *Geophysical Research Letters*, 37.13 (2010), online: <https://doi.org/10.1029/2010GL043584>.

[123] See for example: United Nations Framework Convention on Climate Change, "Reporting of the LULUCF Sector by Parties Included in Annex I to the Convention" , online: <https://unfccc.int/topics/land-use/workstreams/land-use--land-use-change-and-forestry-lulucf/reporting-of-the-lulucf-sector-by-parties-included-in-annex-i-to-the-convention>.

[124] See Colin T. Reid and Walters Nsoh, "The Privatisation of Biodiversity? New Approaches to Conservation Law", *Edward Elgar Publishing*, New Horizons in Environmental and Energy Law series, 2016.

[125] Antonio G M La Viña and Alaya de Leon, "Conserving and Enhancing Sinks and Reservoirs of Greenhouse Gases, Including Forests (Article 5)", (2017), p. 169.

[126] United Nations, *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, (1998), art 3.3 and 3.4, online: <http://unfccc.int/resource/docs/convkp/kpeng.pdf>.

These LULUCF rules are likely to continue to guide accounting and reporting under the Paris Agreement.[127] The methodology for defining these diverse (and imperfectly understood) actions and interactions of both emissions and removals of GHGs for accounting purposes should be in keeping with and informed by the precautionary principle. Another area of mitigation where the precautionary principle will be a particularly key concern is geo-engineering as explored below.

2.1.4 What is the potential role for negative emissions technologies and non-mitigation geo-engineering approaches?

Inevitably, setting a deadline for significant change raises other issues, including contrasting positions on matters of feasibility. The role of technology and its future development and deployment are at the centre of this issue. On one hand, the apparent need for unprecedented socio-political accomplishments has led to questions about whether ambitious targets and deadlines can possibly be met.[128] On the other hand, the severity of anticipated climate change impacts questions the acceptability of less ambitious targets. The past century's experience suggests that extraordinary technological advance is possible,[129] though not guaranteed or likely to come without unanticipated side effects. Moreover, the established international approach to climate change goal setting is iterative, with regular reviews and other openings for adjustments in light of new developments.

The *Paris Agreement* commitments are framed in technology-neutral language that leaves open how much specific technologies could and should contribute to the effort. However, there is high uncertainty about the feasibility of certain negative emissions technologies, from environmental, economic and human rights perspectives. The future deployment of currently untested technologies cannot be relied upon to avoid or delay near-term GHG reductions or justify overshooting temperature goals with the hope of developing technology capable of removing emissions released in excess in the future.[130] Any such delays are unacceptably likely to impose additional adverse effects and remedial action obligations on future generations who will not have contributed to the problem.

Geo-engineering, the "deliberate large-scale intervention in the Earth's natural systems

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[127] Antonio G M La Viña and Alaya de Leon, "Conserving and Enhancing Sinks and Reservoirs of Greenhouse Gases, Including Forests (Article 5)", (2017), p. 169.

[128] A recent study that modelled the effects of efforts somewhat beyond business-as-usual found the likely range of global mean temperature increase by 2100 to be 2.0-4.9°C, with "a 5% chance of less than 2 C warming, and a 1% chance of less than 1.5 C." See Adrian E. Raftery and others, "Less than 2 °C Warming by 2100 Unlikely", *Nature Climate Change*, 7 (2017), 637, online: <https://re.public.polimi.it/retrieve/handle/11311/961659/154659/NCC_negative_emissions.pdf>.

[129] A common example is the success of the US space program in putting a human on the moon within a decade of the US president's challenge to do so, despite the initial absence of adequate technology.

[130] See, for example, Sabine Fuss and others, "Betting on Negative Emissions", *Nature Climate Change*, 4.10 (2014), 850–53, online: <https://re.public.polimi.it/retrieve/handle/11311/961659/154659/NCC_negative_emissions.pdf >.

to counteract climate change"[131] through a variety of different technologies, is not specifically precluded as a potential contribution to compliance. This recognizes that further warming is irreversible unless negative emissions allow for removing excess carbon dioxide from the atmosphere back into geological or other permanent deposits.[132] Negative emission technologies, or more specifically carbon dioxide removal,[133] refer to technologies or techniques to remove CO_2 that has already been emitted to the atmosphere and storing it.

Another (untested) geo-engineering technique, solar radiation management (SRM) that aims to reflect a portion of the sun's energy back into space. In theory, SRM could contribute to the long-term temperature goal but will "not contribute to the balancing of emission and removal of GHG in the second half of the century. Of course, only some geo-engineering technologies can be used to achieve GHG emission neutrality".[134] Non-mitigation techniques such as SRM are not able to avoid "local climate impacts and other types of interference, such as ocean acidification".[135] Hence, non-mitigation geo-engineering efforts such as SRM should likely not be part of the options available for Paris compliance, considering that they do not remove GHG from the atmosphere and therefore do not contribute towards achieving GHG neutrality.[136]

A precautionary approach mindful of the important risks and moral hazards would prioritize a mitigation agenda that would not require future generation to deploy negative emissions technologies at a scale that is both highly uncertain and risky.[137] Successful and relatively low-risk mitigation policies should be prioritized, as they can reduce the need for adaptation: "'successful mitigation policies are known and must be scaled up urgently' and are 'still feasible and will bring about many co-benefits', including reducing the need for adaptation, despite posing 'substantial technological, economic and institutional challenges'".[138] The upper limit of emissions that will have to

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[131] "What Is Geoengineering?", *Oxford Geoengineering Programme*, online: <http://www.geoengineering.ox.ac.uk/what-is-geoengineering/what-is-geoengineering/>

[132] Andreas Fischlin, "Background and Role of Science", (2017), p.14

[133] These are not to be confused with carbon capture and storage which is a mitigation tool because it avoids emitting emissions but it would only become a negative emissions technology, arguably, if it were deployed in combination with a removal system for example bioenergy.

[134] Meinhard Doelle, "Assessments of Strengths and Weaknesses", (2017), p. 378.

[135] Simon Evans, "Explainer: The Long-Term Goal of the Paris Climate Deal", 2015

[136] If international development of these other non-mitigation, non GHG approaches appear ongoing, Canada should engage in these policy discussions in a transparent, inclusive and science-informed manner. Its aim should be to ensure, especially with a view of ensuring that a robust international governance system is established before any further applied research, testing, or even deployment is undertaken. The technological options to engage in international discussions on this area must be understood by Canada.

[137] Kate Dooley and Sivan Kartha, "Land-Based Negative Emissions: Risks for Climate Mitigation and Impacts on Sustainable Development", *International Environmental Agreements: Politics, Law and Economics*, 18.1 (2018), 79–98, online: <https://doi.org/10.1007/s10784-017-9382-9>.

[138] See *Technical Summary, Report on the Structured Expert Dialogue on the 2013-2015 Review of the United Nations Framework Convention on Climate Change* (UNFCCC) (2015 FCCC/SB/2015/INF.1, UNFCCC, Subsidiary Body for Implementation (SBI) and Subsidiary Body for Scientific and Technological Advice (SBSTA), Bonn, Germany) 9, online: <https://unfccc.int/resource/docs/2015/sb/eng/inf01.pdf> (last accessed January 2019), 4-34, cited in

be abated through carbon dioxide removal must not exceed the limits of the most conservative estimate of what current technologies can capture safely.

A precautionary approach can be used to screen proposed carbon dioxide removal approaches for social, environmental and technical risks, and compatibility with the UN's Sustainable Development Goals. A recently completed scenario modelling exercise specifically looked at the near term impact on required emissions reduction stringency of various levels of precaution in approaching carbon dioxide removal with the goal of limiting warming to 1.5°C. It found "there are no plausible scenarios where 1.5°C remained within reach without significantly ratcheting pre-2030 ambition", meaning no amount of future negative emission technologies can help us stay within this temperature threshold without deploying significantly more short term mitigation action.[139]

If focus on precaution are early mitigation action are key, it remains that investment in research to find additional, socially and environmentally sustainable, negative emissions technologies should continue, as the results may be highly useful and necessary in the future. In the meantime, the upper limit of emissions that could be abated through carbon dioxide removal should not exceed the most conservative estimate of what current technologies can capture safely. Moreover, successful and relatively low-risk mitigation policies should be prioritized, as they can reduce the need for corrective action or adaptation.[140]

2.1.5 What are the different timeframes for mitigation actions and ratcheting up national ambitions under the *Paris Agreement*?

In a way, the global community agreed to efforts to limit global temperature increase to 1.5°C without fully knowing what it entailed, as previous modelling and policy effort concentrated on less ambitious temperature goals. However, the *Paris Agreement* and subsequent UNFCCC decision adopting the agreement[141] provide for mechanisms to increase ambition and flesh out details over time. As stated previously, the *Paris Agreement* aims to achieve GHG neutrality at some point in the second half of this

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Andreas Fischlin, "Background and Role of Science", (2017), p.15.

[139] Christian Holz and others, "Ratcheting Ambition to Limit Warming to 1.5 °C–Trade-Offs between Emission Reductions and Carbon Dioxide Removal", *Environmental Research Letters*, 13.6 (2018), online: <https://doi.org/10.1088/1748-9326/aac0c1>. see also Kevin Anderson and Glen Peters, "The Trouble with Negative Emissions", *Science*, 354.6309 (2016), 182, online: <https://doi.org/10.1126/science.aah4567>; Kate Dooley and Sivan Kartha, "Land-Based Negative Emissions: Risks for Climate Mitigation and Impacts on Sustainable Development", (2018).

[140] See Technical Summary, Report on the Structured Expert Dialogue on the 2013-2015 Review of the United Nations Framework Convention on Climate Change (UNFCCC) (2015 FCCC/SB/2015/INF.1, UNFCCC, Subsidiary Body for Implementation (SBI) and Subsidiary Body for Scientific and Technological Advice (SBSTA), Bonn, Germany) 9, online: <https://unfccc.int/resource/docs/2015/sb/eng/inf01.pdf> (last accessed 18 January 2019), 4-34, cited in Fischlin, p. 15.

[141] UNFCCC, *Decision 1/CP.21* Adoption of the Paris Agreement (December 2015), online: <https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf>

century. It should also be noted that the agreement provides for different timeframes to developed and developing countries for peaking of emissions, recognizing that developed countries must do so first.[142] By all accounts, the global peaking of emissions is intensely urgent. Emissions must peak by 2020 in order to keep within reach the Paris temperature goals.[143]

Beyond this, the *Paris Agreement* has a ratcheting up mechanism set to increase national ambition on a voluntary basis so as to globally achieve the temperature and GHG neutrality goals. First, each country will have to "either update or communicate a new nationally determined contributions (NDC) by 2020", based on the outcome of the "Talanoa Dialogue," a facilitative dialogue that led to a Call to Action in December 2018.[144] Countries that set a target covering the period up to 2025 will have to communicate a new NDC by 2020, while countries that set a target covering the period up to 2030, such as Canada, will have to communicate or update their NDC by 2020.

"Countries will agree a common timeframe for their future contributions. This means that future cycles will eventually fall into line, with every country setting targets covering the same time period."[145] Further, the *Paris Agreement* "commits each country to submitting targets on a five-year cyclical basis, each of which must be progressively more ambitious than the last"[146] and are also "encouraged to submit an 'adaptation communication', which includes its priorities, plans and needs. Every two years, developed countries also have to communicate how much climate finance they will provide to developing countries."[147] Further, the IPCC provided a special report in 2018 on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways.

Also in 2018, negotiators made some progress on the development of the Paris Rulebook, the common modalities, procedures and guidelines under the *Paris Agreement.*[148] Indeed, the *Paris Agreement* states that "in order to build mutual trust and confidence and promote effective implementation, an enhanced framework for transparency and support" will be created (UNFCCC 2015b; Article 13.1). The ongoing

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[142] *Paris Agreement*, art 4.1

[143] Presidents of COP 23 and 24, "Talanoa Call for Action" (2018), online: <https://img1.wsimg.com/blobby/go/9fc76f74-a749-4eec-9a06-5907e013dbc9/downloads/1cujutv95_183663.pdf>; Christiana Figueres and others, "Three Years to Safeguard Our Climate", *Nature News*, 546.7660 (2017), 593, online: <https://doi.org/10.1038/546593a>. based on the work by Chloe Revill and Victoria Harris, *2020: The Climate Turning Point* (Potsdam Institute for Climate Impact Research, Carbon Tracker and Climate Action Tracker, April 2017), online: <http://www.mission2020.global/wp-content/uploads/2020-The-Climate-Turning-Point.pdf>.

[144] Sophie Yeo, "Timeline: The Paris Agreement's 'Ratchet Mechanism'", *Carbon Brief*, 19 January 2016, online: <https://www.carbonbrief.org/timeline-the-paris-agreements-ratchet-mechanism>.

[145] Ibid.

[146] Ibid..

[147] Ibid.

[148] *Draft decisions 1/CP.24 and 3/CMA*.1, UNFCCC (2018), online: <https://unfccc.int/sites/default/files/resource/Informal%20Compilation_proposal%20by%20the%20President_rev.pdf>; Paris *Agreement*, article 13.13 and United Nations, *Decision 1/CP.21: Adoption of the Paris Agreement* (2015) para. 91-92, online: <https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf>

development of this rulebook will hopefully represent an important strengthening of transparency on mitigation, adaptation, finance, technology transfer, and capacity building.[149] For now, the Rulebook has established "a detailed and comprehensive set of rules governing these reporting requirements and requires parties to release their reports biennially. Reporting requirements (…) span multiple sectors (e.g., energy, transportation, industrial processes and product use, agriculture, land use change, forestry, and waste). These reporting requirements are likely to trickle down into country-level policies affecting businesses in these sectors."[150]

These rules will greatly influence national action but will not provide the full picture yet. For example, the extent to which Canada will be able to rely on GHG reductions in other countries will be informed by the modalities for international cooperation towards transferred mitigation outcomes[151] and the UNFCCC-governed GHG crediting mechanism,[152] which are to be developed within an unspecified timeframe.

2.2 Allocating responsibility for GHG reductions

Assigning responsibility for GHG reductions is perhaps the most controversial aspect of climate mitigation. This section presents ways in which countries have acted so far under the United Nation Framework Convention on Climate Change (UNFCCC) framework and the main alternative perspectives that are part of the international discourse and could inform development of the *Paris Agreement*.

The global GHG mitigation target and the deadline for achieving overall GHG neutrality must be met by sub-global entities. Traditionally, the focus has been on the responsibilities of sovereign states. The 1992 UNFCCC established the foundations:

> The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof.[153]

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[149] Harald Winkler, Brian Mantlana, and Thapelo Letete, "Transparency of Action and Support in the Paris Agreement", *Climate Policy*, 17.7 (2017), 853–72, online: <https://doi.org/10.1080/14693062.2017.1302918>. cited in Michael Lazarus and others, *Addressing Fossil Fuel Production under the UNFCCC* (Stockholm: Stockholm Environment Institute, 22 September 2017), p.15, online: <https://www.sei.org/publications/fossil-fuel-production-unfccc/>.

[150] Mary Yang, "COP 24 Round-Up Part One: The Paris Rulebook", Covington & Burling LLP (2018), online: <https://www.insideenergyandenvironment.com/2018/12/cop-24-round-up-part-one-the-paris-rulebook/>.

[151] *Paris Agreement*, Article 6.2, 6.3

[152] *Paris Agreement*, Article 6.4-6.7. For further details, see Howard, A. in Paris Book p. 178 and following.

[153] UNFCCC (1992).

The international climate regime is grounded in part on the premise that leadership from developed countries, and corollary differential treatment of developing countries, is the equitable and appropriate basis on which the international response to climate change must be structured.[154] Differentiation has had a "long and contested history in the climate regime," as its nature and extent have "continued to be disputed through the years."[155]

The *Paris Agreement* is anchored in the principles of equity and "common but differentiated responsibilities and respective capabilities," (CBDRRC), a concept first introduced in the UNFCCC[156] as well as a new reference to 'different national circumstances'.[157] This approach, then, assumes that the GHG mitigation responsibilities of the signatory states will differ on the basis of judgments about equity.

Equity is a broad notion "that encompasses arguments based on fairness, justice, equality (for equals), affirmative action, redistribution, and restoration"[158]and is therefore broader than CBDRRC. The principle of equity is entrenched in several provisions of the *Paris Agreement*[159] and is also articulated through complementary notions such as "equitable access to sustainable development",[160] "poverty eradication",[161] and "climate justice".[162] The agreement provides few specifics about fairness in the allocation of responsibilities, but it at least partly reflects a capacities-based approach where wealthier developed countries deliver more and faster mitigation and assist countries with more limited capacities. Developed countries, which benefited from historical emissions associated with past industrialization and have greater wealth and access to technologies, are expected to accept greater responsibilities.

While recognized as a fundamental part of the climate regime, the core content, nature of obligations, legal status and operational significance of CBDRRC remain contested, especially by developed countries.[163]

Still, the *Paris Agreement* tailors "differentiation to the specificities of each of the Durban pillars - mitigation, adaptation, finance, technology, capacity-building, and

[154] Lavanya Rajamani and Emmanuel Guérin, "Central Concepts in the Paris Agreement and How They Evolved", (2017), p. 81.
[155] Ibid..
[156] UNFCCC (1992), preamble & art 4(1).
[157] See *Paris Agreement*, preambular recital, para 3, art 2.2 (purpose of the Agreement), art 4.3 (progression), art 4.19 (long-term low GHG emission development strategies); Lavanya Rajamani and Emmanuel Guérin, "Central Concepts in the Paris Agreement and How They Evolved", (2017), p. 88.
[158] Lavanya Rajamani and Emmanuel Guérin, "Central Concepts in the Paris Agreement and How They Evolved", (2017), p. 81.
[159] See *Paris Agreement*, preambular recital, para 3 (in the context of CBDRRC), preambular recital, para 11 (human rights), art 2.2 (implementation of the Paris Agreement), art 4.1 (mitigation ambition), and art 14 (global stocktake).
[160] See *Paris Agreement*, preambular recital, para 8.
[161] See *Paris Agreement*, preambular recital, para 8, art 2.1, 4.1 and 6.8.
[162] See *Paris Agreement*, preambular recital, para 13.
[163] Lavanya Rajamani and Emmanuel Guérin, "Central Concepts in the Paris Agreement and How They Evolved", (2017), p. 82.

transparency. In effect, this has resulted in different forms of differentiation in different areas".[164] The mitigation provisions of the *Paris Agreement* "embrace a bounded self-differentiation model" in accordance to which "parties were able to determine the scope of their contributions, their form, their rigour, and the information that will accompany them", subject to "several normative expectations" placed upon them, namely "progression", "highest possible ambition", and leadership from developed countries.[165]

Further, the *Paris Agreement* added a qualification to the CBDRRC by a reference to "national circumstances" "which introduces a dynamic element to the interpretation of the principle (CBDRRC-NC). As national circumstances evolve, so too will the common but differentiated responsibilities of states."[166] The effectiveness of the differentiation principles of the *Paris Agreement* remains to be seen, as "the details of the transparency, global stocktake, and compliance arrangements [...] are yet to be fleshed out".[167]

Hence, the interpretation and justification of fair share responsibilities has been left to individual countries and the results should be visible in the "nationally determined contributions" documents submitted by parties to the UNFCCC.[168] Practically speaking, when countries set NDCs, they implicitly determine how much of the remaining global carbon budget they will use themselves. Since the carbon budget is defined in Box 1 above as the finite amount of cumulative remaining emissions, nations effectively engage in a zero-sum game where one country's overuse implies another's deprival, or an exceedance of the budget. So far, no country has submitted an NDC with a rigorous demonstration of a fair effort sharing approach[169] nor one that looks at ramifications of other countries adopting a similar approach and none are tied to a scientifically based global carbon budget.[170] Meeting the Paris Agreement objectives depends on all of these deficiencies being corrected.

Different principles of fairness will generate different emission distributions for each population and different measures of inequality in emissions.[171] The fair share responsibilities nevertheless remain for signatories to the *Paris Agreement*. Determining

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[164] Ibid. p. 84.
[165] Ibid.
[166] Ibid.
[167] Ibid., p. 88.
[168] The Lima Call for Climate Action (UNFCCC decision 1/CP.20) stipulated that countries ought to explain "how the Party considers that its intended nationally determined contribution is fair and ambitious," (1/CP.20, para 14).
[169] Harald Winkler and others, "Countries Start to Explain How Their Climate Contributions Are Fair: More Rigour Needed", *International Environmental Agreements: Politics, Law and Economics*, 18.1 (2018), 99–115, online: <https://doi.org/10.1007/s10784-017-9381-x>.
[170] It is to be noted that effort-sharing/burden-sharing approaches are not necessarily about the question of allocating the carbon budget, but primarily about how to allocate the "effort" (or burden) of mitigation. Both imply very different ethical and practical approaches, but in some cases can be converted into each other.
[171] Peter Singer and Teng Fei, "Fairness and Climate Change", *Project Syndicate*, 11 April 2013, online: <https://www.project-syndicate.org/commentary/fair-distribution-of-rights-to-carbon-emissions-by-peter-singer-and-teng-fei>.

what these responsibilities are for individual countries involves four core questions explored below.

2.2.1 Who is responsible for GHG mitigation?

Under climate conventions such as the *Paris Agreement*, sovereign states are the established bearers of responsibility. However, the *Paris Agreement* also acknowledges that non-state actors, such as corporate entities and individuals,[172] have key roles and responsibilities. State Parties meet their obligations by regulating the private actors responsible for emissions within their borders. For example, fossil fuel corporations could be assigned responsibility for emissions.

While sovereign states, are the established bearers of responsibilities under climate conventions, including the *Paris Agreement*, alternative ways of assigning responsibility have also been developed.[173]

Under one approach, emissions can also be attributed to corporate entities (e.g., fossil fuel corporations) with possible future implications for assigning liability and, more generally, recognizing the power and influence of transnational corporations. In 2014, Richard Heede published ground-breaking research, which concluded that a majority of cumulative worldwide emissions of industrial carbon dioxide and methane since the industrial revolution could be traced back to 90 "carbon major" entities, based on the carbon content of marketed hydrocarbon fuels.[174] The approach has since been picked up by financial actors[175] and underlies increasing litigation against fossil fuel corporations.[176] It is increasingly recognized in international law that businesses have a

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[172] See for example, Sophie Marjanac, Lindene Patton, and James Thornton, "Acts of God, Human Influence and Litigation", (2017) See also Sébastien Jodoin and Yolanda Saito, "Crimes against Future Generations: Harnessing the Potential of Individual Criminal Accountability for Global Sustainability", *McGill International Journal of Sustainable Development Law & Policy*, 7.2 (2017), 115–55, online: <https://doi.org/10.2139/ssrn.2942145>.

[173] See for example, Sophie Marjanac, Lindene Patton, and James Thornton, "Acts of God, Human Influence and Litigation", (2017); See also Sébastien Jodoin and Yolanda Saito, "Crimes against Future Generations: Harnessing the Potential of Individual Criminal Accountability for Global Sustainability", (2017).

[174] Richard Heede, "Tracing Anthropogenic Carbon Dioxide and Methane Emissions to Fossil Fuel and Cement Producers, 1854–2010", *Climatic Change*, 122 (2014), 229–41 <https://doi.org/10.1007/s10584-013-0986-y>.

[175] Paul Griffin, *The Carbon Majors Database: CDP Carbon Majors Report 2017* (CDP, July 2017) , online: <https://b8f65cb373b1b7b15feb-c70d8ead6ced550b4d987d7c03fcdd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/002/327/original/Carbon-Majors-Report-2017.pdf?1501833772>. In which it was concluded that 71% of the world's industrial greenhouse gas emissions originating at just 100 fossil fuel companies.

[176] See, for example, Re. Greenpeace Southeast Asia et al., Commission on Human Rights of the Philippines (2015) , online: <https://perma.cc/2S8R-TTKN>; *Kivalina v. ExxonMobil*, 696 F.3d 849 (9th Cir. 2012), cert. denied, 133 S. Ct. 2390 (2013) ; *Lliuya v. RWE AG*, Az. 2 O 285/15 Essen Regional Court [2015] ; *The People of the State of California v. BP P.L.C. et al.*, 3:17-cv-06012 Superior Court of the State of California [2017].

responsibility to respect human rights.[177] From this, a theory could sustain liability against individuals or enterprises that actively cause or contribute to human rights violations associated with climate impacts through their operations, supply chains or contractual relationships.

Considering the responsibility of individuals has also been recommended as a means of distinguishing between the mitigation responsibilities of rich elites with emission intensive lifestyles and the climate change vulnerability of the majority of the poorer least GHG emitting population.[178]

2.2.2 How do we choose which emissions are counted towards establishing responsibility?

The UNFCCC to date has taken a territorial approach to inventories and responsibilities, whereby each country is responsible for the emissions produced inside its territorial borders.[179]However, alternative ways to conceive of GHG responsibility have been developed to take into account the fact that national market for resources and goods are globally integrated. For example, China may be the world's largest GHG producer, but many of the associated emissions can be considered embedded in the products massively imported and consumed in other countries. However, this approach has been insufficiently effective, so far at least, as evidenced by the fact that global emissions have continued to rise.

Other proposed options include "demand-side" approaches centred on consumption (whereby responsibilities for the lifecycle GHG effects of products and services are assigned to the consumers, or consuming countries, whose demands drive the process),[180] and "supply-side" approaches centred on extraction (responsibilities fall to the initial extractors of the fuels that produce the resulting emissions).[181] Combinations are also possible (e.g., a producer-based approach covering the life cycle of emissions attributable to products that were extracted in the country and exported elsewhere). The

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[177] Special Representative of the Secretary-General, *Guiding Principles on Business and Human Rights: Implementing the United Nations "Protect, Respect and Remedy" Framework* (New York and Geneva: United Nations, Office of the High Commissioner for Human Rights, 2011), online: <https://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf>.

[178] Oxfam International, "Extreme Carbon Inequality: Why the Paris Climate Deal Must Put the Poorest, Lowest Emitting and Most Vulnerable People First", online: <https://www.oxfam.org/en/research/extreme-carbon-inequality>; Christian Baatz, "Climate Change and Individual Duties to Reduce GHG Emissions", *Ethics, Policy & Environment*, 17.1 (2014), 1–19, online: <https://doi.org/10.1080/21550085.2014.885406>.

[179] The producer approach was established in the UNFCCC National Inventories.

[180] Álvaro Berzosa, Jesús M Barandica, and Gonzalo Fernández-Sánchez, "A New Proposal for Greenhouse Gas Emissions Responsibility Allocation: Best Available Technologies Approach", *Integrated Environmental Assessment and Management*, 10.1 (2014), 95–101, online: <https://doi.org/10.1002/ieam.1489>.

[181] Michael Lazarus, Peter Erickson, and Kevin Tempest, *Supply-Side Climate Policy: The Road Less Taken*, SEI Working Paper (Stockholm Environment Institute, 21 October 2015), online: <https://www.sei.org/publications/supply-side-climate-policy-the-road-less-taken/>.

chosen approach can have important implications for what countries are assigned the heaviest mitigation responsibilities (e.g., rich consumer countries versus resource extraction countries) and what tools are used (e.g., regulatory versus market-based).

Box 2. Demand vs. Supply-Side Climate Policy

Demand-side policy focuses on reducing emissions from the consumption of fossil fuels (including electricity producers). Examples of demand-side policy include uptake of low-carbon energy technology (e.g. renewable energy), carbon pricing (e.g. carbon tax or cap-and-trade markets), efficiency measures (e.g. better insulation in buildings, lower carbon intensity of fossil fuel production), and so on.

Supply-side policy focuses on reducing and limiting the production (including exploration, extraction, and transportation) of fossil fuels. Examples of supply-side policy include removal of financial incentives for fossil fuel production (e.g. fossil fuel subsidy phase out), moratorium on new extraction projects, and so on.

There are increasing calls to also take into account what some call "supply side initiatives" where fossil fuel producing countries could be held responsible for emissions related to the production of fossil fuels, and to include fossil fuel supply initiatives within the Paris framework. Up until recently, supply side initiatives have been mostly neglected, even though economic research has shown that such tools could achieve GHG reductions at a lower cost than their demand-side equivalents.[182] This relative neglect results in part because supply-side initiatives are more obvious threats to current practices and vested interests. However, limiting the supply of fuels causes price increases followed by a consumption drop as consumers are encouraged to find alternatives (public transit, more efficient vehicles, etc.).[183]

Whether and to what extent such measures would allow a fossil fuel producing country that foregoes production to claim reductions in downstream emissions as attributable to itself under the *Paris Agreement* is an open question with substantial implications. Although there is no explicit mention of fossil fuels in the *Paris Agreement*, nothing in its flexible framework bars national supply-side measures.[184]

Supply-side policies can also have many other positive impacts on the reduction of carbon dioxide emissions. They can lower carbon dioxide emission abatement costs overall, help deliver more efficient demand-side policies, enhance public understanding

[182] Michael Lazarus, Peter Erickson and Kevin Tempest, *Supply-side climate policy: the road less taken* (21 October 2015).
[183] Ibid.
[184] Refer to the table included in Daniel Horen Greenford, *Supply side policy under the Paris Agreement*, December 2017, subtitle 4, citing Georgia Piggot and others, *How to Address Fossil Fuel Production under the Paris Agreement* (Stockholm Environment Institute, 8 November 2017), online: <https://www.sei.org/publications/fossil-fuel-production-paris-agreement/>.

of national climate policies, and prevent fossil fuel over-supply which slows down the transition towards a fossil fuel-free economy.[185] Perhaps most importantly, supply-side climate policies have the potential to counter the negative impact of the continued supply of fossil fuels to the market, and the continued expansion of associated long term infrastructure and dependencies, which creates a "lock-in" effect that jeopardizes the transition towards a fossil fuel-free economy by "locking out" lower-GHG technologies.

Erickson and Lazarus demonstrated how the construction of the Keystone XL pipeline would favour a higher consumption of oil by lowering the oil barrel price, which ultimately would result in greater carbon dioxide emissions.[186]

Nations could "embed supply-side strategies in their NDCs", including fossil-fuel production phase-down targets, commitments to constrain investments in fossil fuel supply, prohibitive measures on new fossil fuel infrastructures (moratoria, taxes etc.).[187] To the degree that they impact levels of exported fossil fuels (and the GHGs embedded in them), actions like such supply-side strategies fall outside the established reporting regime of the UNFCCC (as they would not register in the exporting country's national inventory reports). Countries have already proposed a variety of non-GHG emissions targets in their NDCs, suggesting the need for the new Paris transparency framework to be flexible enough to incorporate a diversity of targets. Such a framework could also accommodate tracking a phase-down of fossil fuels or other supply-side action.[188]

These considerations extend also to the international implications of domestic extraction and supply. For example, Canada's global GHG footprint roughly doubles when considering emissions associated with the foreign combustion of oil produced in Canada and exported abroad.[189] It can be argued that restricting Canadian production could have an effect on global demand, prompting reductions that could deserve serious attention[190], especially if linked with cooperation measures with foreign jurisdictions. Such cooperation would ensure avoided Canadian fuel does not just get replaced by another fuel in the market, but is effectively replaced by developments in renewable energy and alternative transportation, for example.

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[185] Peter Erickson and Michael Lazarus, "Impact of the Keystone XL Pipeline on Global Oil Markets and Greenhouse Gas Emissions", *Nature Climate Change*, 4.(9) (2014), 778–81, online: <https://doi.org/10.1038/nclimate2335>. cited in Michael Lazarus and others, *Addressing Fossil Fuel Production under the UNFCCC*, (22 September 2017), p. 6.

[186] Perloff, J.M. (2007). Microeconomics: Theory and Applications with Calculus. 4th ed. Pearson, London. (Found in SEI Working Paper 2017-09, p.6)

[187] Michael Lazarus and others, *Addressing Fossil Fuel Production under the UNFCCC*, (22 September 2017), p. 11.

[188] Ibid.

[189] Marc Lee, *Extracted Carbon: Re-Examining Canada's Contribution to Climate Change through Fossil Fuel Exports* (Canadian Centre for Policy Alternatives, 25 January 2017), p. 5, online: <https://www.policyalternatives.ca/publications/reports/extracted-carbon>.

[190] Karine Péloffy and Meinhard Doelle, *NEB Modernization under the Climate Test: Part III* (Centre québécois du droit de l'environnement, 2017), online: <https://cqde.org/wp-content/uploads/2017/02/Part-III-NEB-Modernization-Under-the-Climate-Test.pdf>.pp. 20-23 for a review of the different economic approaches to attributing downstream emissions to project which could also serve to attribute avoided emissions under a supply side perspective.

2.2.3 To what extent are historical GHG emissions considered in determining the level of equitable mitigation commitments for countries?

Developed countries and international scientific efforts have generally adopted near-to-the-present base years to communicate relative reductions of GHG emissions. This is partly based on the fact that efforts to curb GHG emissions, and therefore gather better emissions data, started in the 1990s.[191] Assigning responsibility on this basis aligns with the beginning of global efforts to fight climate change, in about 1988. Some nations, such as Canada, have since started using more recent base years (shifting from 1990 to 2005) for expressing GHG reduction targets. However, it is important to distinguish between baseline year choice for expressing targets and the time horizon chosen for historical responsibility as two distinct concepts with different implications that should therefore be determined independently from each other.

Assigning responsibility for historical emissions circa 1990 aligns with the beginning of global efforts to fight climate change, in about 1988, when any reasonable person, nation or corporation could be said to know that such emissions were harmful. However, using this as starting point in time for assigning responsibility gives wealthier industrial countries amnesty for historical emissions that occurred prior to this date. In contrast, assigning responsibilities according to the full timeline of historical emissions would include all GHG emissions that have occurred since about 1800, when the industrial revolution and major human contributions to GHGs began.[192] Another common choice is 1950, since territorial boundaries were largely settled after World War II, and much of the fossil fuel infrastructure built since then is still in use, and/or still benefiting countries.

Taking into account historical emissions is critical to the principle of equity. It means at least some industrial countries will have used up their fair share of global GHG emission capacity already and would be climate debtors, required to eliminate their further emissions as fast as possible and assist abatement efforts in other countries.[193]

[191] The Kyoto protocol used 1990 as the reference year for developed countries' reduction goals. The 5th IPCC report published in 2013-2014 used 2010 as its reference year. Canada and the US expressed their NDCs relative to a 2005 baseline.

[192] See for an example a breakdown for corporations which looked back to the years 1751 and 1854, Richard Heede, "Tracing Anthropogenic Carbon Dioxide and Methane Emissions to Fossil Fuel and Cement Producers, 1854–2010", (2014) and see for a breakdown by countries: Johannes Friedrich and Thomas Damassa, "The History of Carbon Dioxide Emissions", *World Resources Institute*, 2014, online: <https://www.wri.org/blog/2014/05/history-carbon-dioxide-emissions>.

[193] Christian Holz, Sivan Kartha, and Tom Athanasiou, "Fairly Sharing 1.5: National Fair Shares of a 1.5 °C-Compliant Global Mitigation Effort", *International Environmental Agreements: Politics, Law and Economics*, 18.1 (2018), 117–34, online: <https://doi.org/10.1007/s10784-017-9371-z>; see also H. Damon Matthews, "Quantifying Historical Carbon and Climate Debts among Nations", *Nature Climate Change*, 6 (2015), 60–64, online: <https://doi.org/10.1038/nclimate2774>.

It has been estimated that "the dispute between developed and developing countries over the principle of historical responsibility accounts for about 40% of the global GHG emissions that can occur from 1850 to 2050 without exceeding the carbon budget".[194]

2.2.4 How should equity be addressed in the allocation of GHG reduction responsibilities?

Responsibilities for combating climate change should be distributed in a fair way.[195] Whether or not a given approach can be considered fair is a normative judgement, which can be informed by the relevant normative principles that countries have agreed to in the UNFCCC and the Paris Agreement. Some of the main options for sharing the global carbon budget or the global mitigation effort are listed in Table 2 below.

Table 2. Effort Sharing Approaches for Allocating a Carbon Budget[196]
Cumulative equal Per Capita (CPC) sharing with historical considerations, counting emissions cumulatively from any period of time from the beginning of industrialisation onward (circa 1850).
Capacity-based approach where national, corporate or individual wealth is used as a proxy for ability to act on climate change. For national wealth, either per capita income or income of those above a development threshold may be used to define capability.
Approaches combining responsibility and capacity, with special attention paid to developmental needs. These are used to define fair shares of the global mitigation effort like the metric developed in the Climate Equity Reference Project (CERP).[197]
Equal Per Capita (EPC) sharing of remaining emissions, starting with the present day remaining carbon budget (EPC2018).
Grandfathering includes two broad versions: (i) Full grandfathering (or "eternal grandfathering") allows all countries to retain a share of remaining emissions proportional to their historic share, hence perpetuating the

[194] Peter Singer and Teng Fei, "Fairness and Climate Change", 11 April 2013.
[195] Simon Caney, "Justice and the Distribution of Greenhouse Gas Emissions", *Journal of Global Ethics*, 5.2 (2009), p.127, online: <https://doi.org/10.1080/17449620903110300>.
[196] Different parameterized options for effort sharing are explored in Figure 1 below in the context of estimating a Canadian fair share of the global budget. See Annex for methodological details.
[197] See Climate Equity Reference Project, online: <https://climateequityreference.org/>; this was formerly known as the Greenhouse Development Rights (GDR) project. GDRs opts for the latter definition of capability, using the Gini coefficient and a cut-off of wealth below a development threshold that is set at a level high enough for people to pull themselves out of poverty. See: Eric Kemp-Benedict and others, *Calculations for the Greenhouse Development Rights Calculator (CERc)* (Stockholm Environmental Institute; EcoEquity; Climate Equity Reference Project, 23 February 2018), online: <http://gdrights.org/wp-content/uploads/2013/02/SEI_TechReport_GDRsCalculations.pdf>.

inequitable status quo. It is not compatible with fairness principles.[198]
(ii) Contraction and Convergence (C&C) has all countries converging to equal per capita emissions at some fixed date in the future, then collectively contracting to zero, which allows countries with a currently higher than equal per capita share to perpetuate their excessive share up until the convergence date, and hence can be described as partial grandfathering.

Of all approaches proposed, the "equal per capita cumulative emission" version linked to carbon budget allocations beginning in 1850 would seem to be the fairest of emissions-based sharing metrics since it incorporates attention to inequities in virtually all historical emissions, which likewise recognizes the benefits countries have already gained from activities that appropriated much of the global ability to accommodate anthropogenic emissions.[199] Using financial capability yields a similar outcome since historic emissions correlate strongly with historical wealth accumulation, since fossil fuel use enabled industrialization and the wealth that accompanied it. In this sense, present capability and responsibility for historic emissions are two sides of the same coin, interchangeable ways of viewing responsibility.

The Climate Equity Reference Project incorporates even more considerations into their effort-sharing metric, including additional progressivity measures like counting emissions of those above a certain luxury wealth threshold more than those below while totally excluding wealth of those below a development threshold from their estimate of financial capacity. Their tool also allows historic emissions to be treated in the same way, while also using consumption-based accounts to take trade into consideration. These further refinements put their tool at the leading edge of equitable sharing approaches for remaining allowable greenhouse gas emissions. Further refinements could include consideration for extracted emissions (i.e. attribution of at least partial responsibility to fossil fuel extractors for emissions occurring outside their borders from exported fuels).

There is no objective method for deciding what is ultimately "fairest", however significant strides have been made in improving upon what is known to be patently unfair, like those de facto shares by all developed countries.[200]

Indeed, the approach so far adopted by most developed countries, including Canada, in setting reduction targets is implicitly based on perpetuating their current overuse of atmospheric space by "grandfathering" the allocation of remaining emissions

[198] Simon Caney, "Justice and the Distribution of Greenhouse Gas Emissions" (2009), p.128
[199] Sonja Klinsky and others, *Building Climate Equity: Creating a New Approach from the Ground Up* (Washington, D.C.: World Resources Institute, 2014), p.2, online: <https://www.wri.org/sites/default/files/building-climate-equity-072014.pdf>; see also David Schlosberg, *Climate Justice and Capabilities: A Framework for Adaptation Policy*, Ethics & International Affairs, 26. 4 (2012), p. 446, online: <http://dschlosberg.com/Prof_David_Schlosberg/Publications_files/CC%20Adaptation%20and%20Cap%20EIA2012.pdf>
[200] "Climate Action Tracker", online: <http://climateactiontracker.org/>.

proportionally to current use. Other studies call this approach "inertia"[201] or "constant emissions ratio," both of which are euphemistic and therefore misleading to non-expert readers, and hence we prefer to use the colloquial but more standard term "grandfathering" or "status quo". This approach would entitle developed countries to more of the budget for per capita GHG emissions than poorer countries and has become a de-facto norm for these countries' target setting practice despite the advantages in wealth and capacity and historically greater emissions associated with industrialized countries. Such an approach clearly cannot be considered "fair sharing".[202] It is highly unethical to perpetuate the status quo of international inequality linked to emissions rates, and grandfathering remaining emissions, which uses a share of remaining emissions proportional to historical use does exactly that by perpetuating the status quo.

Box 3 below sets out a framework for considering effort sharing in light of four dimensions of responsibility for climate change mitigation efforts. The orange rectangle represents the combination of options overwhelmingly chosen by the international regime and the approaches taken by most developed countries, including by Canada.

Box 3. Four Dimensions of Climate Change Mitigation Responsibility

Four Dimensions of Responsibility (Diagram)

	(1) Who is responsible?			
Nation	←→	Corporation	←→	Individual
	(2) What emissions do we count?			
Production	←→	Consumption	←→	Extraction
	(3) Over what time period?			
Present	←→	Recent Decades	←→	Full Historical
	(4) How do we consider equity in future efforts?			
Grandfathering	←→	Capacity	←→	Per-Capita

Lastly, one crucial consideration in allocating fair share responsibilities is distinguishing between who has responsibility for emission reductions and where the reductions must physically occur. Separating these allows developed country climate debtors to deploy finances to developing countries to fulfil part of their overall fair shares obligation. In practical terms, this could be implemented formally through internationally transferred mitigation outcomes as provided for by Article 6.2 and 6.3 of the *Paris Agreement*. It could also be implemented informally through financial support, capacity building or technology transfer, including through bilateral or multilateral channels, that would allow developing countries to lower emissions below what they could achieve on their own. Under either approach, reductions abroad or reductions in the future should not be used as excuses to lower national ambitions.

[201] Jonathan Trinastic, "Equity or Inertia: How Emissions Sharing Philosophies Shape Climate Policy Success", *Nature Education*, 29 October 2015, online: <https://www.nature.com/scitable/blog/eyes-on-environment/emission_pledges_from_us_eu>.
[202] Simon Caney, "Justice and the Distribution of Greenhouse Gas Emissions" (2009), p. 128.

2.3 Implications of a Paris-compliant fair share approach for Canada

Canada's emissions are among the highest in the world on a per capita basis and Canada has been ranked 54th out of 60 countries on climate action.[203] Despite the country's small population, we are one of the 10 top emitters of GHGs in the world in absolute terms.[204] Therefore, it is not surprising that fair and/or ambitious approaches to allocating responsibility for emissions have stark implications for Canada.

The discussion so far has left many unresolved questions about what the *Paris Agreement* entails for Canada. The global target – keeping overall global warming to "well below 2°C" and pursuing efforts to limit the increase to 1.5°C" – provides crucial direction but is imprecise. The associated global deadline for achieving GHG neutrality is only roughly estimated, and is difficult to clarify without resolving issues about what is to be counted. In any event, it is only a starting point for determining the responsibilities of individual countries (and/or corporations and individuals). Nations have not yet begun serious efforts to quantify "fair share" allocations. Only independent researchers have developed allocation proposals.[205]

The result, for countries such as Canada, is reasonable clarity only about the inadequacy of current efforts. Canada's current target – its nationally determined contribution – is an interim step to reduce GHG emissions to 30% below 2005 levels by 2030.[206] This commitment, adopted by the previous federal government with no regard to equity when the global temperature goal was conceived as 2°C, has so far been maintained by the present government, despite signing on to the more demanding *Paris Agreement*

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[203]Jan Burck, Ursula Hagen, Franziska Marten, Niklas Höhne and Christoph Bals, "Climate Change Performance Index Results 2019," Climate Action Network, Germanwatch, New Climate Institute, December 2018, p.20, online: https://germanwatch.org/en/CCPI.

[204] Johannes Friedrich, Thomas Damassa, and Megpin Ge, "6 Graphs Explain the World's Top 10 Emitters", *World Resources Institute*, 2014, online: <https://www.wri.org/blog/2014/11/6-graphs-explain-world-s-top-10-emitters>.

[205] Some examples include the Greenhouse Development Rights and Climate Equity Reference Project, with methods described in Paul Baer and others, "Greenhouse Development Rights: A Proposal for a Fair Global Climate Treaty", *Ethics, Place & Environment*, 12.3 (2009), 267–81, online: <https://doi.org/10.1080/13668790903195495>.

Other approaches include using the Contraction and Convergence (C&C) method, and incorporating accrued climate debts and credits between nations as described in Renaud Gignac and H. Damon Matthews, "Allocating a 2 °C Cumulative Carbon Budget to Countries", *Environmental Research Letters*, 10.7 (2015), online: <https://doi.org/10.1088/1748-9326/10/7/075004>.

Allocating the carbon budget on an equal per capita basis is described in: Michael R. Raupach and others, "Sharing a Quota on Cumulative Carbon Emissions", *Nature Climate Change*, 4 (2014), online: <https://doi.org/10.1038/nclimate2384>. Further examples and analysis can be found at Climate Action Tracker, online: <http://climateactiontracker.org/> and Paris Equity Check, online: <http://paris-equity-check.org/>.

[206] Canada, "Canada's Intended Nationally Determined Contribution Submission to the UNFCCC", 2015, online:
<https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Canada/1/INDC%20-%20Canada%20-%20English.pdf>.

temperature goal. Yet Canada's NDC was generally recognized to be an inadequate contribution even to meeting the previous 2°C goal and remains despite Canada signing on to the more demanding *Paris Agreement* temperature goal.

In contrast, the Climate Equity Reference Project (CERP) has provided fair share estimates for meeting a 1.5°C target paying greater attention to Canada's historical emissions and economic capability relative to other countries. CERP concludes that meeting that fair share test would entail GHG emission reductions by Canada of 123-138% below 2013 levels by 2030 – in other words, a very stringent domestic 2030 target of zero anthropogenic GHGs would have to be combined ensuring additional reductions enabled by Canada but achieved elsewhere (internationally or through permanent sink enhancements) equivalent to a total of 123-138% of our 2013 levels.[207] Indeed, a cumulative per capita emissions approach that includes historical emissions amounts to a negative number (necessitating a greater than 100% reduction, even if emissions stopped immediately), and can be framed as a "climate debt" owed to countries that have not yet had access to their fair share of atmospheric capacity for greenhouse gases.[208] See Figure 1, below.

Figure I shows that all but the least equitable versions of the potentially acceptable remaining Canadian "fair share" of the global carbon budget result in a negative number, meaning Canada has already emitted more than its fair share and is a climate debtor. This also implies that the fairest of fair share deadlines for decarbonization have already passed for Canada.

The least equitable of what may be deemed a "fair share" is the EPC2018 setting, which shares remaining emissions equally per capita by year from 2018 to 2100. It is at best marginally equitable since it neglects historical emissions, and economic inequities that have arisen between nations due to this unequal distribution of emissions and the economic development that it facilitated. Keeping this in mind, even if Canada were allotted such a generous share, shares of 1.5°C and 2°C emissions budgets of 4 and 9 Gt CO_2eq would be exhausted in approximately 5.5 and 12.5 years respectively (or an average of 9 years to aim for the *Paris Agreement* objective), at the current national emissions rate of 722 Mt CO_2eq per year. Of course, if emissions were reduced rapidly in the short term, the budget could be further stretched out over time. Put simply, the most generous interpretation of Canada's fair share entails achieving decarbonization within a decade at current emission rates.[209]

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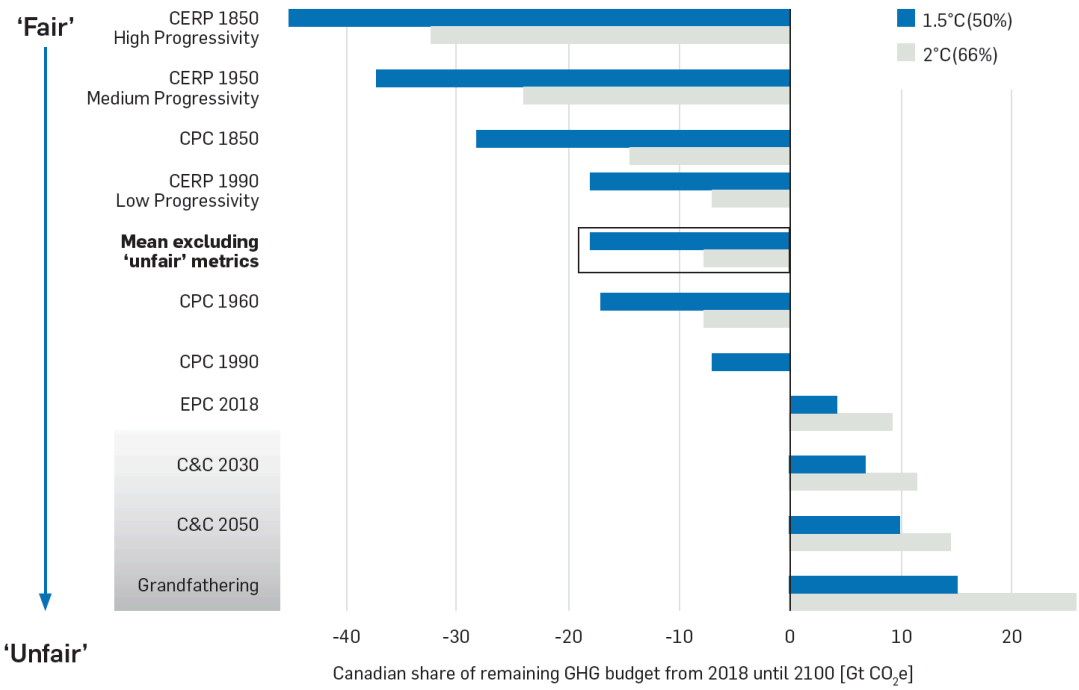
[207] See supplementary data table accompanying Holz, Kartha, and Athanasiou. Such reduction obligations going beyond 100% would imply a dual obligation where a "country can be in compliance with its allocation through a combination of domestic emission reductions and enabling emission reductions outside its borders, with the specific balance of these two options determined by various factors, including ethical, political, social, technological, and cost-effectiveness considerations."

[208] Canada's over-use is estimated be in the 9-17Gt range if considering emissions from 1990, or 1960, respectively. See *Figure 2* in H. Damon Matthews, "Quantifying Historical Carbon and Climate Debts among Nations", (2015).

[209] Another Canadian specific study concluded that reaching either the 1.5°C goal using a "grandfathering" approach or the 2°C goal on a modestly less inequitable basis (equal per capita emissions but still excluding historical emissions) found that avoiding 1.5°C warming "would require a 90% to 99%

Figure 1. Canadian allocations of global carbon budget using annual shares of 1.5 and 2 degree pathways



See Annex for references and methods. Emissions from Land Use, Land Use Change, and Forestry (LULUCF) are included. Values are in cumulative emissions expressed in Gt CO_2eq, or "resource shares" of the remaining all-GHG carbon budget, and are derived by allocating annual global emissions according to various effort-sharing approaches from the literature. The most equitable sharing approaches briefly described in Table 1 are labelled in Figure 1 as "fairest" while those that perpetuate the current inequitable distribution of emissions among countries are labelled here as "unfair." The median allocation from the "fair" allocations for staying between 1.5°C and 2°C (i.e. excluding the C&C and Grandfathering allocations, which are generally not considered to represent equitable sharing methods) in the black rectangle could be understood as a Paris quota representing the approximate GHG allocation if Canada aligns itself with the Paris Agreement goals.

All the other more defensible fair share options in Figure 1 indicate that Canada is already in climate debt and not legitimately entitled to any share of future emissions. Every tonne of GHG emitted today and tomorrow simply adds further to Canada's climate indebtedness.

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reduction in emissions below 2005 levels by 2030. [...] "[I]f an equity-based allocation is used, emissions would need to be reduced to effectively zero [relative to 2005 levels] before 2030 to be consistent with the 2°C warming limit." See Simon Donner and Kirsten Zickfeld, "Canada's Contribution to Meeting the Temperature Limits in the Paris Climate Agreement", 2016, online: <http://blogs.ubc.ca/sdonner/files/2016/02/Donner-and-Zickfeld-Canada-and-the-Paris-Climate-Agreement.pdf>.

That said, it is impossible for a country to stop emitting overnight. A transition will take years if not decades, with the most ambitious political will and best technical capacities being pushed and improved upon on an iterative basis. The take-home message is therefore complex: anything Canada emits now is unequivocally an inequitable overuse of its already unfair share of atmospheric capacity, but we must nevertheless find ways to act fairly and follow a realistic yet ambitious path to compliance.

It should also be noted that regardless of when and how much negative emissions (by means of offsets through trade, aid or those achieved physically), the total allocations (as depicted for example in figure 1 remain the same. This is why representing these allocations as a single amount of cumulative emissions is more practical for communicating the scale of the challenge presented to Canada (compared to using emissions trajectories over time with widely spaced emissions reduction targets).

To date, the Canadian government has not articulated its view of equity or its rationale for why the current nationally determined contribution could be considered an adequate and fair contribution to the Paris temperature goal. The federal government has also issued a mid-century strategy, where it "examines an emissions abatement pathway consistent with net emissions falling by 80% in 2050 from 2005 levels." The government asserts that the strategy is in its view "consistent with the *Paris Agreement*'s 2°C to 1.5°C temperature goal".[210] However, as noted above, international equity does not seem to have been considered since this target remains aligned with a national allocation framework based on current emission shares rather than on equal per-capita shares. So far, Canada has not formally committed to the mid-century target.

At the fairest most ambitious end of the spectrum, Canada should no longer emit any GHGs and start investing massively in reductions in other countries. Even at the most forgiving level, the 2030 NDC is less than justifiable. It falls short of the Paris commitment to "well below 2°C" warming and would require much more aggressive reductions post 2030 or relying on controversial, yet to be developed negative emissions technologies.

Calculations by independent monitors suggest that that global warming would exceed 2°C if all countries followed Canada's approach to "equitable" effort-sharing and that Canada's target "is not consistent with the *Paris Agreement's* 1.5°C limit, unless other countries make much deeper reductions and comparably greater effort".[211]

The government of Canada's stated targets for 2020 and 2030 and contemplated strategy for 2050 are not compatible with the equitable duties implied by the *Paris Agreement* and are only compatible with a grandfathering approach to staying "well below 2C" that

[210] Government of Canada, *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy* (2016), p.3.
[211] Climate Action Tracker, "Canada", Update from 2017-05-17.

would assign no responsibility for historical emissions and allow Canada to be a "climate colonizer", appropriating more of the carbon budget than its fair share[212].

The basics of the needed approach would seem to be the following:

- Canada must acknowledge that it is indebted to those nations that have not had the opportunity to use their fair share of the atmosphere's capacities.
- Canada must decarbonize its economy as rapidly and deeply as possible (politically and technically) but also aid other countries in mitigating their own emissions through financial and technical assistance. These measures should only be considered to compensate for emissions reductions that cannot be made domestically within the fair share deadline or carbon budget. In other words, they should never be perceived as a substitute for maximum domestic decarbonisation and should be deployed only once all avenues for domestic mitigation have been exhausted.[213]

The *Paris Agreement* set ambitious temperature and GHG neutrality goals that the global community is so far failing to achieve. Unfortunately, developed countries, including Canada, are not setting fair share targets and continue to follow a path more in line with grandfathering approaches to allocation that they adopted before the more ambitious Paris temperature goal of "well below 2.0ºC" with efforts to keep below 1.5ºC. Globally, the NDCs, which were put forward before the *Paris Agreement*, are more in line with limiting global warming to 3.1C[214], a gap also recognized in the UNFCCC's Paris decision document.[215] Moreover, as will be seen in Part 3, Canada's

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[212] Christian Holz, "Carbon Budgets and Carbon Colonialism. How to Establish a Sufficient Canadian Share of the Global Carbon Budget Without Robbing the South?" (presented at the Environmental Studies Association of Canada Annual Conference, Calgary, 2016).

[213] Importantly, these steps do not include reliance on GHG reductions achieved through physical removal of emissions through use negative emissions technology. Fair share considerations extend to protecting the most vulnerable from the risks of technological hubris. While some negative emissions possibilities may prove reliable, free of adverse side-effect risks, open to safe pilot testing in the short to medium term, and necessary in the long term, the current uncertainties for large-scale applications are great. Negative emissions technologies do not offer a prudent substitute for early and ambitious GHG emission reductions. See, for example, Sabine Fuss and others, "Betting on Negative Emissions", (2014).

[214] "The unconditional pledges or promises that governments have made, including NDCs as of 1 November 2016, would limit warming to about 2.8°C above pre-industrial levels, or in probabilistic terms, likely limit warming below 3.1°C." ("Effect of current pledges and policies on global temperature", Climate Action Tracker, [visited 16 August 2017]; A 2017 report by the International Energy Agency and the International Renewable Energy Agency estimated the global carbon budget to have two- thirds chance of keeping warming below 2°C between 2015 and 2100 to be 880 gigatonnes (Gt). The energy sector-only carbon budget for this same time period is 790 Gt. "[B]y means of comparison, current Nationally Determined Contributions (NDCs) imply that, until 2050, the energy sector would emit almost 1 260 Gt, i.e. nearly 60% more than the allowed budget." International Energy Agency and International Renewable Energy Agency, *Perspectives for the Energy Transition: Investment Needs for a Low-Carbon Energy System*, 2017, pp. 6-7.

[215] UNFCCC, *Decision 1/CP.21: Adoption of the Paris Agreement* (December 2015), states:

> Emphasizing with serious concern the urgent need to address the significant gap between the aggregate effect of Parties' mitigation pledges in terms of global annual emissions of greenhouse gases by 2020 and aggregate emission pathways consistent with holding the increase in the global average temperature to well below 2°C above

past actions and existing policies are not sufficient to meet our current 2020 and 2030 targets.

All this adds to the importance of serious effort and rigour in clarifying how to fit the gap between the *Paris Agreement* commitments and the needs for guidance for assessments and decision making on particular climate-significant undertakings. We turn to that in the next section.

Conclusions and recommendations from Part 2

The *Paris Agreement* provides broad direction for GHG mitigation. While it leaves significant uncertainties, the Agreement is certainly demanding and its basic implications for countries such as Canada are reasonably clear:

- Keeping overall global warming to the Paris Agreement limit of "well below 2ºC" and aiming for 1.5ºC will require immediate and sustained best efforts, especially by the most advantaged countries.
- Allocating responsibility for GHG reductions requires facing complex questions about who is responsible, which emissions are counted, over what time period are emissions counted, and how equity is considered. While there is little established agreement on the best answers to any of these questions, it is clear that current efforts are inadequate. Nations, including Canada, have not yet begun serious efforts to make "fair share" allocations or act on them.
- Using a carbon budget approach as a means of translating the Paris Agreement's implications into a global maximum of further GHG emissions compatible with achieving the temperature goals, reveals that the remaining global budget for allocation among countries is much smaller than is currently acknowledged in policy making.
- GHG sinks are a critical component of the global GHG mitigation targets, but accounting approaches need to be improved by better understanding anthropogenic impairments and the potential for permanent enhancement of GHG sinks
- Determining Canada's fair share allocation of the global carbon budget involves choices among various options based on competing assumptions. From the Canadian "fair share" allocations that have been calculated created by independent researchers, all but the most marginally equitable find that the remaining Canadian "fair share" of the global carbon budget is negative. That means every tonne of GHG emitted today and tomorrow simply adds further to

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pre- industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels (…)

17. Notes with concern that the estimated aggregate greenhouse gas emission levels in 2025 and 2030 resulting from the intended nationally determined contributions do not fall within least-cost 2°C scenarios but rather lead to a projected level of 55 gigatonnes in 2030, and also notes that much greater emission reduction efforts will be required than those associated with the intended nationally determined contributions in order to hold the increase in the global average temperature to below 2°C above pre-industrial levels by reducing emissions to 40 gigatonnes or to 1.5°C above pre-industrial levels by reducing to a level to be identified (in the next IPCC report).

Canada's climate indebtedness. Even under the most marginally equitable option, Canada would exhaust its share of the global carbon budget within a decade if our GHG emissions continue at current levels.

- Canada's current approach focuses on national actors and emissions only in recent years, is weak on limiting further extraction of GHG-generating hydrocarbons and other undertakings likely to entrench more deeply GHG-generating practices, and ignores equity considerations and exported and embedded emissions.

Part 3. Addressing the gaps between Canada's Paris commitments and guidance for assessment

As noted above, by most fair share calculations, Canada's proper deadline for achieving GHG neutrality has already passed. Meeting the implied obligations established by these commitments, which rest on a serious attempt to apply a fair-share approach, requires nearly instantaneous achievement of GHG neutrality in Canada accompanied by support for similarly major GHG mitigation achievements in other jurisdictions. This seems unfeasible. A successful and just transition to a climate-compliant economy and culture likely cannot be achieved in a decade. We therefore assume that, however pressing Canada's fair share deadline may be, we must allow for deliberation as well as action in moving to GHG neutrality. At the same time, the following discussion recognizes that any defensible approach to meeting our Paris responsibilities will entail more ambition and accomplishment than Canada and the provinces and territories have demonstrated so far.

We can safely conclude only that Canada's current targets and performance efforts will not be sufficient to meet our *Paris Agreement* obligations. Beyond that, a wide range of possibilities remains. The uncertainties include those about the ultimate Canadian deadline for GHG neutrality and more specific concerns about what and how GHG emissions and sink effects, in Canada and beyond, are to be counted.

Nonetheless, we can presume many of the unresolved questions – including those about the *Paris Agreement's* implications for Canada's ultimate GHG neutralization target and deadline – will have to be faced in Canada. These questions will arise inherently in decision making on climate-significant undertakings, in and beyond assessment processes.

With that assumption in place, this section surveys the existing climate policy landscape in Canada and identifies key gaps between what is in place and what is needed meet the *Paris Agreement* commitments (3.1). We then compare existing Canada-specific decarbonisation pathways against our commitments and estimate a preliminary feasible decarbonisation deadline (3.2), and review the ways in which these gaps could be filled, focussing specifically on providing recommendations for making climate-responsible decisions (3.3) and identifying climate-specific tools for undertakings subject to assessment (3.4). The discussion follows a more or less linear path from broad to specific. However, it recognizes that assessments of individual undertakings sit in a broader context (of other activities, other sustainability-related considerations, and other tools for transitioning to meeting the *Paris Agreement*, etc.).

The tools presented in this part will need further development for use in decision making on existing and new undertakings and better tools may need to be developed for analyzing activity alignment with overall climate commitments.

3.1 The existing climate policy landscape in Canada

3.1.1 Absence of comprehensive climate law

Gaps and inconsistencies in policy negatively impact the effectiveness of project assessment.

The issue of federal jurisdiction over climate change is complex. While no constitutional jurisdiction issues obstruct the information-gathering step of the assessment, the decision-making step may be limited to the federal jurisdiction to act on climate change. Federal jurisdiction to implement a carbon price under its taxation power and to regulate GHG emissions under its criminal law power is well established. Additional possible grounds for federal jurisdiction include the interprovincial and international nature of the impacts of climate change, and residual federal powers over matters of national concern and emergencies under the principle of Peace, Order, and Good Government (POGG). While none of these powers establishes unlimited federal jurisdiction over climate change, they collectively establish clear federal jurisdiction to act.

There has been no overarching framework for climate law at the federal level since 2012 when the Conservative government repealed the previous law based on the *Kyoto Protocol*.[216] This unduly complicates the development of coherent and effective domestic climate policy. So far, the federal government has not signalled intentions to remedy entirely this legal vacuum, but at the time of writing, has proposed several regulatory steps under the *Canadian Environmental Protection Act 1999* and passed a GHG pricing statute to implement the *Pan-Canadian Framework on Clean Growth and Climate Change* as detailed below.

Although compliance with climate commitments can be directly included in assessment law (see Part 4), it would be ideal if comprehensive climate law were introduced to provide an overarching, coherent framework for climate action and clarify how our international climate change mitigation commitments are to be implemented under Canadian law. However, even in the absence of such an overarching framework for climate law, other elements of Canadian policy have a bearing on the climate mitigation regime and should inform its development.

A federal legislative framework should be adopted to ensure compliance of government decisions and legislation with the *Paris Agreement*. This gold standard approach would combine a comprehensive climate law/*Paris Implementation Act,* which would provide for the development of pathways in line with a carbon budget approach based on Canada's fair share. This would likely end up setting a price on GHG emissions and

[216] *Kyoto Protocol Implementation Act*, SC 2007, c 30 as repealed by Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, 1st Sess. 41st Parl. 2012 (assented to 29th June, 2012) c. 19 s. 699. For a description of the previous government's poor legacy of climate and environmental in Canada, see Karine Péloffy, "*Kivalina* v. *Exxonmobil*: A Comparative Case Comment", *McGill International Journal of Sustainable Development Law and Policy*, 9.1 (2013), p.129-130.

enabling application of other non-market mechanisms, which at best would be in line with Canada's fair share contribution to the Paris effort, and at the very least ensure the achievement of the government's current reduction ambitions. Such an act could also ensure adequate consideration of climate impacts worldwide of Canadian projects and programs as well as ensure respect for human rights and indigenous people rights in all aspects of climate action.

However, even in the absence of such overarching framework law, other elements of Canadian law and policy have bearing on the climate mitigation regime and should inform its development.

There are three overlapping components of Canada's action on climate mitigation:

1) interim targets (e.g., Canada's nationally determined contribution of a 30% GHG emission reduction from 2005 levels by 2030);[217]
2) associated strategic frameworks (e.g., the *Pan-Canadian Framework*'s set of policy initiatives slowly turning into legislation meant to come close to meeting the 2030 objective, and the *Mid-Century Long-Term Low-Greenhouse Gas Development Strategy*);[218]
3) pre-existing economic and regulatory tools of broad application (e.g., carbon taxes and cap-and-trade mechanisms in some provinces) or more focused influence (e.g., energy efficiency standards and public transit funding).[219]

3.1.2 Federal climate policies under the *Pan-Canadian Framework*

Under the *Pan-Canadian Framework*, federal, provincial, and territorial governments will collaborate to meet or exceed Canada's 2030 target of a 30% reduction below 2005 GHG levels. In December 2016, the federal, provincial and territorial governments, with the exception of Saskatchewan and Manitoba, signed the *Pan-Canadian Framework*. Manitoba later signed on to the Framework in February 2018,[220] while Alberta withdrew from in August 2018.[221] Under this agreement, federal, provincial and territorial governments intend to work collaboratively "to reduce emissions, build resilience to a changing climate and enable clean economic growth" with the objective of "meeting or

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[217] Canada, "Canada's Intended Nationally Determined Contribution Submission to the UNFCCC", 2015
[218] Government of Canada, *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy* (2016) Although the mid-century strategy cannot be said to be a target, it is an indication the government is strategically reflecting on achieving low GHG development in 2050. See part 3.2 for more details.
[219] Note that at the time of writing, most of these tools exist at a provincial level. NOTE: this part does not include pre-existing regulation under the *Canadian Environmental Protection Act, 1999* introduced by the previous government. They are not determinant but should be included for comprehensiveness
[220] Sean Kavanagh, "Manitoba Signs Federal Climate-Change Plan", *CBC News*, 23 February 2018, online: <https://www.cbc.ca/news/canada/manitoba/climate-change-carbon-emission-ottawa-manitoba-squires-canada-tax-1.4549502>.
[221] John Paul Tasker, "After Federal Court quashes Trans Mountain, Rachel Notley pulls out of national climate plan", *CBC News*, August 31, 2018, online: <https://www.cbc.ca/news/politics/trans-mountain-federal-court-appeals-1.4804495>.

exceeding Canada's 2030 target of a 30 percent reduction below 2005 levels of greenhouse gas (GHG) emissions".[222] This goal will be achieved mainly through (i) carbon pricing, (ii) a coal phase-out, (iii) methane regulation, (iv) investments in clean technology innovation, and (v) the creation of the Canada Infrastructure Bank. [223]

i) Carbon pricing

The main pillar of the *Pan-Canadian Framework* is a federal carbon pollution pricing system – the backstop –, which will apply in jurisdictions that do not have carbon pricing systems in place. Currently, Alberta, British Columbia and Québec have their own carbon pricing systems and are expected to be exempled from the federal backstop if their own systems are considered equivalent.[224] The federal backstop is provided in the *Greenhouse Gas Pollution Act* passed into law in June 2018.[225] However, both Saskatchewan and Ontario have filed references with their respective Courts of Appeal and are in the process of challenging and contesting the constitutionality of the federal legislation.[226]

The price is to be set at $10/tonne CO2e in 2018, rising to $50/tonne CO2e in 2022.[227] Carbon prices beyond that time horizon have not been specified, giving rise to policy uncertainty in the medium to long term period that major infrastructure and project decisions should take into account. The amount of Canadian emissions the carbon pricing backstop will cover is not specified and it is not an economy wide carbon price. To be as effective as possible, it should apply "as broadly as possible—ideally to all accurately measurable sources of emissions, rather than only to fossil fuel producers or distributors" or emitters above 50 kt or more of CO2e per year as currently proposed.[228]

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[222] Government of Canada, *Pan-Canadian Framework on Clean Growth and Climate Change: First Annual Synthesis Report on the Status of Implementation*, December 2017, p. i, online: <https://www.canada.ca/content/dam/themes/environment/weather/climatechange/PCF-FirstSynthesis_ENG.pdf>; *Pan-Canadian Framework,* (2016), at "Foreword".

[223] Government of Canada, *Pan-Canadian Framework on Clean Growth and Climate Change: Canada's Plan to Address Climate Change and Grow the Economy* (Gatineau: Environment and Climate Change Canada, 12 December 2016), p. 6, 36 and 49, online: <http://publications.gc.ca/collections/collection_2017/eccc/En4-294-2016-eng.pdf>[*Pan-Canadian Framework,* (2016)].

[224] Sarah V. Powell and others, "Pan-Canadian Carbon Pricing Update: Federal Backstop Legislation Proposed", *Davies Ward Phillips & Vineberg*, 2018, online: <https://www.dwpv.com/en/Insights#/article/Publications/2018/Pan-Canadian-Carbon-Pricing-Update>.

[225] *Greenhouse Gas Pollution Pricing Act*
, online: <http://www.parl.ca/Content/Bills/421/Government/C-74/C-74_4/C-74_4.PDF>.

[226] *Re Greenhouse Gas Pollution Pricing Act, Factum of the Attorney General of Saskatchewan*, C.A. No. CACV3239, online: < http://publications.gov.sk.ca/documents/9/107797-Carbon%20Tax%20Factum.pdf>; Factum of the Attorney General of Ontario, C63807, online: < http://www.ontariocourts.ca/coa/ggppa/files/C65807.FAP.pdf>.

[227] *Pan-Canadian Framework,* (2016), p. 49. Also see Schedule 4 of the Legislative Proposals Relating to the Greenhouse Gas Pollution Pricing Act, online: <http://www.fin.gc.ca/drleg-apl/2018/ggpp-tpcges-l-bil.pdf>.

[228] See Pembina Institute, *Pembina Institute Comments on Technical Paper on the Federal Carbon Pricing Backstop* (The Pembina Institute, 30 June 2017), p. 2, online:

In contrast, it is expected that most emissions from the fossil fuel industry will be exempt from the pricing mechanism.[229]

The federal government's pricing system will apply to seven GHGs and consist of two components:

1) A carbon levy applied to fossil fuels and combustible waste, mainly payable by fuel producers, fuel distributors and transportation carriers. The levy will increase annually and be set by type of fuel.
2) An "output-based pricing system for industrial facilities that emit above a certain threshold, with an opt-in capability for smaller facilities with emissions below the threshold".[230] These facilities would not pay charges on fuels purchased.[231]

"The output-based pricing system will apply to all industrial facilities that emit 50 kilotonnes (kt) or more of CO2e per year. It will not apply to facilities in specifically listed sectors such as buildings (including municipal, hospitals, universities, schools, commercial), waste and wastewater, regardless of the quantity of their emissions. Facilities in industrial sectors that emit less than 50 kt of CO2e per year will have the ability to "opt in".[232]

In 2017, ECCC contemplated the OBS would complement "methane reduction regulations for the oil and gas sector" and apply to flaring, venting and fugitive emissions[233] but the latter two important sources of emissions seem to have been dropped from the legislative proposal, which would now only apply to flaring. The carbon levy will not apply to exported fuels.[234]

The proposed legislation sets out "output-based standards for the following industrial sectors: oil and gas, pulp and paper, chemicals, nitrogen fertilizers, lime, cement, base metal smelting and refining, potash, iron ore pelletizing, mining, iron and steel, and food processing."[235] Additional sectors may be included in the future. "The government is

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<https://www.pembina.org/reports/pembina-institute-submission-to-goc-on-carbon-pricing-technical-paper-june-30-2017.pdf>.

[229] Environmental Defense & Stand, *Canada's Oil & Gas Challenge A Summary Analysis of Rising Oil and Gas Industry Emissions in Canada and Progress Towards Meeting Climate Targets* (2018)_online : <https://d36rd3gki5z3d3.cloudfront.net/wp-content/uploads/2018/12/Canadas-Oil-and-Gas-Challenge-Dec-2018.pdf?x47766>.

[230] Environment and Climate Change Canada, *Technical Paper on the Federal Carbon Pricing Backstop*, 2017, p. 5, online: <http://publications.gc.ca/collections/collection_2017/eccc/En4-306-2017-eng.pdf>.

[231] Sarah V. Powell and others, "Pan-Canadian Carbon Pricing Update: Federal Backstop Legislation Proposed", 2018.

[232] Environment and Climate Change Canada, *Technical Paper on the Federal Carbon Pricing Backstop*, 2017, p. 17

[233] Ibid., p.18

[234] Ibid., p.12

[235] Environment and Climate Change Canada, "Output-Based Pricing System Regulatory Framework", 2018, online: <https://www.canada.ca/en/environment-climate-change/news/2018/01/output-based_pricingsystemregulatoryframework.html>.

considering how to apply carbon pricing to offshore oil and gas and to electricity generation."[236]

> This broad application to all industrial sectors does not provide the targeted application to emission-intensive trade-exposed industries that is necessary for the program to be successful. The OB pricing system is, by design, a subsidy provided to high emitting facilities. If the program is not targeted only to those sectors that can demonstrate a material competitiveness impact and need for the program, it would be unfair to other parties within the OB pricing system and to all parties participating in climate programs more broadly. Maximizing the benefit of the OB carbon pricing system can only be achieved if it is only applied where and when it is necessary.[237]

The output-based pricing system will have compliance credits, implying the need for robust verification and compliance, measures. The output-based pricing system has faced criticism for its risks and deficiencies:

1) The exemption of GHG intensive Canadian industries runs counter to its objective of climate mitigation.
2) Eligible industries will be able to avoid paying most of the carbon price in provinces that adopt the OBPS.[238]
3) Only a small portion (5%) of Canadian industry faces the kind of competitive pressure that would necessitate free allocations under the OBPS. However, in some provinces (notably Alberta), a significant proportion of industry will be allowed to benefit from the OBPS.[239]
4) Gaps in pricing for the oil & gas and electricity sectors will lead to complications for assessments.
5) The blanket exemption of vulnerable sectors will reduce the effectiveness of the policy in reducing emissions and would also impose a greater burden on the remaining sectors.[240]

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[236]Environment and Climate Change Canada, "Output-Based Pricing System Regulatory Framework", 2018.

[237] Pembina Institute, *Pembina Institute Comments on Technical Paper on the Federal Carbon Pricing Backstop* (30 June 2017), p. 7.

[238] Dale Marshall, "Did the Federal Government Get Its Carbon Pricing Bill Right?", *Environmental Defence*, 2018, online: <https://environmentaldefence.ca/2018/02/14/federal-government-carbon-pricing-bill/>.

[239] Dale Marshall, "Did the Federal Government Get Its Carbon Pricing Bill Right?", (2018); Elizabeth Beale and others, *Provincial Carbon Pricing and Competitiveness Pressures: Guidelines for Business and Policymakers* (Canada's Ecofiscal Commission, November 2015), p. 13, online: <http://www.ecofiscal.ca/wp-content/uploads/2015/11/Ecofiscal-Commission-Carbon-Pricing-Competitiveness-Report-November-2015.pdf>.

[240] Elizabeth Beale and others, *Provincial Carbon Pricing and Competitiveness Pressures: Guidelines for Business and Policymakers* (November 2015), p. 14

6) By treating some sectors differently from others, the OBPS discriminates across sectors, can be divisive, and can undermine the political acceptance of the policy.[241]
7) The more permits are provided for free, the less carbon pricing revenue is generated.[242]
8) The draft legislation does not indicate how long large polluters will be able to benefit from the OBPS and avoid paying the full price of carbon.
9) Information asymmetry poses a challenge to the effectiveness of the OBPS, as it will be difficult for the government to properly match both emissions and production data across facilities within the OBP product group.[243]
10) The OBPS poses a great deal of risk for product groups with a limited number of facilities or multiproduct facilities where the attribution of emissions to product groupings can be a challenge.[244]

ii) Coal phase out

The *Pan-Canadian Framework* plans cooperation between "Federal, provincial, and territorial governments [...] to accelerate the phase out of traditional coal units across Canada, by 2030."[245] In February 2018, the Minister of Environment and Climate Change announced that existing regulations would be amended to accelerate the phase-out of traditional coal-fired electricity by 2030 at the latest.[246] Under these regulatory proposals, the phase-out will be accelerated by ensuring that all coal-fired units meet a performance standard of 420 t CO_2 /GWh by December 31, 2029.

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[241] Dave Sawyer and Seton Stiebert, *Output-Based Pricing: Theory and Practice in the Canadian Context* (Canada's Ecofiscal Commission, 5 December 2017), p. 14, online: <http://ecofiscal.ca/wp-content/uploads/2017/12/OBA-Report-December-2017-FINAL.pdf>; Elizabeth Beale and others, *Provincial Carbon Pricing and Competitiveness Pressures: Guidelines for Business and Policymakers* (November 2015), p.17.
[242] Dave Sawyer and Seton Stiebert, *Output-Based Pricing: Theory and Practice in the Canadian Context* (5 December 2017), p. 13.
[243] Dave Sawyer and Seton Stiebert, *Output-Based Pricing: Theory and Practice in the Canadian Context* (5 December 2017), p. 13.
[244] Dave Sawyer and Seton Stiebert, *Output-Based Pricing: Theory and Practice in the Canadian Context* (5 December 2017), p. 14.
[245] *Pan-Canadian Framework,* (2016), p. 13. See also Office of the Minister of Environment and Climate Change, "The Government of Canada Accelerates Investments in Clean Electricity", *News Release*, 2016, online: <https://www.canada.ca/en/environment-climate-change/news/2016/11/government-canada-accelerates-investments-clean-electricity.html>. There is little detail on the coal phase out but it seems to be led by provincial action and federal action remains unclear: "Provinces and territories have already taken action on moving from traditional coal-fired generation to clean electricity. Ontario and Manitoba have already phased out their use of coal, Alberta has plans in place to phase out coal-fired electricity by 2030, Nova Scotia has created a regulatory framework to transition from coal to clean electricity generation, and Saskatchewan has a coal-fired generating unit with carbon capture technology, which captures 90 percent of emissions. New capacity will come from non-emitting sources—including hydro, wind, and solar—as well as natural gas. Energy efficiency and conservation will make added contributions to clean electricity systems.'' *Pan-Canadian Framework*, (2016), p. 11.
[246] Environment and Climate Change Canada, "The Government of Canada Outlines next Steps in Clean-Energy Transition", *News Release*, 2018, online: <https://www.canada.ca/en/environment-climate-change/news/2018/02/the_government_ofcanadaoutlinesnextstepsinclean-energytransition.html>.

Under the coal-fired electricity regulations that were published by the previous government in 2012 and that came into effect in July 2015, coal-fired electricity units were required to meet a performance standard of 420 t CO_2 /GWh; however, existing units would only have to comply with this standard by the end of their operating life (defined as between 45 and 50 years after commissioning dates). The newly proposed amendments correct this policy gap by requiring that plants comply with the 420 t CO_2 /GWh standard by December 31, 2029 or by the end of their useful life, whichever is sooner.[247] Fourteen units are expected to be affected by these amendments. Coal-fired electricity unit operators can meet the performance standard by installing carbon capture and storage (CCS) or by using carbon-neutral biomass. It is expected that most units will be shut down or converted to run on natural gas as a result of these proposed amendments.[248] However, due to the equivalency agreement signed in 2015, existing coal-fired facilities in Nova Scotia may be allowed to continue operating despite not being able to meet the standards prescribed by the federal regulations.[249]

These proposed regulatory amendments are complemented by a proposal for new greenhouse gas regulations for natural-gas-fired electricity. The natural gas regulations are intended to ensure that efficient technology is used with new natural-gas-fired electricity generation, to encourage the early conversion of coal-fired plants to run on natural gas, and to provide assurance that higher emitting coal-to-gas converted plants will be phased out over time.[250] The timeframe of this phase out is to be determined by annual performance tests of the converted coal boilers' GHG emission intensity.[251] Those with the highest emissions would not be permitted to run past their end of life[252], while those emitting the lowest GHG emissions would be permitted to run for up to 10 years after their end-of life-date.[253]

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[247] *Regulations Amending the Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations*, s. 1(2), Canada Gazette, Vol. 152, No. 7, 17 February 2018.

[248] Environment and Climate Change Canada, "Archived: Technical Backgrounder: Proposed Federal Regulations for Electricity Sector", 2018, online: <https://www.canada.ca/en/environment-climate-change/news/2018/02/technical_backgrounderproposedfederalregulationsforelectricityse.html>.

[249] *An Agreement on the Equivalency of Federal and Nova Scotia Regulations for the Control of Greenhouse Gas Emissions from Electricity Producers in Nova Scotia*, 2015, online: <https://ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=775586DB-1>.

[250] Environment and Climate Change Canada, "Proposed Amendments to Coal-Fired Electricity Regulations and Proposed Natural-Gas-Fired Electricity Regulations", 2018, online: <https://www.canada.ca/en/environment-climate-change/news/2018/02/proposed_amendmentstocoal-firedelectricityregulationsandproposed.html>.

[251] *Regulations Limiting Carbon Dioxide Emissions from Natural Gas-fired Generation of Electricity*, s. 5(2), Canada Gazette, Vol. 152, No. 7, 17 February 2018.

[252] *Regulations Limiting Carbon Dioxide Emissions from Natural Gas-fired Generation of Electricity*, s. 4(2)a), Canada Gazette, Vol. 152, No. 7, 17 February 2018.

[253] *Regulations Limiting Carbon Dioxide Emissions from Natural Gas-fired Generation of Electricity*, s. 4(2)d), Canada Gazette, Vol. 152, No. 7, 17 February 2018. See Table 1, Environment and Climate Change Canada, "Archived: Technical Backgrounder: Proposed Federal Regulations for Electricity Sector", 2018.

iii) Methane regulations

The *Pan-Canadian Framework* also provides for methane and hydrofluorocarbon (HFC) reductions. Methane and HFCs are potent GHGs, dozens to thousands of times more powerful than carbon dioxide over the short-term horizon. The oil and gas sector is the largest contributor to methane emissions in Canada. The *Framework* document reports, "Building on provincial actions and targets, the federal government has committed to reduce methane emissions by 40-45 percent by 2025."[254] The baseline date is not stated. This goal was put forward in the proposed *Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector)*[255]. According to the Pembina Institute, "Canada softened its approach on oil and gas methane regulation in 2017 — leaving inexpensive emissions reductions opportunities on the table.''[256] Pembina experts describe this as "the most egregious policy backslide on the climate file in 2017.''[257]

iv) Clean technology

The *Pan-Canadian Framework* strategy for developing clean technology includes investments in early stage innovation, mainly by Sustainable Development Technology Canada, and in the growth of existing green technologies. The strategy also aims to foster the adoption of clean technology by public sector entities, Indigenous peoples, consumers and the industry through the implementation of action plans and certification programs, for instance.[258] In the 2016 budget, several funds were planned to achieve these goals.[259]

This policy may influence what technologies and alternatives are available for undertakings subject to assessment.

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[254] *Pan-Canadian Framework* (2016), p. 21.

[255] Sarah V. Powell and others, "Pan-Canadian Carbon Pricing Update: Federal Backstop Legislation Proposed", 2018

[256] Erin Flanagan and others, *State of the Framework: Tracking Implementation of the Pan-Canadian Framework on Clean Growth and Climate Change* (Calgary: The Pembina Institute, December 2017), p. 21, online: <https://www.pembina.org/reports/state-of-the-framework.pdf>.

[257] Erin Flanagan and others, *State of the Framework: Tracking Implementation of the Pan-Canadian Framework on Clean Growth and Climate Change* (December 2017), p. 21

[258] *Pan-Canadian Framework*, (2016) pp. 37-42.

[259] *Pan-Canadian Framework*, (2016) p. 49. These proposed funds include: $50 million over two years to invest in technologies that will reduce GHG emissions from the oil and gas sector; $82.5 million over two years to support research, development, and demonstration of clean energy technologies with the greatest potential to reduce GHG emissions; $100 million per year from the Regional Development Agencies to support clean technology, representing a doubling of the existing annual aggregate support; $50 million over four years to Sustainable Development Technology Canada (SDTC) for the SD Tech Fund. These resources will enable SDTC to announce new clean technology projects in 2016 that support the development and demonstration of new technologies that address climate change, air quality, clean water, and clean soil; $10.7 million over two years to implement renewable energy projects in off-grid Indigenous and northern communities that rely on diesel and other fossil fuels to generate heat and power.

v) Infrastructure Bank

In 2017, the Canada Infrastructure Bank was created with the purpose of investing and seeking to "attract investment from private sector investors and institutional investors, in infrastructure projects in Canada or partly in Canada that will generate revenue and that will be in the public interest by, for example, supporting conditions that foster economic growth or by contributing to the sustainability of infrastructure in Canada."[260] Parts of the $35 billion public investment are earmarked for specific environmental purposes.[261] For example, $5 billion will be set aside for "green infrastructure projects, including those that reduce greenhouse gas emissions, deliver clean air and safe water systems, and promote renewable power,"[262] along with another $5 billion for public transit systems, as well as an investment of $5 billion for trade and transport corridors.

The Infrastructure Bank will have a large and expansive mandate that does not define the notion of "public interest" or specify decision-making criteria that reflect Canada's climate change mitigation commitments.[263] Guidance, perhaps developed through strategic assessments, will be required on how to incorporate climate criteria in investment decision making. There is a dire need to ensure criteria are provided for these important public investments since previous green infrastructure funding by the federal government has a deplorable record in deliver positive environmental impacts and reporting on the impacts of these investments.

The Infrastructure Bank has undertaken an approach to develop evergreen guidance through its 'Climate Lens' which should be celebrated for the effort but would greatly benefit from further elaboration.[264]

According to the 2016 Spring Report of the Commissioner of the Environment and Sustainable Development on Federal Support for Sustainable Municipal Infrastructure, "Infrastructure Canada could not adequately demonstrate that the [Gas Tax] Fund has resulted in cleaner air, cleaner water, and reduced emissions of greenhouse gases" and was "not adequately considering environmental risks, such as climate change, in how it

[260] *Canada Infrastructure Bank Act*, S.C. 2017, c.20, s.403*,* s.6.
[261] *Canada Infrastructure Bank Act,* s. 23;Infrastructure Canada, "Investing in Canada Plan" , online: <http://www.infrastructure.gc.ca/plan/about-invest-apropos-eng.html>.
[262] Infrastructure Canada, "Canada Infrastructure Bank", online: <http://www.infrastructure.gc.ca/CIB-BIC/index-eng.html>.
[263] For an extensive discussion of public interest determination in the context of fossil fuel infrastructure assessments in the context of the National Energy Board modernization, see Karine Péloffy and Meinhard Doelle, *NEB Modernization under the Climate Test: Part III* (2017) and Marc Bishai and Sébastien Poirier, *Des Oléoducs à La Transition Énergétique : Approche de Droit Comparé Pour Alimenter Une Modernisation Innovatrice de l'Office National de l'énergie Partie I et II, Centre Québécois Du Droit de l'environnement* (Centre québécois du droit de l'environnement, 2017) , online: <https://cqde.org/wp-content/uploads/2017/02/Partie-I-II-Des-oleoducs-a-la-transition-energetique-approche-de-droit-compare-pour-alimenter-une-modernisation-innovatrice-de-lOffice-national-de-lenergie.pdf>.
[264] Infrastructure Canada, "Climate Lens – general Guidance", Government of Canada (2018), online: < https://www.infrastructure.gc.ca/pub/other-autre/cl-occ-eng.html>.

made funding decisions".[265] Moreover, the Report found that "Infrastructure Canada did not implement the performance measurement strategy that it would have needed to determine whether the Fund was meeting its objectives, and to report on results to Parliament and the Canadian public."[266] Without an effective strategy and reporting guidelines, the Canada Infrastructure Bank will be impaired by the same deficiencies.

According to economist Toby Sanger, "[w]hat's needed is much more comprehensive and rigorous analysis of the economic, social and environmental costs and benefits of different projects and alternative ways of achieving these outcomes. While not all benefits can be easily or precisely quantified, many intangible impacts can be estimated, with tools available that provide simple calculations of some of the environmental benefits associated with buildings and infrastructure projects."[267]

vi) Clean Fuel Standard

In November 2016, the federal government announced its intention to enact Clean Fuel Standard Regulations under the *Canadian Environmental Protection Act, 1999*, that would reduce Canada's GHG emissions through the increased use of lower carbon fuels, energy sources and technologies, and thus complement the pan-Canadian approach to pricing carbon pollution.[268] The Clean Fuel Standard aims to achieve 30 Mt of annual GHG emissions reductions by 2030, in view of meeting Canada's NDC target of 30% emission reduction below 2005 levels by 2030.[269] A regulatory framework was published in December 2017, outlining the scope of the regulations, regulated parties, the carbon intensity approach, the timing for the regulations, and compliance mechanisms such as credit trading.[270] The final regulations are expected to be published in mid-2019. Once implemented, the Clean Fuel Standard "will require producers, importers or distributors to reduce the carbon intensity of fuels, also known as the

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[265] Commissioner of the Environment and Sustainable Development, *2016 Spring Report of the Commissioner of the Environment and Sustainable Development on Federal Support for Sustainable Municipal Infrastructure* (Ottawa, Ontario, 2016), pp. 3 and 15, online: <http://publications.gc.ca/collections/collection_2016/bvg-oag/FA1-2-2016-1-1-eng.pdf>.

[266] *2016 Spring Report of the Commissioner of the Environment and Sustainable Development on Federal Support for Sustainable Municipal Infrastructure*, p. 3.

[267] Toby Sanger, *Creating a Canadian Infrastructure Bank in the Public Interest* (Ottawa: Canadian Centre for Policy Alternatives, 20 March 2017), online: <https://www.policyalternatives.ca/publications/reports/creating-canadian-infrastructure-bank-public-interest>.

[268] Environment and Climate Change Canada, "Government of Canada to Work with Provinces, Territories, and Stakeholders to Develop a Clean Fuel Standard", 2016, online: <https://www.canada.ca/en/environment-climate-change/news/2016/11/government-canada-work-provinces-territories-stakeholders-develop-clean-fuel-standard.html>.

[269] Government of Canada, "Clean Fuel Standard", 2018, online: <https://www.canada.ca/en/environment-climate-change/services/managing-pollution/energy-production/fuel-regulations/clean-fuel-standard.html>.

[270] Department of Environment, "Notice to Interested Parties — Clean Fuel Standard Regulatory Framework", *Canada Gazette*, Part 1: Vol. 151, No. 51, 23 (December 2017), online: <http://gazette.gc.ca/rp-pr/p1/2017/2017-12-23/html/notice-avis-eng.html#ne1>.

carbon footprint."[271] Under these regulations, different pollution-reduction targets will be set for gas, liquid and solid fuels from all sectors of the Canadian economy. Depending on the design of the system, this policy may have an impact on assessments, as it may affect the production of fuel and the costs of consumed fuels. A recently published study found that a well-designed Clean Fuel Standard would drive job creation and investment in the clean energy sector, pass on a minimal amount of costs to taxpayers, and would be effective in reducing emissions.[272] In fact, the Clean Fuel Standard would cut more carbon pollution than any other policy stemming from the *Pan-Canadian Framework*.

The deficiencies of the standard become apparent when compared to California, which pioneered the idea of including all lifecycle emissions, including those associated with land-use change. In California, the *Low Carbon Fuel Standard*, which regulates all the oil that is sold in the State, bases its GHG evaluations over the entire lifecycle GHG emissions, including indirect emissions caused by land use emissions as well as downstream emissions issued from the ultimate combustion of the fuel.[273] The California *Oil Production Greenhouse gas Emissions Estimator* (OPGEE), an open source, transparent and accessible model, has provided GHG intensity values for production and transport of 67 types of Canadian crudes. Although the spectrum is wide, Canadian crudes GHG intensity values are amongst the highest of the petroleum products sold in California.[274]

Given that foreign jurisdictions have been able to estimate land use emissions associated with Canadian oil extraction, we see no justifiable reason to exclude such considerations from policies and assessment especially in a context where preserving the carbon stocks of the boreal forest and peatlands will become a global imperative (see case study Section.3.4.1 for the assessment context). So far as we could verify, no Canadian jurisdiction assesses land use emissions associated with oil extraction."

Conclusion on the PCF tools and climate policies

Although it is a great step in the right direction and could "set Canada on a course to cut nearly 200 megatonnes (Mt) of carbon pollution''[275], the *Pan-Canadian Framework* in itself does not reach the NDC since there are 44 Mt of CO2eq emissions above the 2030

[271] Environment and Climate Change Canada, "Canada's Clean Fuel Standard: How It Will Work", 2017, online: <https://www.canada.ca/en/environment-climate-change/news/2017/12/canada_s_clean_fuelstandardhowitwillwork.html>.
[272] Clean Energy Canada, *What a Clean Fuel Standard Can Do for Canada: A Road to Cleaner Fuels, More Jobs and Less Carbon Pollution*, November 2017, online: <http://cleanenergycanada.org/wp-content/uploads/2017/11/CleanFuelStandardReport-FINAL.pdf>.
[273] California Low Carbon Fuel Standard, Final Regulation Order, Subchapter 10, Article 4, Subarticle 7, online: <http://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf>.
[274] California Low Carbon Fuel Standard, Final Regulation Order, § 95489 (Provisions for Petroleum-Based Fuels), Table 8, p. 89, online: <http://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf>.
[275] Erin Flanagan and others, *State of the Framework: Tracking Implementation of the Pan-Canadian Framework on Clean Growth and Climate Change* (December 2017), p. 1.

target of 523 MT CO2eq /year for which there are no current mitigation pathways.[276] All in all, the *Pan-Canadian Framework* serves as a policy vehicle for Canada to take some action on climate change; however, it contains many gaps, details and exceptions that may endanger their policy efficiency, and in any case, will need to be considered in future assessments.

In sum, while the main pillars of the *Pan-Canadian Framework* are promising within Canada's climate policy landscape, critical gaps remain that will hinder their effectiveness in reducing emissions. The GHG emission abatement requirements of these evolving policies, under the *Pan-Canadian Framework*, are not stringent enough to meet the current 2030 target[277], which is in turn insufficient to meet the *Paris Agreement* commitments. This gap needs to be addressed through further policy action.

A collaborative report published in March 2018 by the federal Commissioner of the Environment and Sustainable Development and the provincial auditors general found that no government in Canada has met all its climate change commitments and that most who have set greenhouse gas reduction targets are not on track to meet them. Moreover, the report states that no government in Canada is fully prepared to adapt to the impacts of climate change. While a majority of provinces and territories have developed high-level strategies to reduce emissions, they lack detailed timelines, implementation plans, and cost estimates. In addition, many governments lack the information necessary to determine whether their planned actions would be enough to meet their emission reduction targets, or are already aware that their planned actions will fall short. The report states that "[m]eeting Canada's 2030 target will require substantial effort and actions beyond those currently planned or in place", as "Canada would still need to reduce emissions by a further 66 megatonnes" to meet its 2030 target if all of the greenhouse gas reduction actions in the *Pan-Canadian Framework* are implemented in a timely manner. The report also points to a lack of coordination between the federal, provincial, and territorial orders of government.[278]

The *Pan-Canadian Framework* continues to face a variety of challenges from provincial governments. In addition to their respective constitutional challenges, Saskatchewan and Ontario have either put forth inadequate carbon pricing plans or repealed existing plans. In August 2018, Saskatchewan unveiled a plan to price carbon based on out-put performance standards which only partially applies to industry and falls short of the federal government's benchmark requirements.[279] Similarly, Ontario cancelled its cap-

[276] *Pan-Canadian Framework*, (2016), p. 44.
[277] Recent independent analysis puts this gap at 161 MT in 2030, a gap 3.7 times greater than officially estimated. See Jeffrey Rissman and others, *Enhancing Canada's Climate Commitments: Building on the Pan-Canadian Framework* (The Pembina Institute, March 2018), online: <https://energyinnovation.org/wp-content/uploads/2018/03/Canada-Energy-Policy-Simulator-Research-Note-FINAL.pdf>.
[278] Commissioner of the Environment and Sustainable Development, *Perspectives on Climate Change Action in Canada: A Collaborative Report from Auditors General*, March 2018, online: <http://www.oag-bvg.gc.ca/internet/English/parl_otp_201803_e_42883.html>.
[279] Government of Canada, "Saskatchewan and pollution pricing", November 2018, online: < https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/saskatchewan.html>.

and-trade system.[280] New Brunswick and Alberta have also signalled their opposition to the federal Framework. New Brunswick has chosen to intervene in support of both the Ontario and Saskatchewan governments in their constitutional challenges of the federal carbon tax in addition to recently stating their intent to launch their own constitutional challenge.[281] Finally, in the fallout of the Federal Court of Appeal's decision quashing the Trans Mountain pipeline expansion, Alberta publicly withdrew from the Framework stating that while Alberta's carbon pricing plan will remain in force, it would not follow any federal benchmarks.[282]

Assessment processes will need to consider must measures proposed in the PCF. For example, analysis will be necessary to understand how carbon pricing mechanisms affect the financial viability of projects covered by the regime or projects which rely on products covered by the regime, taking into account the increased stringency of carbon pricing over time.[283] Likewise, federal investment and subsidies programs, such as those that will be administered by the Infrastructure Bank, will need to prioritize funding projects that are climate friendly and "minimize investments into assets that could become stranded and maximize cumulative emission reductions".[284] All processes will need to maximize uptake of new low-emission technologies. [285]

Further, partly due to past federal inaction on the climate file, jurisdictions in Canada have adopted different regulatory pricing schemes to deal with GHG reductions. Quebec adopted a cap-and-trade system linked to US states' markets to which Ontario adhered the Ford administration announced its withdrawal while British Columbia and the federal government have opted for a carbon tax. There will first be a need to ensure equivalency between the different jurisdictions' efforts, which will be a challenge.[286] Regulations from all legal orders, including indigenous and municipal, will have to be considered in assessment.

The different provincial and federal approaches to pricing carbon as well as the use of non-market mechanisms will have to be taken into account in assessments of projects and strategic undertakings, depending on the jurisdictions affected.

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[280] Sarah Powell, Alexandria Pike and Marie-Claude Bellemare, "Federal Government Moves Forward with Pan-Canadian Framework on Climate Change", *Davies Ward Phillips & Vineberg*, 2018, online: <https://www.dwpv.com/en/Insights#/article/Publications/2018/Government-Moves-Forward-on-Climate-Change?utm_source=Mondaq&utm_medium=syndication&utm_campaign=View-Original>.

[281] Kevin Bissett, "New Brunswick will challenge Ottawa's carbon tax, make new emissions plan", *The Toronto Star*, 5 December 2018, online: < https://www.thestar.com/news/canada/2018/12/05/nb-will-challenge-ottawas-carbon-tax-make-new-emissions-plan.html>.

[282] Hamdi Issawi, David P. Ball and Ainslie Cruickshank, "What does Alberta pulling out of the federal climate plan mean for the environment?", *The Toronto Star*, 31 August 2018, online: < https://www.thestar.com/news/canada/2018/08/31/what-does-alberta-pulling-out-of-the-federal-climate-plan-mean-for-the-environment.html>.

[283] *Pan-Canadian Framework* (2016), p. 7.

[284] *Pan-Canadian Framework* (2016), pp. 7 and 17.

[285] *Pan-Canadian Framework* (2016), p. 16.

[286] Erin Flanagan and Bora Plumptre, *Using Equivalency Agreements to Advance Canadian Climate Policy* (The Pembina Institute, 30 August 2017), online: <http://www.pembina.org/pub/using-equivalency-agreements-to-advance-canadian-climate-policy>.

3.1.3 Energy policy "dialogues"

In addition to the *Pan-Canadian Framework*, energy policy is central to Canada's climate framework. After a short period of consultations in 2017, Natural Resources Minister, Jim Carr announced "the federal government's long-promised national energy strategy won't be a single document, but an ongoing conversation with Canadians about the issue."[287]. The "ongoing conversation" approach appears thus far to lack reliable clarity about long-term commitments of the kind needed for planning and decision making on climate-significant energy undertakings, especially when it comes to "planned increases in our overall production and continued global and domestic use of fossil fuels, an objective that is seemingly at irreconcilable odds with Canada's stated goal of reducing emissions and moving away from fossil fuels."[288]

The Expert Panel on the modernization of the National Energy Board in their May 2017 report highlighted the inconsistency between fossil fuel production in Canada and climate action:

> "On the one hand we have a clear expression of high level government policy and targets to reduce greenhouse gas (GHG) emissions. Following the 2015 *Paris Agreement* on Climate Change, governments in all the regions of Canada agreed to calls for major reductions in energy emissions and, by implication, a significant restructuring of our energy production, use, and related energy infrastructure, revolving around a radical change in our production and use of fossil fuels. Most of the actions required to realize these goals are in the hands of provinces and territories, who design strategies that meet their unique circumstances, and are supported by broad agreements with the prime minister and premiers. However, at the same time, the same federal government (in partnership with the provinces) is exploring the creation of large pipeline projects which inherently signal planned increases in our overall production and continued global and domestic use of fossil fuels, an objective that is seemingly at irreconcilable odds with Canada's stated goal of reducing emissions and moving away from fossil fuels."[289]

Beyond the methane regulations and price on carbon, there is very little federal policy direction on the role of the oil and gas sector contemplated in the *Pan-Canadian*

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[287] Mia Rabson, "Canada's Energy Strategy Will Be an Ongoing "Dialogue" Rather than Concrete Document: Carr", *Global News*, 13 October 2017, online: <https://globalnews.ca/news/3802298/canadas-energy-strategy-dialogue/>.

[288] Expert Panel on the Modernization of the National Energy Board, *Forward, Together: Enabling Canada's Clean, Safe, and Secure Energy Future*, 2017, p. 18, online: <https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/pdf/NEB-Modernization-Report-EN-WebReady.pdf>.

[289] Expert Panel on the Modernization of the National Energy Board, *Forward, Together: Enabling Canada's Clean, Safe, and Secure Energy Future*, 2017, p.18

Framework and Mid-Century Strategy. This is a clear policy gap since the oil sector is the largest source of GHG emissions nationally.

Further, the government does not seem to be taking action on the commitment to phase out and rationalize inefficient fossil fuel subsidies at the G20 Summit in 2009. Public subsidies to the fossil fuel sector are still made in Canada to the estimated tune of about CAD $3.3 billion annually for oil and gas producers, which include reduced property taxes, special tax deductions for the industry and direct infusions of cash from both federal and provincial governments.[290] The federal government was responsible for CAD $1.6 billion of that amount, before purchasing the Transmountain pipeline project and providing further subsidies to the oil industry in 2018. Such fossil fuel subsidies act as a negative emissions price and provide an unfair advantage to fossil fuels as compared to renewables.

In 2017, an Independent Audit Report on fossil fuel subsidies by the Auditor General of Canada indicated that "the Department of Finance Canada and Environment and Climate Change Canada did not define what the G20 commitment means in the context of Canada's national circumstances".[291] Because the Department of Finance Canada did not provide proper documents, the Auditor General could not consider whether the G20 commitment was met.[292] The Auditor General also noted that even if Environment and Climate Change Canada "developed a plan to guide the initial stages of its work, it did not yet know the extent of federal non-tax measures that could be inefficient fossil fuel subsidies."[293]

Given that the oil and gas sector development is driven by private investments, a collective of 72 scholars from all ten Canadian provinces suggested that: "Governments should transfer the total environmental cost of production from taxpayers to those investors".[294] Their report suggests ways to internalize climate mitigation and damages costs.

Instead, the fossil fuel industry received almost twice as much funding as renewable energy for research, development and deployment. Federal and provincial investments in research, development and deployment from 2011-2015 totalled $2,261 million for the fossil fuel industry, including carbon capture and storage, and $1,394 million for

[290] International Institute for Sustainable Development, "Unpacking Canada's Fossil Fuel Subsidies: Their Size, Impacts, and What Should Happen Next", online: <https://www.iisd.org/faq/unpacking-canadas-fossil-fuel-subsidies/>.
[291] Auditor General of Canada, *2017 Spring Reports of the Auditor General of Canada to the Parliament of Canada: Report 7—Fossil Fuel Subsidies* (Ottawa, Ontario, 28 February 2017), online: <http://www.oag-bvg.gc.ca/internet/English/parl_oag_201705_07_e_42229.html#hd2c>.
[292] *2017 Spring Reports of the Auditor General of Canada to the Parliament of Canada: Report 7—Fossil Fuel Subsidies.*
[293] *2017 Spring Reports of the Auditor General of Canada to the Parliament of Canada: Report 7—Fossil Fuel Subsidies.*
[294] Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 45.

renewable energy.[295] Such investments will likely and unfortunately lead to an innovation focus on marginal rather than transformational impacts on GHG reductions and insufficient mitigation.

As a result, Canada's energy policy framework is uncertain and inconsistent with the commitments to climate action, especially with respect to the future of fossil fuels. This tension between climate change mitigation commitments and the private and public interests of fossil fuels industries and fossil fuel producing regions underlies and has long stifled Canadian discussions around climate policy broadly and considerations of climate in recent Canadian assessments.

Hopefully these discrepancies, inconsistencies and gaps will be resolved through the announced federal strategic assessment of implications of climate commitments for project level assessments. In the meantime, there is significant uncertainty regarding the specific prices and regulations that will apply to different projects, how assessments should take account of this differing and evolving treatment of key sectors to the transition.

3.2 Lessons from Existing Canadian Decarbonization Pathways

Existing published works on Canadian decarbonisation pathways are recent but rapidly expanding. There are no proposed feasibility based pathways for decarbonisation by 2030 or earlier which would be more in line with Canada's fair share under the *Paris Agreement*. The best available studies explore ambitious Canadian pathways towards decarbonisation towards the 2050 horizon and beyond. Although these existing decarbonization pathways do not give serious consideration to fair sharing principles, they are still useful as the examples of Canada-specific guidance for predicting the amount of cumulative emissions reductions and their trajectories that can be achieved in a technically and economically efficient manner.

Existing decarbonization pathways for Canada have been proposed by independent modeling projects, namely the Deep Decarbonization Pathways Project (DDPP) by Bataille et al,[296] the Energy and Materials Research Group by Jaccard et al (EMRG)[297], the Trottier Energy Futures Project (TEFP)[298] and the Solutions Projects by Jacobson et

[295] Natural Resources Canada, *Energy Fact Books 2012–2013, 2013–2014, 2014–2015 and 2016–2017*, 2012-2017; cited in Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 23.

[296] Chris Bataille, David Sawyer, and Noel Melton, *Pathways to Deep Decarbonization in Canada, SDSN - IDDRI*, September 2015

[297] Mark Jaccard, Mikela Hein, and Tiffany Vass, *Is Win-Win Possible? Can Canada's Government Achieve Its Paris Commitment. . . and Get Re-Elected?* (Burnaby: School of Resource and Environmental Management Simon Fraser University, 20 September 2016), online: <http://rem-main.rem.sfu.ca/papers/jaccard/Jaccard-Hein-Vass%20CdnClimatePol%20EMRG-REM-SFU%20Sep%2020%202016.pdf>.

[298] Trottier Energy Futures Project, *Canada's Challenge & Opportunity: Transformations for Major Reductions in GHG Emissions*, April 2016, online: <http://iet.polymtl.ca/en/tefp/>.

al.[299] All the Canada specific models have inherent political assumptions. EMRG does not use a carbon price to promote emissions abatement, since they feel that a price high enough to have a significant impact is not politically viable).

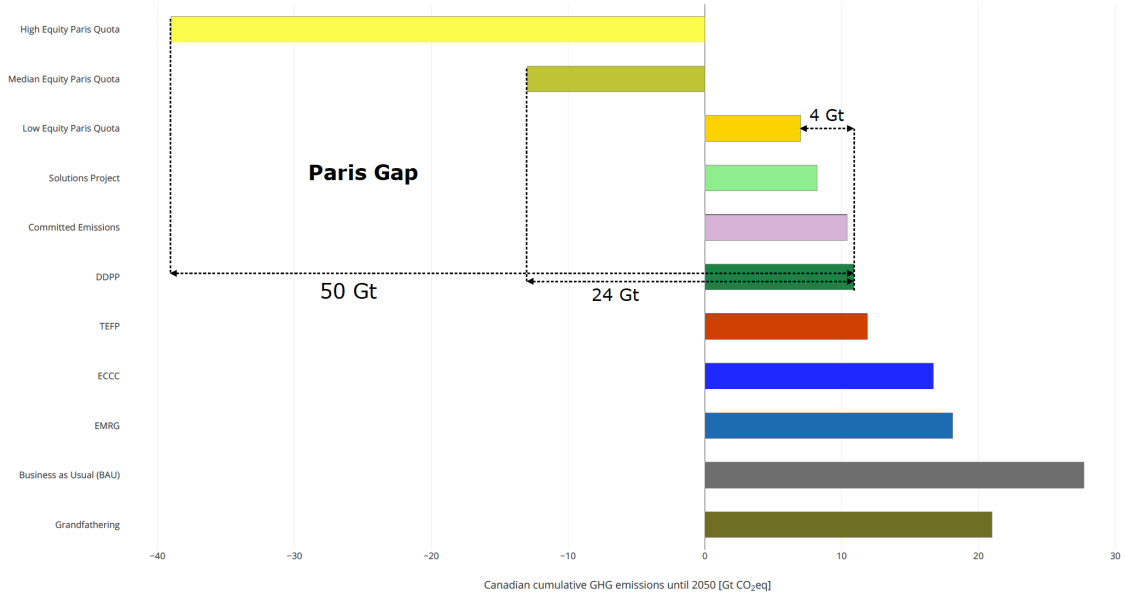
The most ambitious model, the Solutions Project (Jacobson et al.) differs from the previous models in providing a nationally-aggregated pathway to achieve 100% domestic energy production using existing renewable energy technologies, only constrained by technological and economic limits, instead of exploring how the economy will respond to specific policies (e.g. carbon pricing, efficiency measures subsidy programs). It can be interpreted as the lower bound of what is deemed technically possible when political conditions are favourable. That is not to say that it is a physical lower limit, since technologies may change to allow for deeper and more rapid emissions cuts.

DDPP provides a reasonable approximation for what Canada's decarbonization pathway would be if Canada chooses to pursue more ambitious climate action, in keeping with its promise to ratchet up ambition in the near-term, but is by no means the most rapid pathway possible. It simply represents what is presently believed to be the most ambitious of feasible pathways without making any substantial changes to the current political climate, people's attitudes and culture or behaviour, and without any markedly improved available technologies. For example, the more ambitious Solutions Project could be employed if political circumstances allowed it. The TEFP model at present covers only 73% of GHG emissions, and therefore includes only a portion of the national economy.

In Figure 2, the bars show the cumulative emissions (carbon dioxide, methane, and nitrous oxide) from the different pathways described above, stacked against the equity bounds and median equity cumulative emissions allowances of the Paris Quota derived from part 2 representing estimates for Canadian allocations of global carbon budget using annual shares of 1.5C and 2C degree pathways.

[299] Mark Z. Jacobson and others, "100% Clean and Renewable Wind, Water, and Sunlight All-Sector Energy Roadmaps for 139 Countries of the World", *Joule*, 1.1 (2017), 108–21, online: <https://doi.org/10.1016/j.joule.2017.07.005>.

Figure 2. Allowable cumulative emissions for high, median and low equity Paris quotas, compared to cumulative emissions from Canadian decarbonization pathways.[300]



Committed emissions include infrastructure up to 2012 and hence should be treated as a lower bound. All targets are those of the federal government's past and current administrations. When including committed emissions, all fair shares of any budget in the Paris range of 1.5°C to well below 2°C below preindustrial temperatures are unequivocally exhausted. Even under the largest fair share of the largest allowable carbon budget under Paris, by any definition of equity or any estimate of the global carbon budget, Canada will not be in compliance unless existing infrastructure is decommissioned before the end of its economic lifetime.

It is clear that none of the pathways developed so far can limit cumulative Canadian emissions in line with even with the most generous least equitable version of Canada's fair share of the *Paris Agreement* represented by the Paris Quotas. The Solutions Project comes close to the Low Equity Paris Quota and constitutes the most ambitious/fairest decarbonization pathway, followed by DDPP. Since Canada's committed emissions from existing infrastructures alone are greater than the least equitable Paris Quota, phase

[300] All values represent allowable or projected total emissions from 2018 to 2050. The total "Paris Gap" is shown here as the difference between the DDPP emissions and the low/median/high-equity Paris quotas. The Paris Gap represents the accumulated difference between what is achieved in a particular pathway, and what is "fair" according to a range of equity considerations. The dark blue bar represents the cumulative emissions under Environment Canada's pathway to Canada's NDC then following a linear trajectory to the mid-century objective of 80% below 2005 levels described in Canada's *Mid Century Strategy*. There has been no explicit modeling by EC showing how Canada can achieve reductions required to meet its mid-century target (linear interpolation shown with blue dashed line). The pathway modeled by EMRG (light blue line) meets the NDC target but is not as ambitious as the path required to meet the mid-century target of 80% below 2005 levels by 2050. Government of Canada, *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy* (2016). See Annex for more details.

out of existing emitting infrastructure would be fairly consistent with a low-equity Paris decarbonization pathway.

The Paris Gap is the difference between the cumulative emissions it owes under an equitable distribution of a *Paris Agreement* carbon budget, referred to here as its "Paris Quota", and what it will end up emitting between now and its eventual decarbonisation, by providing financial and technological help to climate creditor nations. The Gap is calculated here, for illustrative purposes, between the DDPP and the three equity outcomes shown.

The concept of a Paris Gap can be used to estimate the level of international assistance Canada would have to commit towards internationally transferred mitigation outcomes in order to compensate for insufficient domestic mitigation. It is clear that Canada will have to act with greatest ambition possible to decarbonize its economy as quickly and soon as possible, allowing the maximum possible room for the climate creditor nations to use what little of atmospheric capacity is left under the Paris Agreement.

In other words, just because Canada can't do its fair share based on domestic mitigation alone, doesn't mean it should give up on rapid decarbonization. On the contrary, Canada should pursue the most rapid decarbonization possible and make up its Paris Gap.

Figure 3. Canadian Decarbonization Pathway Trajectories towards 2050

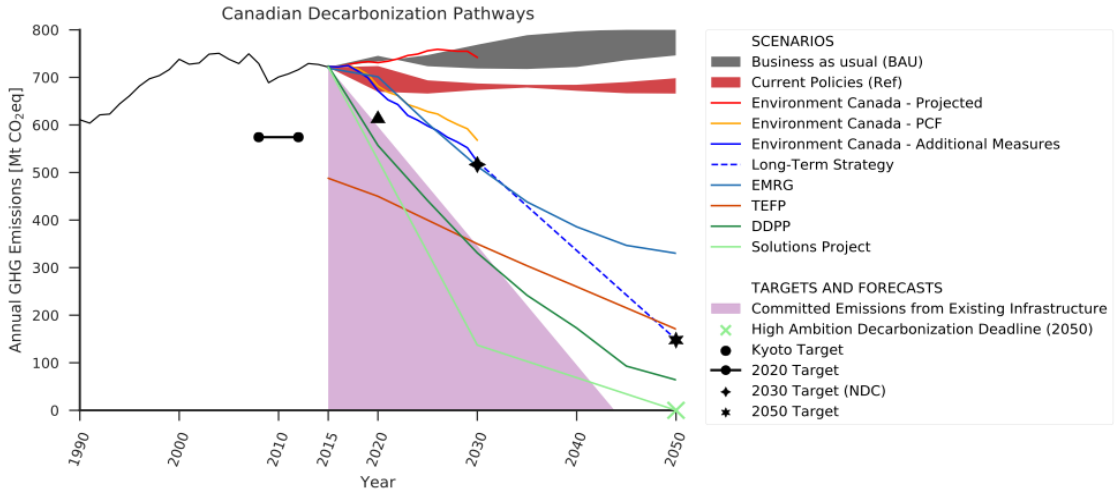


Figure 3[301] illustrates the different decarbonization pathways compared to business as usual and current policies pathways until 2050. Clearly, existing federal government

[301] All pathways are in million tonnes of carbon dioxide equivalents for national aggregate emissions from 2015 to mid-century. "Business as usual" (BAU) represents pathways with no climate policies, and "Current policies" represent pathways compatible with existing federal regulations, without implementation of measures in the *Pan-Canadian Framework* (PCF). In both cases, the range reflects the differences in projections between two independent modeling projects, the Deep Decarbonization

policies do not yet reach what seems to be feasible under the independent decarbonization pathways.

The DDPP pathway (dark green line) outperforms the pathway needed to achieve the target set in Canada's Mid-Century Strategy[302] and brings the economy to near but not full decarbonization by 2050. The light green cross marks a 2050 decarbonization date, which is achievable with existing technologies according to the Solutions Project (light green line).

Hence, the earliest technologically feasible date identified in any of the studies for decarbonization in Canada is 2050 and should be considered the latest possible deadline to do so. Reconsidering what is politically, culturally, and behaviourally possible could bring the decarbonization deadline closer to the short term and reduce the gap between mitigation efforts in Canada and what is considered to be our fair share.

Possible pathways that are yet to be conceived could account for greater rapidity and depth of decarbonization made possible by more fundamental shifts in human behaviour or technological innovation. None of the models developed to date factors either of these uncertainties into its design and so should be perceived as a floor to ambition, not a ceiling. The existing models are conservative in design, not because that reflects the views of the analysts but because the model exercises have been formulated to answer the question of what is possible within the current economic and political system using existing technologies.

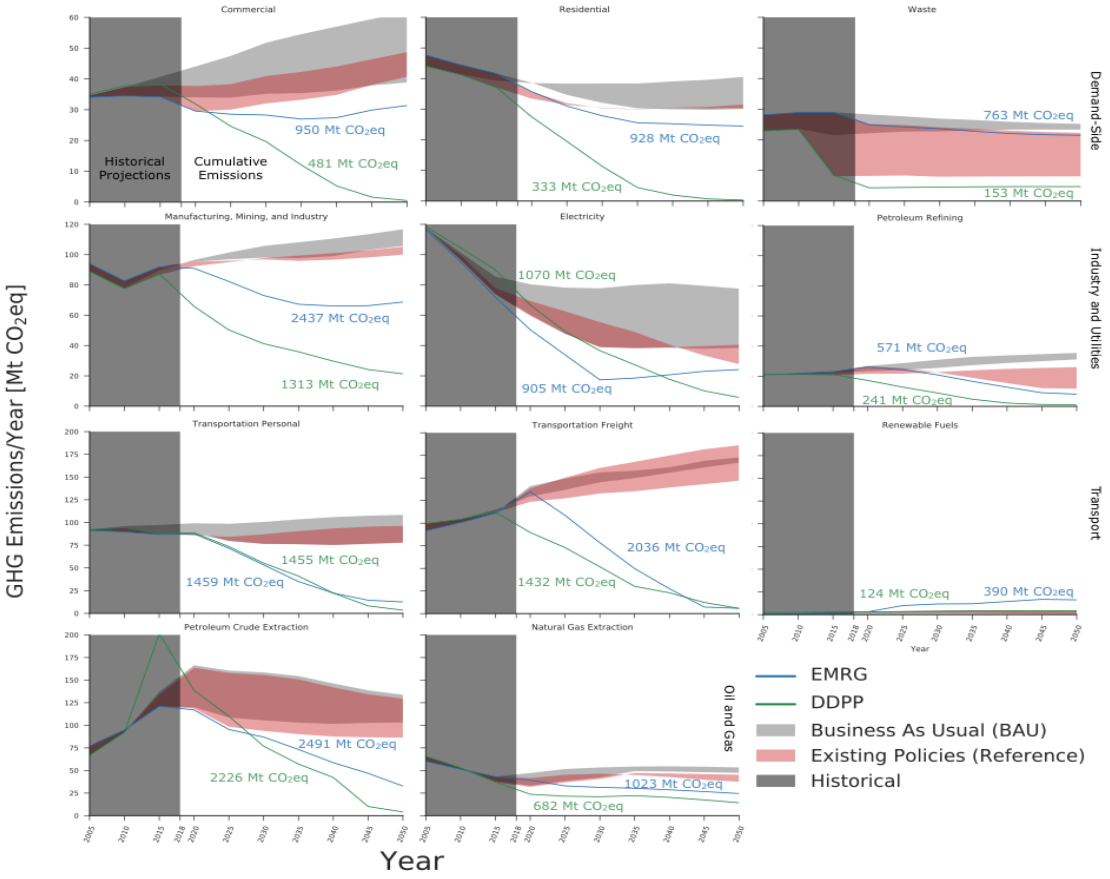
Figure 4[303] compares two decarbonization pathways (EMRG and DDPD) with business as usual and existing policies projections by sectors of the Canadian economy. Even these non-Paris compliant pathways clearly have negative implications for new projects that would release or facilitate significant GHG emissions throughout the period when GHG emissions are to be eliminated, as well as for new projects that would have GHG emitting lifetimes that extend past the deadline for GHG neutrality.

Pathways Project (DDPP) and the Energy and Materials Research Group (EMRG). BAU projections produced in-house by Environment Canada (EC) are shown by the red line, and are quite consistent with the independent BAU estimate. Projected emissions pathways that include implementation of PCF measures are shown as the light orange line. Additional measures are still required to meet the 2030 target as specified in Canada's Nationally-Determined Contribution (NDC), with a hypothetical pathway that will achieve the missing 44Mt towards the 2030 NDC shown as the blue line. There has been no explicit modeling by EC showing how Canada can achieve reductions required to meet its mid-century target (linear interpolation shown with blue dashed line).

[302] Government of Canada, *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy* (2016).

[303] Blue lines denote results from the Energy and Materials Modeling Group (EMRG) and green lines show the Deep Decarbonization Pathways Project (DDPP). "Business As Usual" (BAU) and Existing Policies (Reference) projections are shown as ranges given by the combination of both modeling projects, denoted by the shaded area in grey and red, respectively. Here, historical emissions are shaded out with the dark transparent rectangle, since all modelling started at 2005. Annual and cumulative emissions are measured in million tonnes carbon dioxide equivalents (Mt CO2eq). Cumulative emissions for the EMRG and DDPP decarbonization pathways are the sum of annual emissions from 2018 to 2050 (inclusive).

Figure 4. Comparison of business-as-usual and existing policy emission projections by sector, with sectoral decarbonization pathways



Sectors that show promising amount of achievable reductions are the largest emitting sectors in oil and gas extraction and "manufacturing, mining and industry." It is virtually impossible to mitigate emissions sufficiently to meet even current NDC targets without making substantial cuts in these key sectors. Examples of implications of existing pathways are provided here for two key sectors of the Canadian transition: oil and gas and hydro-electricity.

Oil and gas: There is strong agreement in modelling studies that petroleum crude extraction must be nearly fully decarbonized by mid-century. Decarbonization pathways from the Energy and Materials Modeling Group[304] (EMRG) and the Deep Decarbonization Pathways Project for Canada[305] (DDPP) allow for 2.9 and 2.8 Gt CO_2eq respectively for the oil extraction sector. The Solutions Project calls for the most ambitious reductions and is the only model that yields full-decarbonization (across all

[304] Mark Jaccard, Mikela Hein, and Tiffany Vass, *Is Win-Win Possible? Can Canada's Government Achieve Its Paris Commitment. . . and Get Re-Elected?* (20 September 2016).
[305] Chris Bataille, David Sawyer, and Noel Melton, *Pathways to Deep Decarbonization in Canada, SDSN - IDDRI*, September 2015.

sectors) by mid-century. The Trottier Energy Futures Project (TEFP) allows for the second smallest amount of emissions remaining for the oil extraction sector.[306]

Conversely, projections from existing regulations allow yearly emissions from oil extraction to be in excess of 200 Mt CO2eq for the next decade, roughly half of which would be from the oil sands alone. The policy and assessment implications regarding future Canadian fossil fuel development centre on immediate and demanding steps to avoid locking-in GHG intensive infrastructure that would make future compliance with the *Paris Agreement* goals nearly impossible to achieve. According to the *Re-energizing Canada* report, "If Canada is to meet its climate change commitments, there will need to be a major reduction in either the magnitude of oil production in Canada or the GHG intensity associated with recovery and processing of each barrel of oil or bitumen".[307]

There needs to be a credibly equitable sharing of decarbonization burden across sectors in Canada. The oil and gas sector needs to contract because it is otherwise unfair that everyone else must contract in a draconian way. There is an opportunity cost to Canadians of assigning privilege to the oil and gas industry if this country is to do its fair share under the *Paris Agreement*. Indeed, a recent senatorial report highlighted: "According to Environment and Climate Change Canada projections as of November 2016, Canada must reduce annual emissions by 219 Mt CO2eq in order to meet its 2030 target. To put this into context, it is nearly equal to Canada's entire oil and gas industry in 2030, which is projected to be 233 Mt CO2eq."[308]

The reduction the entire country is expected to achieve is roughly equal to the expected emissions of one industry for which there is essentially no federal pathways guidance, and which would take up nearly half of allowed national emissions in 2030. If we are to believe the 100 Mt annual cap will survive the next elections and be imposed on Alberta's bitumen extraction industry as promised by the provincial government,[309] the result would still assign roughly a fifth of the national GHG budget in 2030 to a single industry in a single province.[310]

In order to understand Canada's veritable global impact on GHG emissions beyond territorial boundaries, it is also possible to look at exported emissions. In 2014, total emissions from Canada's exports of fossil fuels (738 Mt) were approximately equal to

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[306] For models that do not have data explicitly for the emissions pathway over time for the oil extraction sector, figures were approximated using the pattern from the DDPP and EMRG models.

[307] Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 45,

[308] The Honourable Richard Neufeld and The Honourable Paul J. Massicotte, *Positioning Canada's Electricity Sector in a Carbon Constrained Future* (The Standing Senate Committee on Energy, the Environment and Natural Resources, March 2017), p. 3, online: <https://sencanada.ca/content/sen/committee/421/ENEV/Reports/Electricity_e.pdf>.

[309] Bill 25, *Oil Sans Emissions Limit Act*, 2nd Sess, 29th Leg, Alberta, 2016, online: <http://www.qp.alberta.ca/documents/Acts/O07p5.pdf>; Government of Alberta, "Capping Oil Sands Emissions", *Alberta* <https://www.alberta.ca/climate-oilsands-emissions.aspx>.

[310] Karine Péloffy and Meinhard Doelle, *NEB Modernization under the Climate Test: Part III* (2017), pp. 14-15.

all GHG emissions in Canada (732 Mt).[311] Thus, Canada's veritable carbon footprint is roughly twice as large when exported downstream emissions of fossil fuels extracted in Canada are considered.

Hydro-electricity: The assumptions underlying models also have to be questioned, including assumptions about the advantages of proposed technologies that would replace GHG-intensive modes of energy production. For example, concerning the future of electricity generation in Canada, hydro-electricity is assumed to take up a large part of decarbonization efforts in the electricity sector. In most existing pathways studies that underpin the Mid Century Strategy, hydropower generation in Canada is to increase between 113% and 295% in 2050 relative to 2013.[312] However, hydropower undertakings can have significant adverse environmental and social impacts, especially on Indigenous peoples. Also problematic are the increasing unpredictability of rainfall patterns with increasing climate change[313] and experience that "more recent large-scale hydro dams also show rapidly increasing costs well above current wind and solar energy prices."[314] Big hydropower facilities and other conventional "solutions" will need to be re-evaluated in an environment where alternative energy technologies are evolving rapidly and could provide low GHG energy with more flexibility, less environmental and social damage and greater potential for well-distributed benefits (see section 3.4(iv), below, for further details).

Further, the energy system in Canada is too often conceived in terms of production only and energy efficiency is not sufficiently developed even though an important proportion of energy produced in Canada is wasted.[315]

The transition to a low carbon economy needs to occur with equity-oriented policies to strengthen the feasibility and fairness of needed shifts, especially in the economies of provinces, territories and Indigenous jurisdictions most affected. Relevant policies

[311] Marc Lee, *Extracted Carbon: Re-Examining Canada's Contribution to Climate Change through Fossil Fuel Exports* (25 January 2017), p. 5.
[312] James Wilt, "What's the Future of Hydroelectric Power in Canada?", *The Narwhal*, 2017, online: <https://thenarwhal.ca/what-s-future-hydroelectric-power-canada/>; Government of Canada, *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy* (2016), p. 24: "The DDPP scenario requires about 101,500 MW of additional capacity, while the Trottier scenarios require about 111,000 MW of additional capacity. Environment and Climate Change Canada's High Nuclear scenario would require 36,000 MW of capacity to be built, while the High Hydro scenario would require 130,000 MW to be built.". Put another way, the pathways above assume building, respectively, 92, 101, 32 or 118 hydro-dams across Canada equivalent in capacity to Site C, the highly controversial hydropower project
[313] James Wilt, "What's the Future of Hydroelectric Power in Canada?", 2017.
[314] Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 16.
[315] For instance, in 2016, Ontario "wasted a total of 7.6 terawatt-hours (TWh) of clean electricity – an amount equal to powering more than 760,000 homes for one year, or a value in excess of $1 billion." See Ontario Society of Professional Engineers, "Ontario Wasted More Than $1 Billion Worth of Clean Energy in 2016", *Society Notes*, 2017, online: <https://blog.ospe.on.ca/featured/ontario-wasted-more-than-1-billion-worth-of-clean-energy-in-2016-enough-to-power-760000-homes/>.

include, for example, targeted support for alternative sectors and retraining and extended unemployment benefits for fossil fuel sector workers.[316]

All of the considerations in this section point to massive gaps in current Canadian climate policies, which provide no adequate basis for ensuring climate change mitigation is well addressed in federal assessments and associated decision making. How to fill the main climate gaps identified is explored in the next subsection.

The scale of the challenge cannot be underestimated. In the government's own words: "Reducing greenhouse gas emissions to levels consistent with the reasonable probability of maintaining this temperature goal (1.5C) will not be easy. It will require substantial effort on the part of all Canadians, with a fundamental restructuring of multiple sectors of the economy."[317]

3.3 Filling the gap I: Broad guidance for making climate-responsible decisions

All of the policies discussed in the previous section can affect planning and decision making on undertakings subject to assessments. Some of them (e.g., rules on the phase out of coal-fired electricity generation) have decisive effects on project options in affected sectors. However, for most assessments of projects and individual strategic undertakings, the existing and developing package of targets, frameworks and applied tools does not provide an adequate basis for determining whether or not approval of the proposal would be consistent with meeting Canada's commitments under the *Paris Agreement*. To support such determinations, the existing initiatives need to be complemented by more directly applicable guidance based on analyses of what must be accomplished for GHG abatement in the sectors and regions in which projects and other such undertakings are proposed.

Time for careful deliberation and credible consultation will be required to answer the many complex questions that arise in considering the gap between the *Paris Agreement*'s GHG mitigation obligations and implications for planning, assessment and decision making on strategic undertakings and projects. In the interim or in the continued absence of a serious federal exercise, basic working guidance is needed. This section aims to begin providing such guidance, based in part on best practices in other jurisdictions and expert advice. The seven issues we address are by no means a complete list, but nonetheless provide a valuable starting point.

The *Paris Agreement* provides some basis for this working guidance. Because the assumed purpose of the guidance is to ensure decision making on new projects, etc., is consistent with the *Paris Agreement* commitments, alignment with those broad commitments represents the basic climate criterion for decision making and is the test of adequacy for the guidance. Moreover, guidance tools should require that proponents use

[316] Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 45,
[317] Government of Canada, *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy* (2016), p. 3.

the latest credible information, in accordance with the commitment of using the "best available science" under Article 4 of the Agreement.

As noted in s.2.1.5, the *Paris Agreement* is designed to makes parties raise their ambition over time through obligations to define and communicate NDCs every five years. It also involves a global stocktaking exercise of the collective progress every five years, the outcome of which "shall inform" subsequent efforts of parties.[318] Constant movement upwards is to be anticipated and all guidance will be subject to continuous adjustment. Hence, an overall recommendation stemming from the iterative nature of the *Paris Agreement* is for regular policy reviews, including reviews of assessment framework in delivering on Paris commitments in step with the Paris framework. The reviews would build on lessons learned through experience to provide better informed NDC submissions, and use those updated submissions to update the legislative frameworks meant to deliver on commitments (as further specified in part 4).

Unfortunately, the current policy directives are generally not sufficiently ambitious to meet the *Paris Agreemen*t commitments, as discussed in the previous section (e.g., they do not reflect the 1.5ºC or well under 2ºC objective or take into account "fair sharing" of mitigation responsibilities). Consequently, the working guidance will need to address larger and smaller gaps between the Paris commitments and the underlying aims of the current policies. For the purposes of this discussion, we propose that the best and most needed further guidance in addressing these gaps would involve delineation of pathways (or broad corridors) along which transformations in various sectors and/or regions would need to proceed, at a defined pace, to meet the Paris commitments. Further questions also need to be answered to fill the gaps between Paris and establishing climate-responsible decision-making processes. The timing of implementing Canada's fair share; how to address issues of equity and GHG sinks and reservoirs; the need to develop financial tools and measures; accountability; institutional and informational vacuums; complexities of GHG time scales; and the future of Canadian energy and resource markets are all critical to this discussion. We will discuss potential answers to each of these questions in this section.

3.3.1 Implementing a fair share approach in a timely manner

As documented above, Canada is not implementing a fair share approach to GHG emission abatement as required under the *Paris Agreement*. We are not even expected to achieve our most immediate current national target of 17% reduction by 2020 relative to 2005, which in effect represents a 2% increase of GHG emissions over 1990 levels. By comparison, The United Kingdom (UK) is on track for 35% reductions in GHG

[318] Ralph Bodle and Sebastian Oberthür, "Legal Form of the Paris Agreement and Nature of Its Obligations", in *The Paris Agreement on Climate Change: Analysis and Commentary*, ed. by Daniel Klein and others (Oxford: Oxford University Press, 2017), p. 96.

emissions relative to 1990 levels.[319] For immediate steps to address this gap, Canada could adopt the carbon budget approach taken by the UK. The UK approach sets "short-term carbon budgets to aid in planning (for five year periods in the UK generally, and an annual budget in Scotland)."[320] It is designed to ensure that government decision makers stay within a carbon budget, similar to a financial budget. Although the targets are not set in reference to concepts like a global fair share or global carbon budget, this system provides transparency and accountability through a committee overseeing government achievements and the results have been very positive from legal and planning perspectives.

The UK's carbon budget approach highlights the pros and cons of annual and five-year carbon budget timelines. While the five-year budget provides flexibility, the annual budget provides accountability.[321] A five-year carbon budget in which annual budgets are specified allows for the benefits of both timescales. Longer-term carbon budgets would also make sense to ensure respect for the 2030 target and decarbonization deadline.

The United Kingdom system could be called a "political/planning" carbon budget approach. The budget itself was not scientifically based, as described in part 2, nor is it informed by the trickling down of a global carbon budget to a national budget based on a fair sharing approach. Rather, the approach slices up of their commitments into five-year periods. In other words, the approach is designed to ensure that government decision makers stay within a carbon budget, similar to a financial budget. The United Kingdom system provides transparency and accountability through a committee overseeing government achievements and has been very positive from legal and planning perspectives.

The implementation of a similar carbon budget in Canada could be an effective measure in meeting Canada's Paris commitments, as it "facilitates easy comparison and coordination between provincial targets and a national target, as well as aiding in planning."[322] Under a national carbon budget plan, each province and the federal government, with coordination from Environment Canada, would be required to "develop and implement carbon budget implementation plans which will demonstrate how their carbon budgets will be met."[323] It is preferable for carbon budgets to be "broken down into sub-budgets, allowing for detailed planning at a sector, or government agency, level." Moreover, "[c]arbon budget plans should fully 'cost' the different sources of emissions, demonstrating that the measures undertaken are likely to deliver on the carbon budgets at the relevant points in time."[324]

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[319] Andrew Gage, *A Carbon Budget for Canada: A Collaborative Framework for Federal and Provincial Climate Leadership* (Vancouver: West Coast Environmental Law, December 2015), p. ii, online: <https://www.wcel.org/sites/default/files/publications/CarbonBudget%20(Web)_0.pdf>.
[320] Ibid., p. 14.
[321] Ibid., p. 16.
[322] Ibid., p. ii.
[323] Ibid., p. iii.
[324] Ibid., p. iii.

There are pros and cons to annual and five-year approaches: "A 5-year budget gives flexibility and recognizes that there will be unavoidable year fluctuations in greenhouse gas emissions, while an annual budget provides for greater accountability – particularly for governments that are typically elected for 4 year terms."[325] A five-year carbon budget in which annual budgets are specified allows for the benefits of both approaches to be obtained. Further, five years could also work well with *Paris Agreement* stocktaking and NDC development cycles. Longer-term carbon budgets would also make sense to ensure respect of the 2030 target and decarbonization deadline. In sum, this approach calls for "multiple budgets – covering at least 15 years out, with new budgets adopted as needed to keep that 15 year planning window – [to] be set at the same time to allow for long term planning".[326]

The overall national budget should aim to meet Canada's fair share under the *Paris Agreement*, and in turn provincial budgets should represent fair contributions to the national budget. The approach would also "include a federal budget that reflects the actions of the federal government and emissions from federally-regulated sources of emissions".[327]

A carbon budget approach roughly inspired by the UK's successful experience would provide a reasonable basis for planning to reach specific mitigation goals nationally, including by providing clarity, transparency and accountability.

3.3.2 Identifying potential pathways for meeting the Canadian GHG neutrality target and deadline

Pathways studies can explore the feasibility of different GHG neutrality deadlines (e.g., reflecting more and less fair sharing of mitigation responsibilities) and can compare alternative routes to meeting a particular deadline. They can test the effects of strategic options (e.g., progressively increasing carbon/GHG prices), identify priority needs for technological innovations, and provide a vehicle for application of other GHG mitigation tools. Most importantly for our immediate purposes, identified national, regional and sectoral pathways can provide a reasonably simple and comprehensible link between overall climate commitments and individual undertakings.

Credibly developed, assessed, approved (and reviewed and updated) pathways-based policies could be used to guide planning and decision making on broad strategies for meeting our Paris commitments. They would also make it easier to ensure that specific projects and undertakings comply with the *Paris Agreement*, and therefore would render assessments more certain and predictable. Moreover, the same pathways information could guide initiatives involving existing and continuing activities and new undertakings that are not subject to assessment law but are also contributors to GHG emissions and sink impairments.

[325] Ibid., p. 16.
[326] Ibid., p. 18.
[327] Ibid., p. 18.

Nothing about this is easy. Additional consideration would have to be given to areas such as motivations for pathway adherence, credible processes for developing pathways, capacity for flexibility and innovation, criteria for comparing pathways, and mutual support between pathways. Similar treatment of new and existing undertakings is crucial for reasons of equity and consistency in the assignment of responsibilities, burdens and opportunities.

In the bigger suite of GHG mitigation initiatives, pathway applications are heavily dependent on other mechanisms, such as carbon budgets. Pathway guidance is mostly information for decision making. It can be used effectively only in the development and application of other authoritative and influential governance mechanisms that can encourage transition to GHG neutrality – tax and subsidies, prohibitions and funding support, as well as legislated assessment and approval processes. That is important because requirements in assessment law typically apply to only select number of major undertakings. Assessment applications alone cannot drive best efforts to reduce GHG emissions, protect carbon sinks and meet Canada's climate commitments. Moreover, within and beyond assessment applications, mere information about the routes to climate compliance will be ineffective without tools that strengthen motives for adherence to the identified pathways.

The pathways would need to be identified and applied in combination with the other initiatives using targets, frameworks and economic and regulatory tools. All of these efforts would be intended to serve progress towards GHG neutrality by an at least roughly defined deadline. All of them could be effective only if developed through credible processes that enhance broad understanding. And all need to respect and support the delivery of lasting gains in the many other areas where future sustainability requires transformations today. Working pathway strategies must be flexible and encourage innovation, motivating best possible accomplishments, rather than fostering minimal adherence to it, while also keeping other options open.

There should be processes and criteria to compare alternative pathways and their feasibility. Since feasibility is to a large extent a subjective concept, there will need to be open data in various sectors, especially in renewable energy alternative scenarios since they are less known, and assumptions are bound to vary wildly. Underlying data must be available in order to test underlying assumptions. The impact of strategies can be quantified through evidence-based measurements by implementing a system to measure, monitor and model GHG emissions.

Pathways should also incorporate attention to other sustainability objectives and human rights. Similarly, it is expected that climate would be considered within the broader context of sustainability-based assessment legislation.

Working pathways must be designed to interact effectively so that initiatives in each pathway can be mutually supporting. It should be understood that they would proceed in parallel and should be informed by other work to clarify and specify the implications of

Canada's *Paris Agreement* commitment, including the national deadline for GHG neutrality.

Lastly, the development of pathways should aim to correct deficiencies associated with unaccounted externalities and costs of mitigating GHGs associated with undertakings. The latter can be addressed by adequately attributing different prices and costs and budget to projects, programs and technologies in the energy and land based sectors, which are further discussed below.

Identifying pathways has a number of implications for new undertakings, existing undertakings, and the relationship between them, as well as strategic level undertakings. As it currently stands, development in Canada is led by the private sector: proponents initiate projects that trigger (or fail to trigger) federal or provincial assessment processes that then have to play catch-up to the proponent's plan. Governments should develop integrated pathway approaches that are based on Paris-compliant carbon budget approaches, which would then underpin transparent, open, public processes for identifying best options for development initiatives. For example, the processes could encourage energy or service providers to bid to meet a certain public need identified to stay on the pathway and/or allow competitors to conventional proponents to "pitch" alternative scenarios in order to help clarify and quantify relative lifecycle GHG project benefits. In this vein, it is interesting to note that at least one jurisdiction in Canada is legislating strategic environmental assessments to facilitate planning ahead.[328]

Pathways must be defined and applied so that processes and decision making focused on (mostly) proposed new undertakings are combined with initiatives and mechanisms (e.g., GHG pricing) focused on existing activities and non-assessed new undertakings for a well-integrated and fair result. Existing GHG intensive undertakings that are up for re-permitting should undergo a full EA/climate assessment. The design of the whole system must carefully avoid grandfathering in polluters and learn from pathways to construct a rational GHG EA triggering mechanism that includes existing projects up for re-permitting.

In regards to existing undertakings, pathways should identify optimal choices for retiring existing high emitting infrastructure and design policy, assessment and decision making criteria accordingly (e.g., coal fire station). In order to achieve equality between existing and new projects, significant life extensions to, amendments to, or reviews/renewals of existing undertakings should be assessed according to similar, adapted standards to which new projects are held.

The policy environment should make it possible for new transformative technologies and projects to retire older more GHG intensive established industries, in ways that respect human rights and the just transition of the workforce and avoid lock-in of fossil-fuel based infrastructure. The systems should aim to be dynamic and encourage the

[328] Quebec is legislating strategic assessment: see the *Environment Quality Act*, section 95.10 and following, <http://legisquebec.gouv.qc.ca/en/ShowDoc/cs/Q-2>.

private sector to voluntarily fold risky assets and invest in transformative technologies, which could be facilitated through the mandate of the Infrastructure Bank.

Given the importance of public and institutional understanding and process credibility, broad learning about the issues and options should be optimally incorporated in determining pathways through strategic assessment. So far, "the top-down tendency to 'consult' the public to obtain social acceptance, rather than working collaboratively to co-produce desirable outcomes, fails to recognize the unequal distribution of power within policymaking processes" especially when it comes to the energy/climate nexus of issues.[329] This pathway determination will also need to involve all key ministries (resources, environment, science, justice, agriculture) and sectors, private and civil society. There will be a need to create mechanism for strategic assessments of policies and pathways that force coordination amongst many actors and sectors in governments and beyond.

3.3.3 Addressing equity in climate policies, programs and assessments

Although equity is often regarded in the context of industrialized/non-industrialized countries, it has important implications in a country like Canada, where climate change already significantly affects northern, rural and Indigenous communities. Such communities often have limited resources to adapt to climate change, and typically have not benefited from the development associated with the high GHG legacy of industrialisation to the extent that urban communities in southern Canada have. Equity weighting could be incorporated into decision making to address this gap. For example, in their advice to the Expert Panel on environmental assessment reform, the Indigenous peoples and environmental organization members of the Multi-Interest Advisory Committee recommended the use of weighting factors:

> Both climate change and responses to it involve considerable potential for maldistribution of effects. For example, climate change is already having disproportionate impacts on Indigenous peoples as well as rural, remote, northern and poor communities. Further, carbon footprints vary extensively across regions of Canada and fuel poverty should be avoided as an unintended consequence of climate mitigation.
>
> We recommend that climate justice be addressed through the use of weighting factors that incorporate attention to existing disadvantages as well as potential additional adverse effects. For example, weighting could help ensure that regions and communities that have contributed less to the climate problem and are disproportionately affected by it are not further penalized. In this vein, much could be done to enhance energy conservation programs and renewable energy alternatives in remote fossil fuel-dependent Indigenous and rural communities to reduce this reliance and provide cheaper, cleaner forms of energy. For example, a national

[329] Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 34.

> Aboriginal housing strategy that assigns priority to the construction of energy efficient units in rural remote communities on a priority basis would reduce the effects of a major local source of GHG emissions – home heating – as well as the cost of living and living conditions that contribute to chronic poor human health. (…) These are important considerations that have bearing in weighing the trade-offs associated with the distribution of GHG emissions locally, regionally and nationally on project-specific EA.[330]

These considerations are just as fundamental in the context of projects proposed as "climate solutions". It will be extremely important to ensure that human rights, especially Indigenous peoples' rights, are not to be traded-off in the quest to meet *Paris Agreement* obligations. Building criteria and trade-off rules that account for these rights, as well as existing inequities and intergenerational equity, will be critical for climate-responsible decision making and assessment.

Developments should also be sensitive to the most effective and practicable pathways for the various sectors and regions. Regional and sectoral equity is very important to consider in crafting budgets and pathways. Not all sectors will have to (or be able to) move to zero emissions (e.g., agriculture), others (oil, coal, gas) can and must, while others still (LULUCF, electricity) will have to move into negative emissions or positive sink enhancements territory. Likewise, the regional distribution of these sectors has implications for regional distribution of effort. At the same time, capacity to act and responsibility for emissions are distributed unequally among regions. Consequently, what is "fair" to expect from a region might not match what is "needed" from that region. This provides a case for inter-regional support, analogous to the case for international support long recognized in climate conventions, necessary in a Canadian context.

The transition to a low carbon economy needs to occur with equity-oriented policies to help transition the economies of provinces most affected, such as targeted support for alternative sectors, workers' retraining and extended unemployment benefits.[331] The working class has had little say in the key decisions that have lead to GHG intensive developments, and yet it is vulnerable to risks in the transition to come. The concept of just transition should also guide action going forward, and ensure retraining and employment schemes and insurance schemes for workers in GHG intensive industries such as coal that are being retired.

Guidance on how to develop and identify the best ways to develop Paris-compliant pathways to GHG neutrality should include potential equity factors that are crucial in the Canadian context, particularly for Indigenous peoples.

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[330] Multi-Interest Advisory Committee, *Advice to the Expert Panel – Review of Environmental Assessment Processes*, 9 December 2016, p. 28 (section with ENGO and Indigenous Caucus consensus only).
[331] Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 45.

3.3.4 Addressing GHG reservoirs and sinks in decision making

The *Paris Agreement* draws attention to the need to address GHG reservoirs and sinks in decision making, yet significant gaps remain in Canada's approach to doing so. Gaps in knowledge regarding unmanaged forests, peatlands will need to be addressed, as Canada seems to hold the world's second largest stock of peatlands[332] (a globally significant carbon reservoir) and very large areas of forests.

Canada's diverse landmass is third largest in the world after Russia and Antarctica.[333] The federal government should therefore look at different alternative policy scenarios, including integrated approaches to accounting for GHG reservoirs and sinks, in order to gain knowledge of existing stocks and their consideration within assessments as well as to elicit further reductions and conservation of existing stocks.

This issue arises in part because of the failure within the scientific community to establish a practicable definition for emissions within the LULUCF sector that distinguishes between direct human-induced effects and indirect human-induced and natural effects.[334] The absence of such a definition is just one of the many methodological difficulties associated with including forest management in accounting for GHG emissions and sinks, sparking debate over whether forests should be considered at all in the accounting process (keeping in mind that the LULUCF sector is currently not included in calculating national GHG emissions totals).[335] For example, a major concern is that GHG accounting systems would be corrupted by a windfall of unearned GHG reduction credits going to countries such as Canada with significant forest lands.[336] Because the *Paris Agreement* does not provide one specific solution to the challenges presented by forest management within GHG accounting, responsibility lies with the Parties, including Canada.[337]

There seems also to be a knowledge gap regarding the treatment of carbon stored in soils that will need to be addressed in Canada. Canadian peatlands store approximately 150 Gt C, although the total is likely to rise in the future as estimates for permafrost regions are developed. Careful mapping of peatlands should be undertaken for further policy development and carbon stored in soils should be considered in the context of projects with important land based impacts and/or in regions rich in peatlands or intact forests.

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[332] Jiren Xu and others, "PEATMAP: Refining Estimates of Global Peatland Distribution Based on a Meta-Analysis", *CATENA*, 160 (2018), 134–40, online: <https://doi.org/10.1016/j.catena.2017.09.010>.

[333] "The World Factbook: Country Comparison: Area", *Central Intelligence Agency*, online: <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2147rank.html>.

[334] James Watson and others, "The Exceptional Value of Intact Forest Ecosystems", (2018).

[335] Other core methodological challenges include addressing transparency and comparability between different countries, ensuring management impacts are adequately reflected, ensuring the integrity of the accounting system through adequate safeguards, and providing incentives for adaptation within forest management practices. Joachim H. A. Krug, "Accounting of GHG Emissions and Removals from Forest Management: A Long Road from Kyoto to Paris", *Carbon Balance and Management*, 13.1 (2018), online: <https://doi.org/10.1186/s13021-017-0089-6>.

[336] Joachim H. A. Krug, "Accounting of GHG Emissions and Removals from Forest Management: A Long Road from Kyoto to Paris", (2018).

[337] Ibid.

These land-based sectors are probably those for which there is the greatest level of uncertainty in providing guidance for mitigation policy development (reductions through anthropogenic enhancement of natural sinks) and for project and program assessments. LULUCF policy and knowledge development present a necessary avenue for further investigation.[338]

Current trends and approaches in the land use, land use change and forestry (LULUCF) sector are central to accounting for GHG reservoirs, sinks, and emissions in the context of the *Paris Agreement*.[339] The net flux of emissions of the LULUCF sector is calculated by the sum of CO2 and non-CO2 emissions to the atmosphere and CO2 removals from the atmosphere. It should be noted that all emissions and removals in the LULUCF sector are reported separately from the national totals of GHG emissions, despite the fact that they can potentially represent a significant net flux of GHG emissions.[340]

Accounting for GHG emissions and removals within the LULUCF sector is reported in five categories, including Forest Land, Cropland, Grasslands, Wetlands and Settlements, and Harvested Wood Products.[341] Focussing specifically on the Forest Land Category, the government of Canada has classified forests into managed and unmanaged forests. Presently, roughly ⅔ of Canadian forests are "managed forests".[342] Managed forests are "made up of all forests under direct human influence. It's a subset of Canada's total forest area and includes forests managed for harvesting, forests subject to fire or insect management, and protected forests such as those found in national and provincial parks".[343] Forests not covered by this definition are considered unmanaged.

Canadian inventories only account for "managed" forests and agricultural lands. The role that unmanaged forests and peatlands play in GHG mitigation is ignored. The failure to identify the value of unmanaged forests and peatlands as carbon stores has been translated to their having zero value so far within GHG inventories and in assessments of projects with land based impacts. This is particularly problematic in light

[338] Note that "oceans" as carbon reservoirs, sinks or sources of GHGs have not been investigated at all in this report. Canada has three oceans and they are covered in the *Paris Agreement*. Further investigation is recommended concerning whether and how Canada could better manage its impressive "oceanic resources" for climate mitigation and adaptation.
[339] Indeed, changes in accounting approach in the LULUCF sector and how they are included in Canada's nationally determined contribution can have a great impact on net GHG reductions actions actually achieved. See Climate Action Tracker (2018).
[340] 2.3.4 Land Use, Land-use Change and Forestry Sector in Government of Canada, *National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1* (Environment and Climate Change Canada, 2017), p. 72, online: <https://unfccc.int/process/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories/submissions-of-annual-greenhouse-gas-inventories-for-2017>.
[341] Ibid., p. 72.
[342] Around 65% of forests in Canada are managed: Natural Resources Canada, "Indicator: Carbon Emissions and Removals", 2018, online: <https://www.nrcan.gc.ca/forests/report/disturbance/16552>.
[343] Ibid.

of the extensive value that intact forests have in climate regulation, watershed regulation, biodiversity conservation, Indigenous cultures, and human health.[344]

Forests can act both as a carbon source or a carbon sink, depending on the net balance of their exchanges with the atmosphere.[345] As trees grow, they absorb CO2 from the atmosphere through photosynthesis and this carbon is then stored in vegetation, dead organic matter and soils.[346] The decay and burning of forests and vegetation forces the carbon dioxide and other GHG's to return to the atmosphere.[347]

The complexity of determining how forest conservation fits into the broader context of GHG accounting in light of the *Paris Agreement* should not be underestimated.[348] While there is ongoing work to address aspects of this complexity, there is still a broad need for greater attention to unmanaged lands:

> Increased attention to unmanaged lands, and to transitions between the managed and unmanaged lands categories, through key venues such as the Intergovernmental Panel on Climate Change Special Reports and the Global Stocktake and Facilitative Dialogue [under the *Paris Agreement*] will not just improve understanding of the climate mitigation role of intact forests but also support nations in articulating interventions, targets and funding needs for protecting these forests in formulating and implementing their nationally determined contributions.[349]

During the past century, Canada has reported its managed forests as a significant carbon sink, with the amount of carbon being stored outweighing the amount that they have released. However, it should also be noted that Canada's reporting of managed forests are based on a number of controversial assumptions, including the assumption that much of the carbon storage is in harvested wood products. Regardless of past trends, Canada's forests have now become carbon sources, whereby each year forests release more carbon into the atmosphere than they accumulate. A diversity of factors have caused the decay

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[344] James Watson and others, "The Exceptional Value of Intact Forest Ecosystems", (2018).

[345] Natural Resources Canada, "Forest Carbon", 2016, online: <https://www.nrcan.gc.ca/forests/climate-change/forest-carbon/13085>.

[346] 6.3.1.1. Sink Category Description in Government of Canada, *National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1* (2017), p. 201.

[347] Ibid.

[348] The net flux of GHG emissions in LULUCF are calculated by the sum of CO2 and non-CO2 emissions to the atmosphere, and CO2 removals from the atmosphere. However, recent changes in methodology in the Forest Land net flux calculations mean that they do not account for all exchanges between the atmosphere and Forest Lands in terms of GHG emissions.

More precisely, in 2015 a new reporting approach was implemented, which excludes GHG emissions and removals from impacts of natural disturbances and to account for "anthropogenic" LULUCF only. Indeed, impacts of non-anthropogenic natural disturbances with greater than 20% tree mortality, such as wildfires, insect infestations and wind throw, are excluded from the estimates of net removals. In addition, emissions from unmanaged forests, located mostly in the North, are not currently included in GHG inventory. These changes are argued to "reveal more meaningful trends associated with anthropogenic activities". (See Government of Canada, *National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1* (2017), p. 198-201.

[349] James Watson and others, "The Exceptional Value of Intact Forest Ecosystems", (2018).

of forest land that contributed to this shift. First of all, the annual total area affected and burned by wildfires has substantially increased. In addition, the forests have suffered unparalleled insect outbreaks. Finally, economic demand caused annual harvest rates to fluctuate dramatically.[350]

With the objective of isolating anthropogenic impacts of forest management activities, these changes to the methodology to calculate the emissions and removals in Forest Land risk excluding the emissions produced by wildfires from the policy discussion. Without accounting for these emissions, even if derived from a natural cause, the net flux represented by the inventory could fail to capture the gravity of the full picture of LULUCF emissions. Looking at forest fires and their impacts in the future on the carbon sink/source balance of Canada's forests, researchers at Canadian Forest predict that the frequency and severity of these fires will result in much greater amounts of carbon being released into the atmosphere. In fact, they predict that if this trend continues, the forest area annually affected by fire will double.[351] The increase of number of fires combined with longer and more frequent droughts and the increase of insect outbreaks will result in the increase of carbon release into the atmosphere. As Natural Resources Canada explains, "[t]he outcome of all these interconnected events is likely to be further acceleration of the feedback loop: more emissions will lead to accelerated climate change, which in turn will enhance the conditions that create more carbon-releasing disturbances in Canada's forests."[352] Whilst reporting on emissions only related to "anthropogenic" actions may be conceptually justified, it would seem important to not lose track of fire dynamics for the future of GHG reservoirs and sinks as well as for consideration for planning in these regions.

Harvested Wood Products are another key category in the LULUCF sector. The models used in this category calculate GHGs according to different end use and disposal of harvested wood manufactured products (paper vs. wood used in buildings) both domestically and elsewhere in the world. By calculating the emissions based off of end use, this model accounts for delayed release of carbon back into the atmosphere.[353] As such, a significant portion of Harvested Wood Product emissions are caused by decay of long-lived wood products where they have reached the end of their economic life decades after the wood was harvested.[354] This approach encompasses emissions over the full lifecycle of harvested wood products, and provides a relatively sophisticated example of life cycle carbon accounting.

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[350] Natural Resources Canada, "Forest Carbon", 2016, online: <https://www.nrcan.gc.ca/forests/climate-change/forest-carbon/13085>.
[351] Ibid.
[352] Ibid.
[353] 6.4 Harvested Wood Products in Government of Canada, *National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1* (2017), p. 209.
[354] Government of Canada, *National Inventory Report 1990-2016–Greenhouse Gas Sources and Sinks in Canada: Executive Summary* (Ottawa: Environment and Climate Change Canada, 2018), online: <https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/emissions-inventories-reporting/nir-executive-summary/National%20Inventory%20Report%20Executive%20Summary%202018.pdf>.

Agricultural lands in the LULUCF sector include both Cropland (all annual crop lands, summer fallow and perennial crops) and agricultural Grassland ("unimproved" pasture or rangeland used exclusively for grazing livestock).[355] Emissions related to agricultural soils and impacts of different practices are accounted for with a model that accounts for both CO_2 non-CO_2 emissions associated with agriculture. The uptake of different practices, such as the extensive adoption of conservation tillage practices and reduction in the use of summer fallow in western Canada have increased the amount of carbon stored in soils, acting as a carbon sink.[356] For example, net GHG removals peaked in 2009 at 11.7 Mt, and have since declined. This is due in part to slower rates of agricultural expansion onto forest land. While the conversion of forests to other land uses is in decline, it still remains a prevalent practice in Canada, particularly for conversion to settlements for resource extraction (mining camps). Furthermore, emissions due to forest conversion also declined from 16 Mt in 2005 to 14 Mt in 2015.[357]

Other CO2 emissions associated with agriculture, such as those exchanged by some Cropland that includes berries, grapes, nursery crops, vegetables, and fruit trees and orchards, are accounted for with managed forests.[358]

The existing treatment of Canadian reservoirs and sinks under Canadian GHG accounting rules for forests and agricultural lands has been a topic of controversy for Canada on the international stage in the past. Among the difficulties is that recent trends in emissions from these sectors are dominated by the variation in wild fires and pests, which are largely beyond human control and have been excluded in the new methodology developed to focus exclusively on anthropogenic emissions.

Given the importance of these sinks and reservoirs, a moratorium on development with extensive land based impacts should be considered in areas of the country containing important sinks and reservoirs, at least until appropriate mapping and research has been conducted as well as special programs established to conserve key areas. At the very least accounting for emissions stemming from land disturbances and their avoided future sequestration should be included in project assessments (see section 3.4). These data could also inform future rounds of NDC development and position Canada as a world leader in sink and reservoir protection.

This means that forests are becoming increasingly important to consider in the context of protecting carbon sinks to meet *Paris Agreement* commitments. Careful research is

[355] 6.2 Land Category Definition and Representation of Managed Lands in Government of Canada, *National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1* (2017), p. 198.
[356] 6.1 Overview in Land Use, Land-Use Change and Forestry in Government of Canada, *National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1* (2017).
[357] Government of Canada, *National Inventory Report 1990-2016–Greenhouse Gas Sources and Sinks in Canada: Executive Summary*, 2018
[358] 6.2 Land Category Definition and Representation of Managed Lands in Government of Canada, *National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada, Part 1* (2017), p. 198.

needed regarding the capacity of forests to be permanently enhanced as GHG sinks given forecasted climate related impacts on these sinks and reservoirs.

3.3.5 Developing policies for carbon pricing and other economic tools/measures

Different economic tools have been proposed for pricing GHG emissions to incentivize successful abatement. Various tools have also been proposed for assessing the benefit of non-market-based regulatory action to abate GHG emissions. Understanding the underlying concepts and weaknesses of each approach is key to guiding the use of the right tools in context.

Since the federal government's announced price on GHGs is unlikely to yield the necessary level of mitigation required to meet *Paris Agreement* commitments, higher prices are expected in the future and should be considered in assessment. There are two considerations to be taken into account regarding adequate pricing/costing considerations. First, there is the question of assigning the right price on GHG emissions to yield the necessary reductions to meet our mitigation goals (from our existing targets up to our fair share of the Paris goals). Then, there is the matter of assessing the "benefits" associated with non-market regulatory actions, which the federal government until very recently did through the use of cost benefit analysis and the social cost of carbon.

i) Using adequate GHG pricing policy to achieve mitigation outcomes

Recent international studies by renowned climate economists could provide guidance for establishing abatement pricing mechanisms in Canada that would fill the gap between the existing carbon price announced by the federal government and the pricing needed to achieve Paris mitigation goals. Further, developments abroad and in Canada highlight controversies in the use of economic tools, such as the social cost of GHGs that assess climate damage. However, their use may be important if economic approaches remain in place as the way to justify regulatory action in Canada, including on GHGs. Models and methodologies will need to be made public and transparent and rely on the best international practices from other jurisdictions and experts.

Several tools have been elaborated to estimate the different costs of GHGs. These include the costs associated with abating a GHG emission, often represented by the marginal abatement cost, and damage-related costs, often represented by the social costs of GHGs[359]. Other concepts and hybrids have also been developed. These tools have first been developed in the context of attempting to capture costs and/or benefits associated with regulatory action on GHG reductions. [The use of these tools in the context of project assessment is discussed in section 3.4]

[359] For a comparison between the social cost of carbon and marginal abatement cost methodologies, see *The Value of Carbon in Decision-Making: The Social Cost of Carbon and the Marginal Abatement Cost* (Ottawa: Sustainable Prosperity, November 2011), online: <https://institute.smartprosperity.ca/sites/default/files/value-carbon-decision-making.pdf>.

There are inherent difficulties involved in determining a carbon price that will result in the effective abatement of emissions. The deployment of further tools than those currently contemplated by the government will be necessary in order to fully assess the employment of mitigation prices and damage costs in the appraisal of proposed projects and other undertakings with important climate impacts. This report relies on independent studies and examples from foreign jurisdictions for best practices and suggests that these approaches should inform future Canadian developments.

One approach to carbon pricing that has been employed by various countries to price GHG reduction outcomes is the marginal abatement cost (MAC). The MAC reflects the cost of reducing emissions (by contrast, the social cost of carbon reflects the damage imposed by creating emissions - see subsection ii). The MAC is thus "an estimate of how much it would cost to reduce (or 'abate') the next unit of carbon emitted."[360] This methodology presumes "that the cheapest and easiest abatement techniques will occur first, leaving the more expensive techniques for the future," as it is commonly assumed that carbon abatement becomes more expensive as emissions are reduced.[361]

In May 2017, the High-Level Commission on Carbon Prices chaired by renowned climate economists J.E. Stiglitz and Nicholas Stern issued a report supported by the World Bank "identifying corridors of carbon prices that can be used to guide the design of carbon–pricing instruments and other climate policies, regulations, and measures to incentivize bold climate action and stimulating learning and innovation to deliver on the ambition of the *Paris Agreement* and support the achievement of the Sustainable Development Goals."[362]

Another approach to carbon pricing that Stiglitz and Stern have pioneered in their report is the concept of "switching price". The switching price is the GHG emission value that would cause the production of carbon-intensive fuel sources to be less profitable than climate-compatible alternative technologies.[363] For instance, if the carbon price were to be set higher than the price for switching from coal, it would be beneficial for a coal producer to switch to a less emitting fuel source. Stiglitz and Stern note that switching values vary across technologies and countries. For instance, "the carbon price that will make coal non-competitive in Africa—in other words, that will stop all new investment

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[360] Elizabeth A. Stanton and Frank Ackerman, *Out of the Shadows: What's Behind DEFRA's New Approach to the Price of Carbon?* (Stockholm: Stockholm Environment Institute, July 2008), p. 3, online: <http://www.ase.tufts.edu/gdae/Pubs/rp/shadow_price_of_carbon.pdf>.

[361] Elizabeth A. Stanton and Frank Ackerman, *Out of the Shadows: What's Behind DEFRA's New Approach to the Price of Carbon?* (July 2008), p. 3. See also, Department of Energy and Climate Change, *Carbon Valuation in UK Policy Appraisal: A Revised Approach* (Department of Energy and Climate Change, July 2009), p. 10, online: <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/245334/1_20090715105804_e____carbonvaluationinukpolicyappraisal.pdf>.

[362] High-Level Commission on Carbon Prices, *Report of the High-Level Commission on Carbon Prices* (29 May 2017), p. i.

[363] Johan Obermayer, "An Analysis of the Fundamental Price Drivers of EU ETS Carbon Credits" (KTH Royal Institute of Technology, 2009), online: <https://www.math.kth.se/matstat/seminarier/reports/M-exjobb09/090907b.pdf>.

in coal and lead to the retirement of old plants—is likely to be different than in Europe," just as the carbon price that will make CCS competitive is different from the one that will make solar energy competitive.[364]

According to the Stiglitz and Stern report, the implementation of carbon pricing needs to take into account "the use of revenues derived from it, the local context, and the political economy (including the policy environment, adjustment costs, distributional impacts, and political and social acceptability of the carbon price). Depending on other particular policies implemented, a carbon price could have powerful co-benefits that go beyond climate, for instance, potential improvements in air pollution and congestion, the health of ecosystems, access to modern energy, and so on".[365] These high prices, however, should also be considered in the context of unpriced co-benefits associated with climate action such as reducing pollution and protecting ecosystems.[366]

Stiglitz and Stern acknowledge that "appropriate carbon-price levels will vary across countries", as "it is impossible to disregard distributional and ethical considerations when designing climate policies".[367]

Indeed, others have used the different dimensions of assigning international responsibility for emissions as a basis to assign carbon prices and suggest international monetary transfers through a bonus-malus system, as proposed by the Climate Economics Chair of Paris. This equity-based system can act as a means of implementing the "common but differentiated responsibilities" principle enshrined in the *Paris Agreement*. Under a bonus-malus system, countries whose per capita emissions exceed the world average (polluters, or "penalty countries") would pay a penalty, while countries whose per capita emissions are below the world average (beneficiaries, or "bonus countries") would receive a bonus. Thus, this system externalizes the disparities that exist between developed and developing countries' per capita emissions. In total, penalty countries would transfer a total of $100 billion to beneficiary countries. Canada's contribution under this envisioned system would total approximately $3.75 billion.[368]

Conversely, as it stands, "85 percent of global emissions are currently not priced, and about three quarters of the emissions that are covered by a carbon price are priced below US$10/tCO2".[369]

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[364] High-Level Commission on Carbon Prices, *Report of the High-Level Commission on Carbon Prices* (29 May 2017), p. 26.
[365] Ibid., p. 3.
[366] Ibid., p. 2.
[367] Ibid., p. 4.
[368] Christian de Perthuis and others, *Economic Instruments and the 2015 Paris Climate Conference: The Catalyst of Carbon Pricing*, Policy Brief (Climate Economic Chair of Paris-Dauphin University, 25 September 2014), p. 9, online: <https://www.chaireeconomieduclimat.org/en/publications-en/policy-briefs-en/policy-brief-5-economic-instruments-and-the-2015-paris-climate-conference-the-catalyst-of-carbon-pricing/>.
[369] High-Level Commission on Carbon Prices, *Report of the High-Level Commission on Carbon Prices* (29 May 2017), p. 4.

Under the *Pan-Canadian Framework*, a carbon price of $10/tonne CO2eq will be implemented in 2018, rising to $50/tonne CO2eq in 2022.[370] In this regard, a 2017 Canada-specific study proposed that a price of "$150 per tonne of CO2eq ($2016 real) by 2030 and emissions trading imports from the Western Climate Initiative or other global sources could all work together to close the gap to Canada's 2030 Nationally Determined Contribution (NDC)".[371] However, the price would have to rise to $220 per tonne by 2030 if Canada cannot rely on internationally transferred mitigation outcomes through the Western Climate Initiative to reach its NDC.[372] Further, "[s]imulations suggest that the carbon prices needed to achieve deep decarbonization depend on the presence of other policies—lower prices are needed if the price policies are complemented by additional measures"[373]

It is too early for a definitive evaluation of the potential effectiveness of the federal carbon pricing approach. Preliminarily, while it is a good starting point, the price appears to be too low, not defined for a long enough period to provide for investment certainty and not broad enough in its application. In sum, if the carbon price and regulatory regimes introduced to implement the *Pan-Canadian Framework* is inadequate, and it likely is, as it will not lead to a sufficient level of abatement for Canada to reach its *Paris Agreement* objectives.

ii) Assessing the benefits of climate mitigation policies of the avoided climate damage

Non-market based GHG abatement regulations are also useful and necessary. Canada, like the US under President Obama, uses the concept of the social cost of carbon in order to assess benefits of such regulatory action. All departments and agencies of the Government of Canada are required to conduct a cost-benefit analysis of proposed regulatory action as part of the Regulatory Impact Analysis Statement (RIAS) conducted for all regulatory proposals.[374] A promising but controversial component for these analyses is calculation of the social cost of carbon.

The social cost of carbon (SCC) is a comprehensive estimate of the present discounted value of future damages for a given year – that is, the monetized value of the net

[370] *Pan-Canadian Framework,* (2016), p. 50.
[371] Dave Sawyer and Chris Bataille, *Taking Stock: Opportunities for Collaborative Climate Action to 2030, Policy Brief 2: The Pan-Canadian Framework on Clean Growth and Climate Change*, 31 March 2017, p. i, online: <https://www.enviroeconomics.org/single-post/2017/03/31/Taking-Stock-Opportunities-for-Collaborative-Climate-Action-to-2030>.
[372] Ibid., p. 5.
[373] High-Level Commission on Carbon Prices, *Report of the High-Level Commission on Carbon Prices* (29 May 2017), p. 31.
[374] Government of Canada, *Cabinet Directive on Regulatory Management* at 6(g) (2010), online: <https://www.canada.ca/en/treasury-board-secretariat/services/federal-regulatory-management/guidelines-tools/cabinet-directive-regulatory-management.html >.

impacts, both negative and positive – from the global climate change that results from a small (1 metric ton) increase in CO2 in that given year.[375]

There are important ethical considerations when monetizing climate damages, but it seems the lesser evil since the lack of monetary value for future harm, particularly environmental harm and climate harm, has tended to mean decision makers assess them as zero. Note that including a social cost of GHG analysis is not an alternative to compatibility with decarbonisation pathways, it is just another metric for assessment.[376]

The concept was initially developed by the government of the United Kingdom in 2002 in order to assess the benefits (avoided future climate damages) of policies involving GHG reductions.[377] Since then, in both Canada and the United States, cost-benefit analysis (CBA) for the regulation of carbon emissions "places calculation of the social cost of carbon (SCC) front and center",[378] as the "SCC is an input—quantitative fodder—for the broader CBA employed in regulatory decision making".[379] Cost-benefit analysis (CBA) is an overarching analytical tool that assesses "the benefits and costs of a particular course of action" by "compar[ing] costs that would result from regulatory action to reduce carbon dioxide emissions with the benefits that society would incur, including those associated with avoided damage to the environment and public health."[380] It is a central part of regulatory decision making in the context of climate change and regulation of carbon dioxide emissions.

The complex operation of generating SCC estimates given consists of (i) projecting a future path of global greenhouse gas emissions; (ii) translating this emissions path into alternate scenarios of climate change; (iii) estimating the physical impact of the resulting climate change on humans and ecosystems; and (iv) monetizing these impacts and discounting future monetary damages back to the year in question.[381]

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[375] National Academies of Sciences and Engineering, and Medicine, *Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide* (Washington, D.C.: The National Academies Press, 2017), pp. 1 and 6 <https://doi.org/10.17226/24651>.

[376] Karine Péloffy and Meinhard Doelle, *NEB Modernization under the Climate Test: Part III* (2017), p. 28.

[377] Anthony Heyes, Dylan Morgan, and Nicholas Rivers, "The Use of a Social Cost of Carbon in Canadian Cost-Benefit Analysis", *Canadian Public Policy*, 39 (2013), S69, online: <http://www.jstor.org/stable/23594772>.

[378] David Wright, "Carbonated Fodder: The Social Cost of Carbon in Canadian and U.S. Regulatory Decision-Making", *Georgetown International Environmental Law Review*, 29.3 (2017), p. 515, online: <https://papers.ssrn.com/abstract=3019854>; see also Executive Order No. 13,563. 2011. "Improving Regulation and Regulatory Review" issued by the President of the United States, 18 January 2011, online: <https://obamawhitehouse.archives.gov/the-press-office/2011/01/18/executive-order-13563-improving-regulation-and-regulatory-review>.

[379] David Wright, "Carbonated Fodder: The Social Cost of Carbon in Canadian and U.S. Regulatory Decision-Making", (2017), p. 519.

[380] Ibid.

[381] William Pizer and others, "Using and Improving the Social Cost of Carbon", *Science*, 346 (2014), p. 1189 cited in David Wright, "Carbonated Fodder: The Social Cost of Carbon in Canadian and U.S. Regulatory Decision-Making", (2017), p. 517.

The social cost curve may be described incorrectly due to incomplete knowledge regarding the impacts of climate change. As Stanton and Ackerman have noted:

> [I]t would be impossible to account for every future impact of climate change; values placed on social costs, therefore, always should be assumed to underestimate true social costs. In addition, because the estimation of social costs requires not just scientific knowledge but also value judgments, there could be said to exist an infinite number of "correct" social cost curves across a range of very different ethical perspectives.[382]

Upon reviewing the relevant literature, Stiglitz and Stern's High Commission concluded, as did the fifth Assessment Report of the IPCC and other studies, that many of the impact functions used in modeling exercises to calculate the social costs of carbon are biased downward because they fail to consider many vitally important risks and costs associated with climate change.[383] This is not to say that the social cost of carbon should be dismissed. Rather, its limitations need to be acknowledged and addressed.

Box 4. Weaknesses and limitations of the Social Cost of Carbon identified in the literature

Existing SCC models do not fully account for various interactions, variables and feedbacks in the human-climate system such as:

- the effect of climate change on economic growth and the resulting disparities between wealthy and poor regions,
- the degree of risk aversion exhibited by policy makers,
- the changing rate and intensity of economic damage above critical temperature thresholds,
- the long-term effect of climate change on labour productivity,
- widespread biodiversity losses,
- impacts on the poorest and most vulnerable,
- rising political instability and the spread of violent conflicts,
- ocean acidification,
- large migration movements; and
- the possibility of extreme and irreversible changes.

Moreover, there is limited consensus with regard to the treatment of SCC model inputs such as:

- the climate change damage function,
- substitutability between natural and human capital,
- equity weighting,
- treatment of catastrophic climate damages,

[382] Elizabeth A. Stanton and Frank Ackerman, *Out of the Shadows: What's Behind DEFRA's New Approach to the Price of Carbon?* (July 2008), p.8.

[383] IPCC 2014a,b; Tol 2012; Stern 2013; Weitzman 2014; Dietz and Stern 2015 as cited in High-Level Commission on Carbon Prices, *Report of the High-Level Commission on Carbon Prices* (29 May 2017), p.52.

- future growth rates; and
- reference case emission pathway (see paragraph below)

Other limitations inherent in the SCC calculation include:

- uncertainty in parameters used for modeling,
- insufficient transparency in modeling practices and input judgments,
- inadequate representation of non-catastrophic climate damages in the modeling (for example, not all sectors of the economy are included, nor is regional variability),
- unevenly captured or unrepresented inter-sector and inter-regional interactions in the modeling,
- assumed substitutability of environmental amenities (such as an inappropriate assumption that natural system losses can be compensated through non-climate goods),
- inadequate consideration in the modeling of variance in individuals' risk aversion to high-impact climate outcomes,
- the high impact of the chosen discount rate on the final SCC value; and
- uncertainties regarding adaptation response and how to factor it into the modeling (i.e. expected impacts and technological responses).[384]

[384] See National Academies of Sciences and Engineering, and Medicine, *Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide* (2017), p.11.
See also Center for Biological Diversity et al., "Re: Draft Guidance on Consideration of Greenhouse Gas Emissions and Climate Impacts under the National Environmental Policy Act" (2015) p. 7; IPCC 2014a,b; Tol 2012; Stern 2013; Weitzman 2014; Dietz and Stern 2015 as cited in High-Level Commission on Carbon Prices, *Report of the High-Level Commission on Carbon Prices* (29 May 2017), p.52.
For impacts of climate change on economic disparity, see Moore, F. and Diaz, D., T*emperature impacts on economic growth warrant stringent mitigation policy*, 5 Nature Climate Change 127-131 (Jan. 12, 2015).
For more on risk mitigation and the SCC, see Howarth, R.B., and others, "Risk mitigation and the social cost of carbon", *Global Environmental* Change, 24 (2014), 123-31.
On economic damage above critical temperature thresholds, see Weitzmann, M.L., *GHG Targets as Insurance Against Catastrophic Climate Damages*, National Bureau of Economic Research Working Paper No. 16136 (2010), online: http://www.nber.org/papers/w16136.
For discussion on the limited consensus with regard to SCC inputs, see Anthony Heyes, Dylan Morgan, and Nicholas Rivers, "The Use of a Social Cost of Carbon in Canadian Cost-Benefit Analysis", (2013), S70-71.
For more on climate change damage functions, see Roberto Roson and Martina Sartori, *Estimation of Climate Change Damage Functions for 140 Regions in the GTAP9 Database* (Department of Economics, Ca' Foscari University of Venice, 2016), online: <https://www.unive.it/media/allegato/DIP/Economia/Working_papers/Working_papers_2016/WP_DSE_roson_sartori_06_16.pdf>. Climate change damage functions represent "relationships between climate variables (typically average temperature, but sometimes also humidity or 'heating days') and economic variables (potential income, productivity, resource endowments, etc.)." They provide the basis for quantitative modeling exercises for the assessment of climate change policies; however, "[i]t is generally acknowledged that damage functions constitute a weak link in the economics of climate change."
For limitations inherent in the SCC, see David Wright, "Carbonated Fodder: The Social Cost of Carbon in Canadian and U.S. Regulatory Decision-Making", (2017), p. 524.

Smith and Braathen argue that because "the social cost of emitting one additional tonne of carbon dioxide varies depending on the level of greenhouse gases in the atmosphere, the social cost of carbon has to be defined on specific assumptions about the current level and future trajectory of atmospheric greenhouse gas concentrations, against which its effects are to be measured".[385]

Assumptions regarding the trajectory of greenhouse gas concentrations (reference case emission pathways) can include: (i) a 'business-as-usual' scenario ("in the absence of any (additional) climate change policy measures"); (ii) a target trajectory ("such as the maximum emissions consistent with restricting the rise in global mean temperature to two degrees Celsius"); (iii) a trajectory reflecting the level of GHG abatement that would be optimal in theory from an economic perspective ("at which the global marginal damage cost just equals the global marginal abatement cost"); a trajectory reflecting any other specified level of emissions[386].

In the US, the approach adopted by the Obama administration was "to assess the global social cost of carbon, in terms of the impact of incremental emissions on global welfare, assessed from the starting point of business-as-usual emissions."[387] More specifically, of five scenarios underlying the model, four are business-as-usual reference scenarios that implying no mitigation policy and "entail atmospheric CO2 concentrations between 612 and 889 ppm in 2100".[388] Those concentrations are roughly in line with temperature increases of 3.1 to 4.8 degrees. They represent the most dangerous trajectories reviewed by the IPCC.[389] Needless to say, none of these scenarios is Paris-compliant and all depict some form of failure to comply with the international agreement.

Conversely, the United Kingdom moved from the social cost of carbon (set on business as usual scenarios) to a shadow price of carbon (based on trajectories that limit ultimate atmospheric GHG concentrations to 450-550 ppm), based on the assumption of all nations taking similar actions to limit GHGs. This led to an under-estimation of the damages due to overly optimistic assumptions about actions of other nations and entities. Indeed, even more so today, current trajectories point to a business as usual scenario rather than the fundamental transformation necessary to mitigate impacts effectively. Paradoxically, these low damage estimates can dangerously lead to under-investments in abatement discouraging the necessary transformation to mitigate impacts and lead to a vicious circle:

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[385] Stephen Smith and Nils Axel Braathen, *Monetary Carbon Values in Policy Appraisal*, Environment Working Papers (Paris: OECD Publishing, 2015), p. 10, online: <https://www.oecd-ilibrary.org/environment/monetary-carbon-values-in-policy-appraisal_5jrs8st3ngvh-en>.
[386] Ibid, p. 10.
[387] Ibid., p. 25.
[388] National Academies of Sciences and Engineering, and Medicine, *Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide* (2017), p.62.
[389] Intergovernmental Panel on Climate Change, "Assessing Transformation Pathways", in *Climate Change 2014: Mitigation of Climate Change: Working Group III Contribution to the IPCC Fifth Assessment Report*, p. 431.

> The risk is that this will fail to discourage the approval of policies and projects that will lead to a growth in carbon emissions – and thus help to make it more difficult to achieve the stabilisation target that the paper assumes will be met.[390]

Following such criticism, the UK has since moved away from the SCC to using a price based on the marginal abatement cost for assessing the impacts of regulations as described above.

The SCC as conceptualized in the United States of America relies on more pessimistic, and arguably more realistic GHG emission scenarios leading to concentrations by the end of the century that are associated with dangerous climate change, which is at least the trajectory that the United States of America and Canada are on.

The use of the discount rate is an important challenge that will have to be navigated in incorporating the SCC into future decision making. The discount rate "refers to the reduction ("discount") in value each year as a future cost or benefit is adjusted for comparison with a current cost or benefit."[391] The discount rate is expressed as a percent value that purports to quantify the current value of future impacts (i.e. "what society would spend today to avoid damage in the future"), by indicating both a rate of time preference and relative risk aversion.[392] This value allows regulators to compare present-day costs more directly to the future benefits of mitigating climate change. A lower discount rate places greater value on future costs, thus increasing the social cost of carbon value. A higher discount rate attributes a smaller weight to future costs, while a zero discount rate values present and future costs equally.[393] The use of the discount rate to estimate a net present value of future damages is highly controversial, as it implies ethical judgements and raises fundamental questions of intergenerational equity.[394]

The present value of damages is a reflection of a society's willingness to trade value in the future for value today.[395] "Small differences in the discount rate can have large impacts on the estimation of the SCC."[396]. One of the most well known estimation of the social cost of carbon conducted by Nicholas Stern, former chief economist of the World

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[390] House of Commons Environmental Audit Committee (2008:19) in Elizabeth A. Stanton and Frank Ackerman, *Out of the Shadows: What's Behind DEFRA's New Approach to the Price of Carbon?* (July 2008), p. 3.
[391] National Academies of Sciences and Engineering, and Medicine, *Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide* (2017), p. 157.
[392] Jonathan Baron, "The Discount Rate for the Social Cost of Carbon", *The Regulatory Review*, 2017, online:<https://www.theregreview.org/2017/01/18/baron-discount-rate-social-cost-carbon/>; Environment and Climate Change Canada, *Technical Update to Environment and Climate Change Canada's Social Cost of Greenhouse Gas Estimates*, March 2016, online: <http://publications.gc.ca/collections/collection_2016/eccc/En14-202-2016-eng.pdf>.
[393] Environment and Climate Change Canada, *Technical Update to Environment and Climate Change Canada's Social Cost of Greenhouse Gas Estimates*, March 2016.
[394] National Academies of Sciences and Engineering, and Medicine, *Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide* (2017), p. 161.
[395] Ibid., p. 2.
[396] Ibid., pp. 221-222.

Bank, was relatively high, exceeding $ 100/t C02 because the report used a low discount rate (1.4%).[397] Other prominent economic researchers suggest a social cost of carbon ten times lower.[398] The wide range of estimates is driven by a limited consensus in how to treat model inputs. The impact of these underlying assumptions cannot be understated.

Discount rates used by Environment and Climate Change Canada are too limited and further values would have to be developed for discount rates other than the currently used sole value of 3% for the SCC. This would accurately reflect the value judgements inherent in the SCC process, rather than leave the false impression that SCC is a value free number that can be plugged into a formula to determine whether a project is economically viable or will make a net contribution to sustainability.[399]

The omission of actual current and future costs in the estimated social cost of carbon results in an SCC value that is lower than the veritable cost of damages and thus insufficient to incentivize the required level of abatement. If the social cost is under-estimated and lower than the marginal abatement cost, it may lead to insufficient incentives to abate GHGs and an underestimate of climate damages.[400]

Canada like the US under Obama (Trump has since cancelled the practice) uses a global value of climate impacts in assessing its regulation.[401] The global nature of impacts that result from GHG emissions regardless of where they originate means the focus should be on assessing total global damage. Using a global approach is consistent with Canada's ratification of the *Paris* Climate *Agreement*, and the principle of CBDRRC that underlies the Agreement and its the approach that all member states will reduce their emissions according to their responsibility, capacity, and national circumstances (see Parts 1 & 2). The *Paris Agreement* is based on the very idea that we need to act collectively, because all our emissions have global impacts. This means that we have to accept our share of responsibility for the global impact of our emissions.

Using global figures also makes sense from a national point of view. Trying to get to a national estimate of social cost of carbon would seem to be too limited an exercise, because the damages to a country associated with GHG emissions go above and beyond the direct impacts of climate change that occurs within a country's physical borders. Climate change in other regions of the world could affect Canada "through such

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[397] Nicholas Stern, *The Economics of Climate Change: The Stern Review* (Cambridge: Cambridge University Press, 2007), online: <https://doi.org/10.1017/CBO9780511817434>.
[398] William D Nordhaus, "A Review of the Stern Review on the Economics of Climate Change", *Journal of Economic Literature*, 45 (2007), p.698 cited in David Wright, "Carbonated Fodder: The Social Cost of Carbon in Canadian and U.S. Regulatory Decision-Making" (2017), p. 526.
[399] This section was based on Karine Péloffy and Meinhard Doelle, *NEB Modernization under the Climate Test: Part III* (2017), pp. 29-30.
[400] Elizabeth A. Stanton and Frank Ackerman, *Out of the Shadows: What's Behind DEFRA's New Approach to the Price of Carbon?* (July 2008), p. 8.
[401] Environment and Climate Change Canada, *Technical Update to Environment and Climate Change Canada's Social Cost of Greenhouse Gas Estimates*, March 2016. online: <http://ec.gc.ca/cc/default.asp?lang=En&n=BE705779-1>

pathways as global migration, economic destabilization and political destabilization".[402] There also may be changes in the economic conditions of Canada's trading partners. This could have important ramifications, as Canada imports a significant portion of its food produce given its cold climate. For example, in 2014, Canada imported $2.7 billion worth of produce from the State of California alone. Droughts in California can mean higher food bills for Canadians or the necessity to start importing food from countries with less stringent safety standards.[403] We recommend continuing the use of the global value of damages in regulatory impact assessments and assessments under the future IAA (section 3.4).

Canada's previous government opted to use the social cost of carbon in regulatory analysis, on the basis that following the U.K. approach "would require estimating the marginal abatement costs associated with attaining a given emission reduction target, necessitating assumptions regarding federal, provincial and territorial policy choices (e.g., sector coverage, compliance flexibility)."[404] The context has since changed significantly, with Canada signing on to the *Paris Agreement* and adopting the pan-Canadian framework. If the current government is serious about achieving its climate goals, it should maybe review the use of the SCC-based approach in regulatory impact analysis and adopt an approach similar to the United Kingdom that is tailored to reach its mitigation goals rather than measuring the avoided climate damages as the SCC entails.

Further, one must question whether any of these economic tools based on evaluating costs of reducing GHGs – or damages associated with not doing so – at the margin offers helpful guidance since the transition to GHG neutrality "involves non marginal and unprecedented changes in energy systems and other emitting activities, thus posing special analytical challenges to estimating the price that is consistent with a given carbon constraint."[405]

Some recommend the "[a]doption of the $100/t CO_2 shadow price in place of the SCC in regulatory policy analysis would ensure consistency between climate change policies and quantitative targets. Further, it would closer reflect Treasury Board and economist advice regarding the issue of standing in cost-benefit analysis. Finally, it would likely be more easily understood by the public and decision makers who consume cost-benefit analysis reports."[406]

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[402] National Academies of Sciences and Engineering, and Medicine, *Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide* (2017), p. 12.
[403] Patrick Cain, "What the State's Water Crisis Means for Canada's Food Security", *Global News*, 9 June 2015, online: <https://globalnews.ca/news/2031246/after-california-what-the-states-water-crisis-means-for-canadas-food-security/>.
[404] Environment and Climate Change Canada, *Technical Update to Environment and Climate Change Canada's Social Cost of Greenhouse Gas Estimates*, March 2016.
[405] High-Level Commission on Carbon Prices, *Report of the High-Level Commission on Carbon Prices* (29 May 2017), p.32.
[406] Anthony Heyes, Dylan Morgan, and Nicholas Rivers, "The Use of a Social Cost of Carbon in Canadian Cost-Benefit Analysis", (2013), S77.

This is not to say these economic tools should be dismissed. So long as cost-benefit analysis remains a frame of analysis used by governments, the social cost of carbon may be a necessity to ensure climate damages are not entirely dismissed. However, the deficiencies of such analyses must be addressed or at the very least be made more transparent in reporting. SCC calculations should follow the recommendations of the U.S. National Academies of Science, Engineering, and Medicine of 2017.

See section 3.4.3 for a discussion of these concepts in the assessment context.

3.3.6 Good governance: Addressing institutional capture and informational vacuums

Good governance will be central to a successful low-carbon energy transition. While technology plays a vital role, the most important barriers to accelerating the low-carbon energy transition are social, political and organizational.[407] Canada lacks strong climate governance and reliable, accessible information of a high standard on which to base public decisions. For example, the National Energy Board (NEB) has thus far not considered the impact of the *Paris Agreement* on global energy demand, including its implications for GHG-intensive Canadian oil and gas extraction. Yet, the NEB has provided recommendations to approve projects based on the fact that there is a future global market for Canadian oil and gas, a future market that can only exist if the world fails to achieve *Paris Agreement* goals.

This may be no coincidence as some have suggested the oil and gas industry has had undue influence over Canadian governments[408] resulting in real risks that major fossil fuel infrastructure projects expand and lengthen dependencies, and entrench economic and political interests inclined to pursue further similar developments in the future and oppose the needed energy transition.[409] On the other hand, not going forward with a project could result in alternative energy supply industries flourishing and locking in, strengthening political momentum in the opposite direction.[410] Germany's *Energieweden* (Energy turnaround) demonstrates that alternative energies will fill the gap once it is there.[411] It also demonstrates how the approval or refusal of a project should be studied not only considering its GHG emissions, but how it will impact other projects and ultimately have a wider impact on a country's GHG emissions, as each project influences the systemic trends of a country's economy.[412]

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[407] Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 5.
[408] See for example Kevin Taft, "How the Oil Industry Created a 'Deep State' in Canada", *Maclean's*, 6 October 2017, online: <https://www.macleans.ca/opinion/is-there-a-deep-state-in-albertas-oil-industry/>; Jason MacLean, "Striking at the Root Problem of Canadian Environmental Law: Identifying and Escaping Regulatory Capture", *Journal of Environmental Law and Practice*, 29 (2016), 111, online: <https://papers.ssrn.com/abstract=2726626>.
[409] Stefan Bößner, *Turning Energy around: Coal and the German Energiewende*, (4 August 2016)
[410] Karine Péloffy and Meinhard Doelle, *NEB Modernization under the Climate Test: Part III* (2017), p. 27.
[411] Stefan Bößner, *Turning Energy around: Coal and the German Energiewende*, (4 August 2016), p. 1.
[412] Peter Erickson and Michael Lazarus, *Assessing the Greenhouse Gas Emissions Impact of New Fossil Fuel Infrastructure*, SEI Discussion Brief (Stockholm: Stockholm Environment Institute, 27 September 2013), p.7, online: <https://www.sei.org/publications/assessing-the-greenhouse-gas-emissions-impact-of-

Therefore, a political economy analysis of different industries' influence on climate policies or actions of other major players is necessary. At the project level, a project approval or refusal could have a climate impact vastly exceeding its associated emissions if it catalyzes large-scale changes, spillover effects or other systemic change to the country's economy. [413]

While the new federal government has made efforts to increase capacity on climate, the fact remains that where capacity does exist, it is often split into complex networks of actors across different government departments and across jurisdictions, all while lacking accessibility for the broader public. It will be key that institutions and individuals tasked with providing information and reviewing projects, plans or policies be sufficiently independent from industries in order to provide credible, reliable information.

The recommendations identified by those such as the Expert Panel reviews on Environmental Assessment law reform and NEB modernization can provide direction in addressing institutional and informational vacuums. The Expert Panel on the Modernization of the NEB recognizes the deficiencies of the NEB's information gathering capacity and calls for the creation of a new, independent Canadian Energy Information Agency that would be "accountable for providing decision-makers and the public with critical energy data, information, and analysis" and distinct from the policy making and regulatory oversight functions of the NEB.[414] This new agency would bring about "an enhanced government role for the collection, analysis, and dissemination of information about energy production, transmission, use, future trends, and associated carbon emissions, to inform policy-makers, industry, Indigenous peoples, academia, civil society, and Canadians."[415]

According to the NEB Modernization Expert Panel, the establishment of an independent source for energy information is needed because the new agency "needs to have the mandate and ability to tell it like it is on energy matters, and inform the development of energy policy and strategy, without being involved in the determination of energy policy, or administering energy infrastructure regulation. This will help to assure that information is seen as neutral and credible."[416] In addition, this new agency would have a larger mandate to produce information about energy by considering a broader range of

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new-fossil-fuel-infrastructure/>; For an analysis of the Canadian situation: Peter Erickson, Michael Lazarus, and Kevin Tempest, *Carbon Lock-in from Fossil Fuel Supply Infrastructure*, SEI Discussion Brief (Stockholm Environment Institute, 23 September 2015), p. 5, online: <https://www.sei.org/publications/carbon-lock-in-from-fossil-fuel-supply-infrastructure/>.

[413] Peter Erickson and Michael Lazarus, *Assessing the Greenhouse Gas Emissions Impact of New Fossil Fuel Infrastructure* (27 September 2013), p.7; For an analysis of the Canadian situation see Peter Erickson, Michael Lazarus, and Kevin Tempest, *Carbon Lock-in from Fossil Fuel Supply Infrastructure*, (23 September 2015), p. 5

[414] Expert Panel on the Modernization of the National Energy Board, *Forward, Together: Enabling Canada's Clean, Safe, and Secure Energy Future*, 2017, p. 4.

[415] Ibid., p. 20.

[416] Ibid., p. 20.

data sources and be responsible for producing regular public reports about projected energy demand, energy sources (including renewables), progress in implementing innovative clean energy technologies, climate change, international benchmarking, and performance against Canada's policy objectives.

An institution such as the US Energy Transition Information Administration could be especially helpful in providing research for the Canadian federal government's broader strategic policy-making beyond project assessments.[417]In the meantime, models and methodologies should be made public and transparent and rely on the best international practices from other jurisdictions and experts. This also includes ensuring there is sufficient energy information is available. The House of Commons Standing Committee on Natural Resources recommended, the federal government should create a "one-stop-shop" for energy information, working with industry and research institutions to fill information gaps and standardizing energy reporting.[418]

Other key climate governance features will also need to be addressed, such as establishing a framework for provincial, territorial, and federal government coordination.[419] *The Pan-Canadian Framework* provides for the collaboration of federal, provincial and territorial governments through the Canadian Council of Ministers of the Environment (CCME) in monitoring and publicly reporting GHG emissions in a consistent manner across the country, in monitoring progress on the *Pan-Canadian Framework*, and in supporting international reporting obligations to the UNFCCC. Assessment of policies is to be undertaken with a view to ensuring continual improvement so as to increase ambition over time, in accordance with the *Paris Agreement*.[420]

Thus, the enhancement of policy coordination and of cooperation among all levels of government will be critical for managing the low-carbon transition.[421] New approaches to governance will "need to factor in the contribution that individuals and groups in communities make to place-based decision making at the lowest appropriate governance level."[422] In the Canadian context, key governance features include:

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[417] Karine Péloffy and Meinhard Doelle, *NEB Modernization under the Climate Test: Part III*, (2017), pp. 12-13.

[418] Report of the Standing Committee on Natural Resources, *Rethinking Canada's Energy Information System: Collaborative models in a data-driven economy* (2018), House of Commons, online: <http://www.ourcommons.ca/Content/Committee/421/RNNR/Reports/RP10034978/rnnrrp10/rnnrrp10-e.pdf>.

[419] For further recommendations, see Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 32.

[420] *Pan-Canadian Framework*, (2016) p. 45-46.

[421] Dan Greenwood, "The Challenge of Policy Coordination for Sustainable Sociotechnical Transitions: The Case of the Zero-Carbon Homes Agenda in England", *Environment and Planning C: Government and Policy*, 30.1 (2012), 162–79, online: <https://journals.sagepub.com/doi/pdf/10.1068/c1146>, cited in Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 28.

[422] Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 28; citing Vischer, R.K. (2001). Robert K. Vischer, "Subsidiarity as a Principle of Governance: Beyond Devolution", *Indiana Law Review*, 35.1 (2001), 103–42, online: <http://journals.iupui.edu/index.php/inlawrev/article/view/3505/3450>; Pablo Martinez de Anguita, Maria

- Establishing a permanent framework for the provinces, territories and federal government to continue to work together at transforming energy systems;
- Integrating the energy transition within the work of relevant ministries and agencies and ensuring horizontal coordination across departments; and
- Re-examining the finances and powers of municipal governments to ensure they have the authority and financial resources to play their part in the low-carbon energy transition.[423]

Existing institutional and informational deficiencies have not yet been corrected by the federal government's initiatives in assessment processes reform exercise. In the meantime, models and methodologies should minimally be made public and transparent and rely on the best international practices from other jurisdictions and experts.

3.3.7 Treating different GHGs and differentiating their time scale of impacts

Canada has rightly identified abatement of short-lived non-CO_2 climate pollutants such as methane, black carbon, nitrous oxide and HFCs, as key to early climate mitigation action and strategy. This is a particularly relevant goal for a northern and Arctic nation that is warming more rapidly than the global average. However, few policies are differentiated by GHGs and the widespread use of only one aggregated metric expressed in "carbon dioxide equivalency" obscures the very different timescale of climate impacts and global warming potential of climate pollutants. Further differentiation by gases may be needed in policy-making and assessments would provide a clearer picture. Further development should ensure more comprehensive policy and assessment coverage of short-term climate pollutants as well as carbon dioxide.

According to the Government of Canada, short-lived climate pollutants (SLCPs) are "potent greenhouse gases (GHGs) and air pollutants [which] have relatively short atmospheric lifetimes compared to longer-lived GHGs such as carbon dioxide (CO_2), and have a warming impact on the climate''.[424]

As stated in part 2, even if carbon budgets are based on CO2 only, the size of the budget depends on non-CO_2 gases. Black Carbon, Methane, Hydrofluorocarbons (HFCs) and Tropospheric Ozone are the SLCPs addressed in Canada's mid-century long-term Strategy. The strategy further recognizes that "fast concurrent actions on SLCPs" are needed to remain on a pathway consistent with keeping temperatures well below 2°C.[425] Moreover, the reduction of SLCPs "has considerable benefits beyond those that are climate related, such as improving air quality, human health, and environmental and

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Martin, and Abbie Clare, "Environmental Subsidiarity as a Guiding Principle for Forestry Governance: Application to Payment for Ecosystem Services and REDD+ Architecture", *Journal of Agricultural and Environmental Ethics*, 27.4 (2013), 617–31, online: <https://doi.org/10.1007/s10806-013-9481-8>.

[423] Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 32.

[424] Government of Canada, *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy* (2016), p. 8.

[425] Ibid., p. 8.

ecosystem outcomes".[426]

All of these gases have a greater global warming potential than CO2 on shorter timescales and therefore lead to increases in the rate and intensity of early warming, which is a key factor for Canada's quickly warming Northern latitudes. For example,

- Black carbon influences the climate in multiple ways: by directly heating surrounding air when suspended in the atmosphere; by reducing the reflectivity of the earth's surface when deposited, an effect particularly strong over snow and ice; and through additional indirect effects related to interaction with clouds. Black carbon is estimated to be 3,200 (270 to 6,200) times more potent a warming agent than CO2 over a 20-year period.[427]

- Methane emissions, which account for 15% of total GHG emissions in Canada, are significant contributors to climate impacts. In addition, methane contributes to the formation of ground-level ozone. The oil and gas sector accounted for 44% of Canada's methane emissions in 2014, largely from oil and natural gas fugitive sources, including venting. The remainder of Canada's methane emissions arises largely from agriculture and solid waste disposal.[428]

- Hydrofluorocarbons (HFCs) are synthesized chemicals used as replacements for ozone-depleting substances. Internationally, atmospheric observations show that the volume of HFCs in the atmosphere is increasing rapidly, about 10 to 15% per year. To address concerns regarding an estimated increase in HFC emissions to 10% or more of total CO2 equivalent emissions by 2050, the 197 Parties to the Montreal Protocol agreed to an amendment to phase-down the use and production of HFCs on October 15th, 2016. The "Kigali Amendment" could help to avoid almost 0.5°C of global warming by the end of the century [...][429]

Social costs that have been estimated for carbon dioxide, methane and nitrogen dioxide provide some of this needed differentiation. They provide interesting ways to show different costs of inaction on different gases for different GHGs with different durations in the atmosphere and varying impacts over time. [430]

Canada joined almost 200 other countries in signing the Kigali Amendment to the

[426] Ibid., p. 51.
[427] Ibid., p. 53.
[428] Ibid., p. 51.
[429] Government of Canada, *Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy* (2016), p. 52.
[430] *Decision XXVIII/1: Further Amendment of the Montreal Protocol* [The Kigali Amendment to the Montreal Protocol], 15 October 2016 C.N.872.2016.TREATIES-XXVII.2.f online: <https://treaties.un.org/doc/Publication/CN/2016/CN.872.2016-Eng.pdf>.

Montreal Protocol, which will push the global phase out of HFCs.[431] HFCs are a class of refrigerant gases used since the 1990s as a replacement for chlorofluorocarbons (CFCs) that deplete the ozone layer. Although HFCs are not harmful to the ozone, they are a GHG that is 14000 times more powerful than CO_2.

Further development is hoped for to ensure more comprehensive policy coverage of short-term climate pollutants as well as carbon dioxide since coverage is currently patchy and important under-reporting has been noted for fugitive emissions of methane in the oil and gas sector, the largest source and a sector to be covered by new regulation.

This section on broad guidance for making climate-responsible decisions has surveyed seven major issue areas. Each of them contains large and numerous gaps that undermine Canada's policy framework for addressing *Paris*-compliant mitigation, and represent important opportunities for improvement. These all have finer scale implications for assessments explored in the next section.

3.4 Filling the gap II: Specific tools necessary to include climate considerations adequately in assessment

In addition to broad, policy-level guidance, specific tools are also necessary to address gaps between Canada's assessment processes and meeting Paris commitments. The main existing federal guidelines on how to take climate into account in federal assessments date back to 2003 and are in dire need of an update.[432]

Attention to climate change mitigation commitments and their implications has been largely absent to date in federal assessments of major GHG-generating projects. Climate mitigation considerations in assessments have often been limited to untested assertions by proponents that rely on "ambiguous and/or inconsistent definitions of GHG emission levels as well as significance of GHG emission impacts" and use "scale tricks" of GHG emissions relative to different baselines (often national or global) to conclude that project emissions are insignificant.[433]

Further, climate mitigation objectives have been absent or only superficially considered in the latest federal assessments of major GHG projects under federal review such as

[431] The Amendment was negotiated at the 28th Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer (MOP 28) held in Kigali in October 2016.

[432] Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners*, November 2003, online: <https://www.ceaa-acee.gc.ca/Content/A/4/1/A41F45C5-1A79-44FA-9091-D251EEE18322/Incorporating_Climate_Change_Considerations_in_Environmental_Assessment.pdf>.

[433] Takafumi Ohsawa and Peter Duinker, "Climate-Change Mitigation in Canadian Environmental Impact Assessments", *Impact Assessment and Project Appraisal*, 32.3 (2014), pp. 222 and 230, online: <https://doi.org/10.1080/14615517.2014.913761> (analysing all completed federal environmental impact assessments as of November 2013).

pipelines, oil and gas extraction projects and massive public infrastructure based on passenger car transportation.

The tools presented here will need further development for use in decision making on existing and new undertakings. Better tools may need to be developed for analyzing how activities align with overall climate commitments. It will also be important to explore what economic, legislative and other measures can be mobilized to provide a suitably broad set of motivations and guidance for the transition to GHG neutrality. This section focuses specifically on tools for determining how GHGs are attributed, offsets are considered, costs and benefits are assessed, alternatives are considered, and transparent and accessible information is made available and used in assessments.

3.4.1 Methods to determine attribution of GHGs to particular kinds of undertakings

The Canadian General Guidance for Incorporating Climate Change Considerations in Environmental Assessments produced in 2003) indicates assessments should include direct and indirect GHG emissions as well as related effects without defining these terms.[434] Technical guidelines prepared by the federal government on activities to be included in cumulative effects assessments specify that that the effects of induced development that are certain and reasonably foreseeable are to be considered.[435] Clarification is needed on how that applies in assessments of GHG-generating projects and the further developments induced by such projects.

A key gap that remains within Canada's assessment processes is determining what methods can be used to ensure GHGs are properly attributed to particular kinds of undertakings. One way in which this gap can be addressed is through full life cycle assessments, which not only include emissions directly cause by the proposed undertaking, but also those caused indirectly through related activities over its lifespan. Their inclusion in assessments of pipelines has been especially controversial of late, as exemplified by the evolving federal scope of the climate assessment of the now abandoned Energy East pipeline proposal between 2014 and 2017 in Box 5 below.

Some guidance in navigating the complex analysis of 'indirect' emissions can be taken from the approach developed in the US. This approach was established under the general framework of US *National Environmental Policy Act* and regulations, which define the various concepts as follows.

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[434] Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners*, November 2003.

[435] Canadian Environmental Assessment Agency, *Technical Guidance for Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012*, December 2014, p. 29, online: <https://www.canada.ca/content/dam/ceaa-acee/documents/policy-guidance/technical-guidance-assessing-cumulative-environmental-effects-ceaa2012/cumulative_environmental_effects-technical_guidance-dec2014-eng.pdf>.

Table 3: Scope of Consideration under US National Environmental Policy Act[436]

Three types of environmental effects required to be considered by U.S. federal agencies	
Direct effects:	those that are "caused by the action and occur at the same time and place."[437]
Indirect effects:	those that are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable," and which may include "growth inducing effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."[438]
Cumulative effects:	those that result from "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions."[439]
Three types of related action with significant impact on the environment required to be considered by U.S. federal agencies	
Connected actions:	actions that are "closely related and therefore should be discussed in the same impact statements."[440] Executive guidance on these general regulations were provided by the Council on Environmental Quality under the Obama administration in August 2016 specified that connected actions are those 'subject to reasonable limits based on feasibility and practicality," including activities "that have a reasonably close causal relationship to the Federal action, such as those that may occur as a predicate for a proposed agency action or as a consequence of a proposed agency action (including land clearing, access roads, extraction, transport, refining, processing, using the resource, disassembly, disposal, and reclamation)".[441]

[436] 42 U.S.C. §4321 et seq. (1969) and Regulation

[437] 43 FR 56003, Nov. 29, 1978, sec. 1508.8 (a).
[438] 43 FR 56003, Nov. 29, 1978, sec. 1508.8 (b).
[439] 43 FR 56003, Nov. 29, 1978, sec. 1508.7.
[440] 43 FR 56003, Nov. 29, 1978, sec. 1508.25 (a) 1.
[441] Council on Environmental Quality, *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews*, 1 August 2016, p. 13-14, online: <https://ceq.doe.gov/docs/ceq-regulations-and-guidance/nepa_final_ghg_guidance.pdf>. This final guidance has since been withdrawn under President Trump's Executive Order 13783.

Cumulative actions:	actions that "have cumulatively significant impacts and should therefore be discussed in the same impact statement."[442]
Similar actions:	actions that "have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography."[443]

US authors put forward the fact that there is some overlap between the concept of "indirect effects" and the "impact of related actions": upstream and downstream emissions can be conceptualized as "indirect impacts" or as the "impacts of related actions". [444] However, authors proposed to use the requirement to evaluate "impacts of related actions" to provide a basis to conclude that an agency must evaluate upstream and downstream emissions when those emissions were not considered as "indirect impacts".[445] They also proposed to consider non-federal actions – not subject to NEPA regulations which can't be considered as "connected actions" – as "indirect effects" to allow the evaluation of those emissions in the environmental assessment.[446] In short, in some circumstances "it makes more sense to rely on the indirect effects requirement to compel the consideration of upstream and downstream emissions"[447].

A full life cycle assessment would include emissions directly caused by the proposal as well as indirect emissions resulting from any connected actions over its lifespan, including upstream and downstream emissions in the fossil fuel sector. Different concepts should be considered for inclusion in the broader context of lifecycle / lifespan assessments. These are:

- Direct emissions – i.e. emissions from the construction and operation of a project like a pipeline
- Indirect emissions – emissions from the manufacture of components, material, equipment etc., could also include emissions from harms to sinks, leakage, etc. These are sometimes called scope 3 emissions.
- Upstream emissions – indirect emissions from the extraction of fossil fuels transported or consumed
- Downstream emissions – indirect emissions from the use of the oil being extracted or transported

[442] 43 FR 56003, Nov. 29, 1978, sec. 1508.25 (a) 2.
[443] 43 FR 56003, Nov. 29, 1978, sec. 1508.25 (a) 3.
[444] Michael Burger and Jessica A. Wentz, "Downstream and Upstream Greenhouse Gas Emissions: The Proper Scope of NEPA Review", *Harvard Environmental Law Review*, 41.1 (2016), pp. 129 and 168, online: <http://www.ssrn.com/abstract=2748702>.
[445] Ibid., pp. 168-169.
[446] Ibid., pp. 170-171. Most federal courts have interpreted upstream and downstream emissions as indirect effects of fossil fuel extraction and transportation projects.
[447] Ibid., p.174.

- Imbedded emissions – emissions associated with the manufacture of components of a product or project such as a pipeline.

In the specific context of fossil fuel projects, courts in the US – and also in Australia[448] – have held that downstream emissions of fossil fuel projects fall within the scope of indirect impacts. They should therefore be reviewed, since emissions from combustion are "reasonably foreseeable" when production estimates are available.[449] In the fall of 2017, a US federal Court of Appeal reiterated that federal agencies must "consider all direct effect, reasonably foreseeable indirect effects, and effects that are cumulative over time or aggregated with other forces outside of the agency's proposed action."[450] Likewise, we argue that assessment processes in Canada should take a similar approach in its consideration of indirect effects.

In *Sierra Club v. FERC*, the D.C. Circuit Court of Appeals released a decision about "the scope of greenhouse gas emission impacts that must be considered by the Federal Energy Regulatory Commission (FERC) in environmental reviews of pipeline projects".[451] The court held that "the downstream greenhouse gas emissions are an indirect effect of authorizing the project, and that those emissions should be quantified".[452] Interestingly, the court found that because FERC can act on information about greenhouse gas emissions and climate change impacts when deciding whether to issue a pipeline certificate, and because FERC can deny the certificate if it finds that the project would be too harmful to the environment, FERC's approval is a "legally relevant cause" of the downstream effects of combusting the gas.

US Courts have consistently held that emissions from combustion are "reasonably foreseeable" when production estimates are available. For coal extraction, all the examined cases have found that there is a sufficient causal connection between the extraction and the downstream greenhouse gas emissions from the processing, transportation, and end-use of the extracted coal.[453] In their findings, the courts have rejected three types of arguments denying the causal connection between extraction and

[448] *Gray* v. *Minister of Planning* [2006] NSWLEC 720, para 124.
[449] Michael Burger and Jessica A. Wentz, "Downstream and Upstream Greenhouse Gas Emissions: The Proper Scope of NEPA Review", (2016), p. 28.
[450] *Wildearth Guardians and Sierra Club* v. *United States Bureau of Land Management and al.*, D.C. No. 2:13-CV-00042-ABJ, p.4.
[451]Jessica Wentz and Michael Burger, "Pipelines and Climate Change: New Cases on FERC's Obligation to Assess Indirect Greenhouse Gas Emissions in NEPA Reviews", *Sabin Center for Climate Change Law*, (2018), online: <http://blogs.law.columbia.edu/climatechange/2018/01/29/pipelines-and-climate-change-new-cases-on-fercs-obligation-to-assess-indirect-greenhouse-gas-emissions-in-nepa-reviews/>; *Sierra Club* v. *FERC*, No. 16-1329 (2017), online: <https://www.cadc.uscourts.gov/internet/opinions.nsf/2747D72C97BE12E285258184004D1D5F/$file/16-1329-1689670.pdf>.
[452] Jessica Wentz and Michael Burger, "Pipelines and Climate Change: New Cases on FERC's Obligation to Assess Indirect Greenhouse Gas Emissions in NEPA Reviews", 2018.
[453] Michael Burger and Jessica A. Wentz, "Downstream and Upstream Greenhouse Gas Emissions: The Proper Scope of NEPA Review", (2016), p. 29

downstream emissions: the "status quo"[454] argument, the "it's not our call" argument, and the "perfect substitute" argument. The "it's not our call" argument states that there is no "reasonably close causal relationship akin to proximate cause" between the extraction of coal and emissions from downstream activities such as combustion of the coal because the agency lacks jurisdiction over those activities.[455] The inability to exercise jurisdiction on foreign combustion emission is not a defensible argument at the stage of assessing the cumulative impacts of a project.

Box 5: Energy East Case study – To Assess or Not to Assess Indirect GHGs?

Shortly after the National Energy Board received the application[456] for the Energy East pipeline project in October, 2014, it determined that it would not assess indirect greenhouse gas (GHG) emissions associated with the project[457]. If built, it would have been the largest oil sands pipeline in North America. Many Canadians expressed concern: 100,000 messages were delivered on February 3, 2015, urging the National Energy Board to assess the climate impacts of the pipeline[458]. The emissions resulting from the combustion of fuel delivered by the pipeline (the incremental increase in downstream emissions) was argued to contribute to global GHG emissions in a measurable and significant way, and that under CEAA 2012, the climate constitutes a global part of the environment and therefore projects under consideration must have their global impacts assessed[459].

In early 2016, the newly elected federal government initiated a process of modernizing

[454] *Dine Citizens Against Ruining Our Env't* v. *United States Office of Surface Mining Reclamation & Enf't*, 82 F. Supp. 3d 1201, 1217 (D. Colo. 2015); *S. Fork Band Council Of W. Shoshone Of Nevada v. U.S. Dep't of Interior*, 588 F.3d 718, 725 (9th Cir. 2009). The status quo argument is used by agencies to assert that continued operation of a mine will not increase the rate at which coal is extracted, and thus their activities will not increase combustion emissions with reference to the status quo.

[455] *Border Power Plant Working Grp*. v. *Dep't of Energy*, 260 F. Supp. 2d 997, 1017 (S.D. Cal. 2003)

[456] National Energy Board, "Archived: National Energy Board Receives Application for Energy East", *News Release*, 2014, online: <https://www.neb-one.gc.ca/bts/nws/nr/archive/2014/mddvsrymvnrgst-eng.html>. [all links to this case study visited Jaunary 3rd, 2017.]

[457] See List of Issues in Filing A65298-2, Annexe A, 6 January 2015. In writing these lines, we were only able to access a French version of this document, as all decisions rendered by the recused Hearing Panel are no longer accessible on the National Energy Board's website. We therefore rely on our own translation of the meaning of the following passage: *« Au cours de cette audience, l'Office n'étudiera pas les questions liées aux activités en amont, notamment l'exploitation des sables bitumineux ou l'utilisation en aval du pétrole transporté grâce au projet. ».* The fact that the decisions rendered by the recused Hearing Panel stopped being accessible during the assessment process by the new Hearing Panel, rather than being archived online to remain accessible to participants and to the public, is another illustration of the lack of transparency discussed below/above.

[458] Kerianne Sproule, "Energy East Protesters Hand-Deliver 100,000 Messages", *Calgary Herald*, 3 February 2015, online: <https://calgaryherald.com/business/energy/energy-east-protestors-hand-deliver-100000-messages-video>.

[459] See for example: Daniel Horen Greenford, "Letter of Comment on Emissions Scope of Energy East", 31 May 2017, online: <https://apps.neb-one.gc.ca/REGDOCS/Item/View/3280866>.

the National Energy Board at the same time as the Energy East assessment and adopted "Interim Measures for Pipeline Reviews."[460] These measures established that the Government of Canada rather than the National Energy Board would "[a]ssess the upstream greenhouse gas emissions associated with this project and make this information public". In the hearing order released in July 2016, the National Energy Board's Hearing Panel specifically indicated that it would not consider issues pertaining to the upstream activities associated with the project such as the development of tar sands, or the downstream use of oil transported through the pipeline.[461] In March 2016, Environment and Climate Change Canada proposed a "methodology to assess the upstream GHG emissions from projects under review".[462]

Following a widely publicized controversy regarding an apprehension of bias on the part of its members, the Energy East Hearing Panel of the National Energy Board recused itself in September 2016. [463] The newly nominated Hearing Panel[464] decided to restart the assessment process from the start in January 2017.[465]

This new Hearing Panel released its own "List of Issues" late August, 2017, in which it indicated that it would consider indirect greenhouse gas emissions, in the following terms:

> Quantification of incremental indirect greenhouse gas emissions that could result if the Project is constructed, including from incremental upstream oil production and upgrading, incremental downstream

[460] Natural Resources Canada, "Interim Measures for Pipeline Reviews", 2016, online: <https://www.canada.ca/en/natural-resources-canada/news/2016/01/interim-measures-for-pipeline-reviews.html>. These interim measures were followed by a "Memorandum of Understanding between Environment and Climate Change Canada and the National Energy Board for the Establishment of a Public Engagement Process for the Assessment of Upstream Greenhouse Gas Emissions Related to the Energy East Project", 2016, online: <https://www.neb-one.gc.ca/bts/ctrg/mmrndm/2016nvrnmntclmtchngcnd-eng.pdf>.

[461] As mentioned in note 2 above, we were only able to access a French version of the OH-002-2016 Hearing Order issued on July 20, 2016, as all decisions rendered by the recused Hearing Panel are no longer accessible on the National Energy Board's website. We have therefore endeavoured to translate the meaning of the following passage as accurately as possible: *« L'Office ne se penchera pas sur les questions liées aux activités en amont ou en aval qui sont associées à l'extraction, au traitement ou à l'utilisation finale du gaz qui serait transporté par les installations du projet. » (A78623-4, Annexe I – Listes des questions pour Énergie Est et le réseau principal Est).*

[462] Department of Environment and Climate Change, "Estimating Upstream GHG Emissions", *Canada Gazette*, Order 2016-87-04-01, 150.12 (2016) , online: <http://www.gazette.gc.ca/rp-pr/p1/2016/2016-03-19/html/notice-avis-eng.html>.

[463] National Energy Board, "Energy East Hearing Panel Steps Down", *News Release*, September 9, 2016, online: <https://www.canada.ca/en/national-energy-board/news/2016/09/energy-east-hearing-panel-steps-down.html>.

[464] National Energy Board, "NEB Names New Energy East Hearing Panel", *News Release*, January 9, 2017, online: <https://www.canada.ca/en/national-energy-board/news/2017/01/names-new-energy-east-hearing-panel.html>.

[465] National Energy Board, "Energy East Hearing to Restart from the Beginning", *News Release*, January 27, 2017, online: <https://www.canada.ca/en/national-energy-board/news/2017/01/energy-east-hearing-restart-beginning.html>.

refining and end-use, and incremental third-party electricity generation.[466]

In early October 2017, TransCanada formally abandoned its Energy East pipeline project.[467]

On another note, considering Canada's important GHG reservoirs, it is crucial that emissions associated with land-use changes, whether direct or indirect are considered in federal assessments going forward.

Box 6: Case study: GHGs associated with Land Use Change (LULUCF) in assessments

Land-use changes contribute to GHG emissions because of the suppression of topsoil and deforestation and the loss of carbon sequestration[468]. Curiously, foreign jurisdictions and researchers have been able to estimate these emissions in Canada in the context of lifecycle assessment of fuels[469] or upstream emissions associated with the Keystone XL pipeline[470] but so far no Canadian jurisdiction seems to include these important emissions in assessment. For example, net emissions effects due to LULUCF are not considered in the methodology set out in March 2016 by the federal Department of Environment and Climate Change for estimating upstream GHGs associated with pipelines.

Under the *Canadian Environmental Assessment Act 2012*, in-situ oil and gas projects are not on the list of designated projects subject to federal environment assessment requirements.[471] This is significant .According to Alberta Energy, 97% of the area covered by the oil sands reserves are too deep to be mined and extraction operations must resort to in-situ mining techniques.[472]

This has a major impact as such land based emissions associated with major oil and gas

[466] National Energy Board, "Appendix 3: List of Issues for Energy East", August 23, 2017, online: <https://apps.neb-one.gc.ca/REGDOCS/Item/Filing/A85619>.
[467] TransCanada, "Letter to the National Energy Board", 5 October 2017, online: <file:///C:/Users/info/Downloads/A86594-1%20TransCanada%20Withdraws%20Energy%20East%20and%20Eastern%20Mainline%20Project%20Applications_TransCanada%20retire%20la%20demande%20des%20projets%20%C3%89nergie%20Est%20et%20R%C3%A9seau%20principale%20Est%20%20-%20A5V1X1%20(1).pdf>.
[468] Karine Péloffy and Meinhard Doelle, *NEB Modernization under the Climate Test: Part III*, (2017) p.23.
[469] California Low Carbon Fuel Standard, Final Regulation Order, Subchapter 10, Article 4, Subarticle 7, online: <http://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf>.
[470] United States, *Final Supplemental Environmental Impact Statement for the Keystone XL Project* (Department of State: Bureau of Oceans and International Environmental and Scientific Affairs, January 2014), p. 4, 14, 34 and 35.
[471] Canadian Environmental Assessment Act S.C. 2012, c. 19, s. 52, art. 13.
[472] Government of Alberta, "Oil Sands: Facts and Statistics", *Alberta Energy*, online: <https://www.energy.alberta.ca/OS/AOS/Pages/FAS.aspx>.

projects in Western provinces are significant., even for in situ recovery techniques A study conducted on the Alberta oil sands in 2015 concluded that an "additional 500 km2 and 2,400 km2 of boreal forest including carbon-rich peatlands would be disturbed from surface mining and in-situ production, respectively, between 2012 and 2030; releasing additional 107–182 million tonnes of GHG from land use alone."[473]

Finally, recommendations to include carbon sequestration implications associated with projects were part of the by the Council on Environment Quality guidance on the consideration of GHG emissions in National Environmental Policy Act reviews[474]. Similarly, Canada should follow suit and reflect these guidelines in their own domestic environmental assessment reviews.

Lastly, it would seem sensible to assess undertakings' GHG emissions cumulatively towards certain key deadlines, for example 2030, and 2050 so as to provide a basis for comparison of alternatives as well as to ensure that undertakings are in line with climate commitments over their lifetime and do not continue emitting GHGs passed the decarbonization deadline.

Assessing GHG emissions over the lifespan of projects can create incentives to restore ecosystems sequestration potential at the end of a project in order to reduce overall project GHG emissions. Focusing on cumulative lifetime emissions also provides for a fuller picture of the climate impacts of a project. For example, when assessing the Pacific Northwest LNG project, the Canadian Environmental Assessment Agency carried out a GHG analysis on an annual basis and assessed the predicted emissions to be insignificant. By contrast, an expert affidavit in a court case challenging the project approval showed that the project's lifetime cumulative emissions would fill up, on its own, 10% of a "fair share" Canadian carbon budget consistent with limiting warming to 2C.[475]

[473] Sonia Yeh and others, *Past and Future Land Use Impacts of Canadian Oil Sands and Greenhouse Gas Emissions* (University of California, Davis: Institute of Transportation Studies., January 2015), p. 2, online:
<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=2ahUKEwie19nB-fffAhVjkeAKHVZKAeoQFjAAegQICRAC&url=https%3A%2F%2Fitspubs.ucdavis.edu%2Fwp-content%2Fthemes%2Fucdavis%2Fpubs%2Fdownload_pdf.php%3Fid%3D2412&usg=AOvVaw1t743EKBaHiXHsnrRXrAow >.

[474] Council on Environmental Quality, *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change,* 1 August 2016, pp. 13–14.

[475] Zickfield, Kirsten, "1st Affidavit," *Skeena Wild Conservation Trust* v. *the Queen et al.*, Court File No.: T-1836-16, online: <https://www.scribd.com/document/353788938/Kirsten-Zickfeld-Affidavit-PNW-LNG>; Anthony Ho and Chris Tollefson, "Sustainability-Based Assessment of Project-Related Climate Change Impacts: A Next Generation EA Policy Conundrum", *Journal of Environmental Law and Practice*, 30.1 (2016), 67.

3.4.2 Guarantees for GHG reductions, future remediation and emissions offsets

A crucial problem with current approaches to GHG emissions is the failure to link GHG emissions with climate harms. The current climate governance system fails to provide adequate recourse for the existing and growing numbers of victims of climate impacts domestically and internationally. Climate justice litigation is rapidly growing, as evidenced by recent legal actions taken by victims of climate change impacts from the Philippines[476], Peru[477], Alaska[478], California[479], and New York.[480] Climate litigation is likely to increase and future disbursements in one form or another are to be expected eventually.

We preliminarily suggest that financial guarantees should be sought as a condition for passing a climate test, to ensure that emissions are effectively reduced by mitigation plans proposed in projects and programs. If projects or policies fail in the future to mitigate emissions as planned, they would have to disburse an amount previously required to be held in guarantee. This amount could be based on the social cost of the unabated GHG for the year it was emitted. These guarantees, at least those that would be held by the government, could become the basis for establishing a fund for national and international victims of climate change who will need financial support for adaptation and remediation measures.

How to consider carbon offsets within assessment also requires careful attention. Among the complexities is the need to ensure that accepted offsets are permanent. GHG reductions due to restored carbon sinks or on-site mitigation plans should only be included in assessments under certain conditions. Specific considerations include enforceable approval conditions for effective application of commitments by the proponent and sufficient financial security put aside in a fund to ensure the restoration and mitigation will be done and will lead to permanent results. Likewise, efforts to reduce emissions in foreign jurisdictions to offset emissions should only count in a Canadian project assessment if they happen over the same time scale and provide rigorously verified results according to the latest guidance under international climate frameworks. The *California Environmental Quality Act*[481] and attendant guidelines[482]

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[476] Commission on Human Rights of the Philippines, Greenpeace Southeast Asia & Philippine Rural Reconstruction Movement, Petition to the Commission on Human Rights of the Philippines Requesting for Investigation of the Responsibility of the Carbon Majors for Human Rights Violations or Threats of Violations Resulting from the Impacts of Climate Change, online: <https://perma.cc/2S8R-TTKN>.

[477] *Lliuya* v. *RWE AG*, Az. 2 O 285/15 Essen Regional Court [2015].

[478] *Kanuk* v. *State, Department of Natural Resources*, 335 P.3d 1088 (Alaska 2014); *Kivalina* v. *Exxon Mobil Corp, et al*, U.S. Supreme Court, No. 12-1072.

[479] *The People of the State of California (acting by and through the San Francisco City Attorney)* v. *BP P.L.C. et al.*, Superior Court of the State of California, No. 17-561370; *The People of the State of California (acting by and through the Oakland City Attorney)* v. *BP P.L.C. et al.*, Superior Court of the State of California, No. RG17875889; *City of Santa Cruz* v. *Chebron et al.*, Superior Court of the State of California, No. 17CV03243.

[480] *City of New York* v. *BP P.L.C. et al.*, United States District Court, No. 18 cv 182.

[481] *California Public Resources Code*, section 21000-21189.57, online: <http://leginfo.legislature.ca.gov/faces/codes_displayexpandedbranch.xhtml?tocCode=PRC&division=13.&title=&part=&chapter=1&article=>.

provide useful inspiration for Canadian developments concerning the consideration and discussion of mitigation measures proposed to minimize significant effects.

The *California Environmental Quality Act* Guidelines § 15126.4(c) lists five measures that may mitigate the significant effects of greenhouse gas emissions:[483]

> (1) existing plan or mitigation program to reduce GHG;
> (2) project features or project design that reduce GHG;
> (3) off-site measures, including offsets that are not otherwise required, to mitigate a project's emissions;
> (4) measures that sequester greenhouse gases;
> (5) specific measures or policies found in an adopted ordinance or regulation that reduces the cumulative effect of emissions.

The *California Environmental Quality Act* (CEQA) Guidelines § 15126.4(c) Consideration and Discussion of Mitigation Measures Proposed to Minimize Significant Effects are also relevant:

> (c) Consistent with section 15126.4(a), lead agencies shall consider feasible means, supported by substantial evidence and subject to monitoring or reporting, of mitigating the significant effects of greenhouse gas emissions. Measures to mitigate the significant effects of greenhouse gas emissions may include, among others:
> (1) Measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision;
> (2) Reductions in emissions resulting from a project through implementation of project features, project design, or other measures, such as those described in Appendix F;
> (3) Off-site measures, including offsets that are not otherwise required, to mitigate a project's emissions;
> (4) Measures that sequester greenhouse gases;
> (5) In the case of the adoption of a plan, such as a general plan, long-range development plan, or plans for the reduction of greenhouse gas emissions, mitigation may include the identification of specific measures that may be implemented on a project-by-project basis. Mitigation may also include the incorporation of specific measures or policies found in an adopted ordinance or regulation that reduces the cumulative effect of emissions.

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[482] *California Code of Regulations*, Title 14, Division 6, Chapter 3, Sections 15000-15387.

[483] *California Code of Regulations*, Title 14, §. 15126.4, online: <https://govt.westlaw.com/calregs/Document/I7DB65D405F7511DFBF66AC2936A1B85A?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)&bhcp=1>; *California Environmental Quality Act & Climate Change, Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act*, January 2008, see Appendix B, online: <http://www.capcoa.org/wp-content/uploads/downloads/2010/05/CAPCOA-White-Paper.pdf>.

In order to prevent and reduce GHGs, there should be a mandate to perform "all feasible mitigation" of emissions. That way, after the performance of all feasible on-site mitigation, offsets could be purchased and used for mitigation. Considering that science and research related to GHGs are constantly evolving, off-site measures are important because they consider solutions not directly related to the project. Those measures include offsets that are not otherwise required by the law or regulations, thereby ensuring further mitigation is additional to actions already required of others.

3.4.3 Consideration of the costs of emitting and abating GHG emissions

As discussed in s.3.3.5, there are legitimate reservations concerning a solely economic approach to understanding climate impacts. A stable climate is not simply a good to be traded, but a pre-condition to advanced human societies. However, given the predominance of economic arguments in current decision making and the fact that the current absence of rigorous climate discussions in assessments has meant that climate costs have been interpreted as zero, it is recommended to include economic assessments of mitigation, adaptation and damage costs associated with projects. Proposed projects should not be allowed to rely on projected benefits to gain federal approvals without disclosing important costs to the public. Such carbon prices and/or costs have been included in assessments in other jurisdictions, such as the European Union[484] and the United States of America but not yet in Canada.

Box 6 Example of judicially required social cost of carbon assessment

One example is a US court's use of the social cost of GHGs as a basis for rejecting an impac6 statement that had failed to include the social costs related to climate change in the context of a proposed forest road to open up access to new coal mines in otherwise roadless untouched areas in Colorado. The court ruled in *High Country Conservation Advocates*:

> Common sense [suggests] that quantifying the effect of greenhouse gases in dollar terms is difficult at best. The critical importance of the subject, however, [suggests] that a "hard look" has to include a "hard look" at whether

[484] Davide Sartori and others, *Guide to Cost-Benefit Analysis of Investment Projects: Economic Appraisal Tool for Cohesion Policy 2014 - 2020* (Luxembourg: Office of the European Union, December 2014), pp. 62–63, online: <https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cba_guide.pdf>. Evaluation of externality using a unit cost of CO2-equivalent. Total tonnes of CO2 e emissions are multiplied by a unit cost expressed in Euro/tonne. It is suggested to use the values illustrated in table 2.10 [(see below)], for the central scenario, going from EUR 25 per tonne of CO2 e in 2010 and then assuming a gradual increase to EUR 45 per tonne of CO2 e until 2030. Due to the global effect of global warming, there is no difference between how and where in Europe GHG emissions take place. For this reason, the same unit cost factor applies to all countries. However, the cost factor is time-dependent in the sense that emissions in future years will have greater impacts than emissions today."

this tool, however imprecise it might be, would contribute to a more informed assessment of the impacts than if it were simply ignored.[485]

The court cited a previous decision, which held that, "a government agency [proponent] choosing to trumpet an action's benefits has a duty to disclose its costs."[486] By deciding not to quantify costs at all, agencies effectively zero out the costs in quantitative analyses, since there are no estimates that assign a zero cost to GHG emissions.[487]

The *High Country Conservation Advocates* decision led a new impact statement which represents the best, yet imperfect, example of using the social cost of GHGs as an estimation of global damages associated with a project's GHG emissions, including the social cost of the GHGs associated with extracting and combusting the coal after the court cancelled the previous impact statement which had failed to. [488]

i) Costing concepts applicable to abated and unabated emissions

Whether a mitigation or a damage price needs to be included in assessments of GHGs depends on whether we anticipate each GHG emission associated with a project to be either subjected to a regulatory or pricing scheme for mitigation or whether it will be emitted and lead to damages. Distinguishing between which project GHGs will be abated in the future and those that will be emitted unabated will be key in determining whether a carbon price or the social cost of carbon should be applied. However, important complexities must be recognized.

There is a need to distinguish between emissions covered by a cap-and-trade or tax pricing scheme and those that aren't so as to avoid doubly costing a ton or carbon. There is a further need to distinguish between (i) emissions covered by reduction schemes (cap and trade) under which GHG emissions can be said to have been avoided at the market or set price, assuming there are no leakages in the system[489]; (ii) emitted GHGs that are

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[485] *High Country Conservation Advocates v. United States Forest Serv.*, 52 F. Supp. 3d 1174, 1190 (D. Colo. 2014), p. 22.

[486] *Sierra Club v. Sigler,* 695 F.2d 957, 979 (5th Cir. 1983).

[487] *Ctr. for Biological Diversity* v. *Nat'l Highway Traffic Safety Admin*., 538 F.3d 1172, 1217. (9th Cir. 2008); See also *Border Power Plant Working Grp.* v. *U.S. Dep't of Energy*, 260 F. Supp. 2d 997, 1028-29 (S.D. Cal. 2003)

[488] USDA Forest Service, "SDEIS Rulemaking for Colorado Roadless Areas" <https://www.fs.usda.gov/roadmain/roadless/coloradoroadlessrules>; See also Federal Energy Regulatory Commission, "Final Environmental Impact Statement for the Constitution Pipeline and Wright Interconnect Projects (CP13-499-000 and CP13-502-000)", 2014, online: <https://www.ferc.gov/industries/gas/enviro/eis/2014/10-24-14-eis.asp>; See also "Navajo Generating Station-Kayenta Mine Complex Project EIS", online: <https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=217901>.

[489] This would assume that the purchase of a carbon credit effectively results in a reduction elsewhere. But since cap and trade provide for free allowances and GHG reduction additionally remains controversial, query whether we can assume carbon credits necessarily lead to a compensation / reduction elsewhere. Allocation without charge of greenhouse gas emission units under Québec's cap and trade system for

taxed; (iii) emissions that are covered by a non-market abatement regulation; and (v) emissions entirely not covered by a regime, which also get released into the environment unabated, contributing to climate change damages.

A tonne of GHG subjected to a pricing scheme is not automatically abated if the cost incentive benefits the emission. Conversely, a tonne of carbon that is not subject to a pricing scheme may nevertheless be abated through the application of non-market mechanisms.

Marginal abatement cost and switching prices should be considered in assessments if it is expected that emissions in a project not covered by an existing regulatory or pricing scheme nonetheless may need to be abated because the government does not have a plan for reducing certain emissions and is expected to take corrective action closer to deadlines which would affect the project.

As much as possible, assessment analysis should integrate costs and prices in a matrix format presenting effects of different prices on the economic viability of the project or the economic angle of a public interest determination based on different assumptions:

- Costs of abating emissions:
  - minimal: effect of the federal carbon price on the project on emissions that will be abated / covered by scheme (until 2022)
  - robust: marginal abatement cost/switching price necessary to achieve different versions of fair share of the Paris goals and the necessary transition applied to all emissions generated by the project.
- Cost of unabated emissions: Social cost of GHGs associated with unabated project emissions presenting a wider range of estimates and discount rates.

Care should be had to incorporate the specification and use of effects calculation tools, such as those based on the anticipation of a rising marginal abatement cost / GHG price consistent with meeting the *Paris Agreement* commitments, and calculation of the social costs of carbon/GHGs and sink effects attributable to a proposed undertaking.

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every year from 2013 – 2017 : Ministre du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, "Le Marché du Carbone : Documentation", online: <http://www.environnement.gouv.qc.ca/changements/carbone/documentation.htm>. In 2013, the government gave away 18 952 508 units of free emissions allowance, which represents 18 952 508 metric tons of CO2. In 2017, 13 681 985 units of emissions were allocated to emitters benefiting from the free allowance. This value represents 75% of all emissions units that qualified for free allocation in 2017: Ministre du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, "Quantité d'unités d'émission versées en allocation gratuite pour l'année 2017 et La liste des émetteurs qui en ont bénéficié", 2017, online: <http://www.environnement.gouv.qc.ca/changements/carbone/ventes-encheres/allocation-gratuite/Avis_allocation_2017.pdf>.

ii. Increasing carbon price estimates

Carbon prices are likely to increase significantly in the future. Current values should therefore be used with caution, or applied only to undertakings that are already generally consistent with Paris-compliant pathways to GHG neutrality. Carbon prices estimated by independent experts are higher than those set by government especially for timescales beyond 2022, and should be suitable for adoption in assessments.

Independent estimates are needed to complement government assigned carbon prices/costs. Federal and provincial carbon prices, either set by taxes or cap and trades, are likely to be too low to bring about the Paris consistent transition and therefore likely will lead to unabated emissions. Thus, carbon prices may need to be complemented with additional costing estimates in assessments about future conditions that may come to be set in later years by future governments under greater climate constraints. Short-term carbon prices soon to be set in federal policy will need to be replaced by numbers based on calculations based on what is necessary for Paris compliance. If the federal government fails to undertake such an exercise, assessments should rely on values established by international academia as well as jurisdictions that have taken the exercise seriously.

iii) Climate costs as a public learning and analytical tool

Further, expressing climate impacts in dollar figures may be more readily understandable for the public and decision makers, though focussing on economic dimensions is undoubtedly a limited approach. This characteristic is especially useful because it can be difficult for the public to relate to intangible and invisible concepts like "a ton of GHG."[490] Finally and most importantly, the social cost of carbon ensures that climate impacts of a project are framed in a way that enables the public and decision makers to gain a more tangible understanding of the scale of damage associated with a project.[491]

The social cost of carbon can serve important goals in assessment. Adding consideration of the impacts associated with business as usual, especially to projects in line with business as usual developments such as fossil fuels, provides for an important, even if imperfect, ground-truthing exercise. It can be used as an input in analyzing the economic viability of the project in the context of a "polluters pay" principle. Indeed, it could serve as a basis for providing security/guarantee to back the payment of mitigation action or to compensate for adaptation or victims funding as seen above.

The social cost of carbon is an analytical tool to understand the approximate scale of the climate impacts of a proposal compared to alternatives and should be used regardless of

[490] Center for Biological Diversity (CBD) et al., *Re: Draft Guidance on Consideration of Greenhouse Gas Emissions and Climate Impacts under the National Environmental Policy Act*, 2015, p. 6. [*Re: Draft Guidance Climate Impacts NEPA*].
[491] CBD, *Re: Draft Guidance Climate Impacts NEPA,* p. 6.

whether a formal cost-benefit analysis is conducted.[492] It is not possible to understand the climate impact of a project by only accounting for its GHG emissions, without some assessment of the harm they will cause.[493] Statements in reports highlighting the small proportion of global GHG emissions that a project contributes should be discouraged since such numbers conceal the specific climate change impacts of a project.[494] By using social cost of carbon values, better consideration can be given to climate change impacts by ensuring that GHG emissions are tracked *along with* the project's marginal contribution to global temperature increase and translating those temperature increases into monetized damage estimates.[495]

The social cost of carbon encourages the consideration of the cumulative impacts of climate change, although it is not a substitute for cumulative effects analysis.[496] "The SCC provides an estimate of the cumulative impacts of incremental emissions: that is, the impact of a proposal's emissions when added to the past, present, and reasonably foreseeable emissions".[497] Climate change is inherently cumulative in nature and the social cost of carbon provides the necessary context for understanding data that may otherwise fail to capture the larger picture.[498]

In any case, SCC methodologies and the presentation of their results should be upgraded if they are to be used in assessments.

3.4.4 Consideration of alternatives and GHG scenarios

Another question to be addressed is how different alternatives and their GHG scenarios should be considered in project and strategic assessments. Comparison of alternative future scenarios will be especially important where public resources (e.g., lands or funding) would be used for proposed undertakings that could have significant adverse effects on meeting climate commitments and/or other key sustainability considerations, including human rights and Indigenous peoples' rights. Such alternatives need to be considered not only for GHG-generating undertakings (e.g., fossil fuel extraction projects), but also for industrial projects proposed as climate solutions (e.g., large hydropower dams and, nuclear power stations).

Alternative scenario creation should not remain the exclusive responsibility of the proponent who has vested interest in ensuring other "alternative" scenarios are conservative in their effectiveness and ambition. Assumptions linked to status quo industrial projects can be unduly uncreative and ignore radically different pathways that can deliver greater sustainability and community well-being, for example through

[492] Ibid., p. 4.
[493] Ibid., p. 5.
[494] Ibid., p. 5.
[495] Ibid., p. 5.
[496] Ibid., p. 6.
[497] Ibid., p. 5.
[498] Ibid., p. 8.

decentralized, renewable energy generation, demand side management and efficiency measures:

> When sustainability is considered, low-carbon energy projects can reduce their footprint and coincide with other developments that limit negative impacts on the environment. Wind turbines that maximize the footprint-efficiency of hydro reservoirs, floating photovoltaic arrays, and rooftop solar, geothermal heating and waste-to-energy biomass conversion in industrialized or urban areas are examples of strategies that contribute to reducing energy infrastructures' impact on natural ecosystems. Finally, energy efficiency and conservation reduce the need for expensive and potentially damaging energy infrastructure. A commitment to environmental protection could become a field of innovation in itself, incentivizing the development of reduced-impact, low-carbon energy technology.[499]

The case of the controversial Site C dam assessment and the subsequent independent review discussed in Box 7 illuminates the importance of careful and impartial evaluation of broad alternatives.

Box 7: Case study: The Site C Dam or the failure to assess a dubious climate solution

Site C is a third dam and 1,100-megawatt hydroelectric generating station proposed on the Peace River in northeast British Columbia, near Fort St. John / Treaty 8 territory proposed by BC Hydro.[500] Initially submitted in the 1980's, the project resurfaced in 2010 and was submitted to a Joint Review Panel under *CEAA 2012*.[501] The report found the project would have more significant adverse environmental effects than any other project ever assessed during the 25-year history of the *Canadian Environmental Assessment Act*, including bitumen extraction projects.[502]

[499] Catherine Potvin and others, *Re-Energizing Canada: Pathways to a Low-Carbon Future*, 2017, p. 17

[500] Minister of the Environment, *Decision Statement Issued under Section 54 of the Canadian Environmental Assessment Act, 2012 for the Site C Clean Energy Project* (Ottawa, Ontario, 14 October 2014) , online: <http://www.ceaa-acee.gc.ca/050/documents/p63919/100565E.pdf>.

[501] Review Panel Established by the Federal Minister of the Environment and the British Columbia Minister of Environment (Canada) and Canadian Environmental Assessment Agency, *Report of the Joint Review Panel - Site C Clean Energy Project, BC Hydro*, 2014, online: <https://www.ceaa-acee.gc.ca/050/documents/p63919/99173E.pdf>.

[502] Karen Bakker, Gordon Christie, and Richard Hendriks, *REPORT #2: Assessing Alternatives to Site C (Environmental Effects Comparison)* (Vancouver: University of British Columbia, May 2016), online: <http://watergovernance.sites.olt.ubc.ca/files/2017/11/Briefing-Note-2-Site-C-Environmental-Effects.pdf>.

Following the report, the federal authorizations were issued in October 2014[503] concluding succinctly that: "the significant adverse environmental effects that the Designated Project is likely to cause are justified in the circumstances"[504] without any justificatory analysis of adverse environmental effects or treaty right infringement analysis of the local First Nations who are heavily impacted.[505] It has been called the first "mega-project in new era of reconciliation with Indigenous Peoples[506] and in August 2017, a United Nations panel on racism called on the "B.C. government to immediately halt construction on the $8.8-billion Site C dam, arguing the province needs to review the controversial project in consultation with the First Nations communities facing irreversible destruction of their lands."[507] In December 2017, the B.C. Government chose to continue the project.

Throughout the project review, the dam was being lauded as 'clean' energy. [508] However, the joint review panel did not analyze GHG emissions in detail. Relying solely on proponent evidence about alternative energy scenarios, the panel concluded that "the project would produce more power per gram of CO2e than any alternative (non-nuclear) over its lifetime".[509]

In 2016, a team of researchers at the University of British Columbia program on Water Governance and independent academic experts began producing a series of reports on the Site C Project assessing First Nations issues, environmental impacts, regulatory process, greenhouse gas emissions, economics, and employment. This provides for a rich body of inspiration to influence future alternatives assessments.[510]

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[503] Minister of the Environment, *Decision Statement Issued under Section 54 of the Canadian Environmental Assessment Act, 2012 for the Site C Clean Energy Project* (14 October 2014). The current government stands by it.

[504] Minister of the Environment, *Decision Statement Issued under Section 54 of the Canadian Environmental Assessment Act, 2012 for the Site C Clean Energy Project* (14 October 2014).

[505] *Prophet River First Nation* v. *Canada (Attorney General)*, 2017 FCA 15 (CanLII); leave to appeal denied *Prophet River First Nation, et al.* v. *Attorney General of Canada, et al.*, 2017 CanLII 40511 (SCC)

[506] David Schindler and Faisal Moola, "Opinion: Decision to Approve Site C Undermines Reconciliation with Indigenous Peoples and Long-Term Action on Climate Change", *Vancouver Sun*, 2017, online: <https://vancouversun.com/opinion/op-ed/opinion-decision-to-approve-site-c-undermines-reconciliation-with-indigenous-peoples-and-long-term-action-on-climate-change>.

[507] Mike Hager, "United Nations Panel Calls for Halt of Site C Dam Project in B.C.", *The Globe and Mail* (Vancouver, 28 August 2017), online: <https://www.theglobeandmail.com/news/british-columbia/united-nations-panel-calls-for-halt-of-site-c-dam-project-in-bc/article36102238/>.

[508] Government of British-Columbia, "Site C to Provide More than 100 Years of Affordable, Reliable Clean Power", *Press Release*, 2014, online: <https://news.gov.bc.ca/stories/site-c-to-provide-more-than-100-years-of-affordable-reliable-clean-power>

[509] Review Panel Established by the Federal Minister of the Environment and the British Columbia Minister of Environment (Canada) and Canadian Environmental Assessment Agency, *Report of the Joint Review Panel - Site C Clean Energy Project, BC Hydro*, 2014, p. 243.

[510] Richard Hendriks, Philip Raphals, and Karen Bakker, *Site C: Summary of Key Research Results. Program on Water Governance* (Vancouver: University of British Columbia, November 2017), p. 4, online: <http://watergovernance.sites.olt.ubc.ca/files/2017/11/UBC-Report-Site-C-Key-Issues-Full-Report-1.pdf>.

Their comparative study on GHG unpacks and questions conservative assumptions made by the proponent concerning alternative energy portfolios and found that at best, lifecycle GHG emissions of the Site C dam are comparable to alternatives presented by the project proponent. At best, the dam would provide emission reductions equivalent to 0.15% of the province's current emissions.[511] Further, "Site C Project entails the release of at least 4 Mt CO2e emissions before 2035, as a result of construction-related emissions and the fact that reservoir emissions are concentrated in the early years following inundation. It will be several decades before the GHG emissions of an optimized Alternative Portfolio exceed those of the Site C Project, if ever".[512] The alternatives scenarios reviewed in the independent report had much smaller ecological and social impacts, and also created more jobs. In comparison, site C provided the "least jobs per dollar spent"[513], a key consideration for a just transition.

It is important to consider employment not only during the construction phase of a project, but also throughout the production and transformation phase. It is also important to consider employment opportunities across alternatives: clean technologies, such as wind, solar and geothermal, could cover the demand for energy while creating more long- and short term-jobs.

The study also highlights a very important dimension of GHG emissions comparison: time frames. Building large-scale infrastructure such has hydro dams lead to important methane emissions, a powerful GHG, in the short term, precisely when the largest reductions in GHGs are necessary. Other renewables do not have such important front loaded emissions associated with the early years of projects (but all have most of their emissions occurring during construction years).

A second example of an inefficient green infrastructure investment that could have been avoided or greatly improved by a robust alternatives analysis is the Réseau électrique métropolitain project, a planned electric rapid transit system for the Greater Montreal area. This project, into which the federal government will be investing $1.3 billion[514], should result in a meager 1% reduction of GHG emissions when factors such as cement production and urban sprawl are taken into account. A similarly priced public transit

[511] Rick Hendriks and Karen Bakker, *Comparative Analysis of Greenhouse Gas Emissions of Site C versus Alternatives* (Vancouver: University of British Columbia, July 2016), online: <https://sitecstatement.files.wordpress.com/2016/07/1-site-c-comparative-ghg-analysis-report-final2.pdf>.
[512] Richard Hendriks and Karen Bakker, *REPORT #4: Comparative Analysis of Greenhouse Gas Emissions of Site C versus Alternatives* (Vancouver: University of British Columbia, July 2016), p. 4, online: <http://watergovernance.sites.olt.ubc.ca/files/2017/11/Report-4-Site-C-Comparative-GHG-analysis.pdf>.
[513] *Briefing Note: Employment - Site C versus the Alternative Portfolios* (Vancouver: University of British Columbia, 18 November 2017), online: <http://watergovernance.sites.olt.ubc.ca/files/2017/11/UBC_Briefing_Note_Comparative_Employment_Assessment_of_Site_C_versus_Alternatives.pdf>.
[514] Office of the Prime Minister, "Prime Minister Announces Support for Montréal's Réseau Électrique Métropolitain", *News Release*, 2017, online: <https://pm.gc.ca/eng/news/2017/06/15/prime-minister-announces-support-montreals-reseau-electrique-metropolitain>.

system could have reduced 19 times the amount of emissions with a capacity for three times more passengers.[515] Thus, it is imperative that there be rigorous, transparent methodologies and models that are consistent across alternatives studied and assessment processes.

Assumptions linked to status quo industrial projects can be uncreative and ignore radically different pathways that can deliver greater sustainability and community well-being. Different alternatives to the project and alternative means of designing the project with different GHG implications could therefore be compared across the matrix of different costs to identify the best alternative from a climate perspective and/or integrated into a broader matrix of alternatives across a broader range of sustainability considerations. More detailed guidance on alternatives in assessment is provided in Part 4 below.

3.4.5 Transparent and accessible models and data

The research undertaken for this report highlighted a paucity of published research and many areas of difficulties and contention in existing approaches to considering climate change in the review of fossil fuel projects. There is also still not enough information and context-specific analysis on how we should transition away from hydrocarbons in a manner that maximizes social, economic and environmental benefits while minimizing risks and harm to our society. This gap in research and analysis is apparent internationally, but the situation is especially bad in Canada relative to most other developed countries.

Finally, assessment processes need to ensure information relevant to decision making is transparent and accessible. Most knowledge, information and arguments regarding climate change impacts and possible mitigation pathways rely on modelling. Outputs of models cannot be adequately interpreted without access to the full suite of underlying assumptions and the data that fed into them. The uncertainties associated with these various tools to be deployed must also be addressed transparently.

Models are essential to understanding climate and energy systems. Put simply, they expand what the human brain can do. However, the parameters, data and assumptions fed in to models greatly impact the output, underpinning the crucial need for transparency. Unfortunately, as Hoffman and Sigvaldason have observed,

> the existing stock of energy systems models in government, academia and business are not adequate to meet the needs of sound policymaking and public understanding of energy and its interaction with the economy

[515] Luc Gagnon, "Émissions de gaz à effet de serre du projet de Réseau électrique métropolitain et d'un scénario alternatif", Novembre 2016.

> and the environment […] Models should be made accessible to all interested parties and fully transparent.[516]

This is echoed by the Sustainable Canada Dialogue team whose second key finding was:

> Improvements are needed in the quality of, and access to, data on energy systems. Federal and provincial governments should also support the establishment and improvement of technology-rich, open source, well-documented scenarios and optimization models that can be used by researchers to explore energy pathways and inform policy and investment decisions.
> (…)
> Energy information in Canada is in a dire state: it is fragmented, incoherent, somewhat inaccessible, and without clear organizing principles and standards.[517]

Further, global models like those produced by the International Energy Agency often do not include territorial / geographic considerations within a modelled region. For a large country like Canada, distances can have a non-negligible impact and must be included in Canada-specific models.[518]

For assessment purposes, private and public proponents alike should minimally have to disclose key parameters such as carbon price, technology assumptions and underlying data. It is noteworthy that of the different pathways models compared for this report, only Environment and Climate Change Canada did not respond to requests for information and did not provide their data for comparison. It is problematic that the federal government, unlike other jurisdictions, consider models proprietary information. The federal government could learn from the experience of the United Kingdom, which pioneered an integrated framework of climate modeling, law and policy[519] ; or California which bases its policies on open source models.

The push for more accessible and transparent information could be further assisted by an independent information agency. This body would facilitate the collection and public

[516] Robert Hoffman and Oskar Sigvaldason, "Trottier Energy Futures Project Submission to the Expert Panel: National Energy Board Modernization", 28 March 2017, online: <https://www.neb-modernization.ca/montreal-engagement>.
[517] Robert Hoffman and Oskar Sigvaldason, "Trottier Energy Futures Project Submission to the Expert Panel: National Energy Board Modernization", 28 March 2017.
[518] Conversation with Kathleen Vaillancourt, modeller for the Trottier Energy Futures Project, Trottier Energy Futures Project, *Canada's Challenge & Opportunity: Transformations for Major Reductions in GHG Emissions*, April 2016, online: <http://iet.polymtl.ca/en/tefp/>.
[519] See for example UK Department for Business, Energy & Industrial Strategy, "Guidance on Carbon Budgets", 2016, online: <https://www.gov.uk/guidance/carbon-budgets>; See also "Models", *UCL Energy Institute Models*, online: <https://www.ucl.ac.uk/energy-models/models>; See also "Grantham Institute: Climate Change and the Environment", *Imperial College London*, online: <http://www.imperial.ac.uk/grantham/>.

access to the data needed, and would develop analytical tools that permit researchers and policy makers to test a range of assumptions and possible pathways. An institution such as the US Energy Transition Information Administration could be especially helpful in providing research for the Canadian federal government's broader strategic policy-making beyond project assessments.[520]

Conclusions and recommendations from Part 3

As a working assumption, the latest potentially justifiable deadline to achieve net zero anthropogenic GHG emissions in Canada (GHG neutrality or decarbonisation) is 2050. Given that our fair share decarbonisation deadline is most likely past or at best looming in the next decade, the earliest feasible achievement date should be adopted as the latest possible deadline for achieving decarbonisation. So far, the earliest technologically feasible date identified in any of the studies for decarbonization in Canada is 2050.

Reconsidering what is politically, culturally, and behaviourally possible could move the decarbonization deadline to before 2050 and reduce the gap between mitigation efforts in Canada and what is considered to be our fair share under the *Paris Agreement*.

Any working deadline for decarbonization must be accompanied by always attempting to do better and by international assistance towards mitigation and adaptation abroad to compensate for our domestic lateness and past inaction.

For planning and decision making on particular new and existing undertakings, including those subject to assessment requirements, the current and developing package of targets, frameworks and applied tools needs extensive strengthening to provide an adequate basis for determining what activities would be consistent with meeting Canada's commitments under the *Paris Agreement*.

This strengthening will require the following:

- raising the level of specific domestic commitments to reflect the 2050 working deadline for decarbonisation, and best efforts to do better in the context of a fair share approach to meeting international commitments;
- developing more ambitious pathways to decarbonization, examining alternative future scenarios, testing the feasibility of different GHG neutrality deadlines and comparing alternative routes to meeting particular deadlines;
- adopting a carbon budgeting system, roughly following that of the UK to clarify expectations and track accomplishments over time;
- building explicit long range energy policies, incorporating means of meeting the decarbonization deadline and encouraging best efforts;
- mobilizing price and regulatory tools more effectively, including by recognizing both carbon pricing and the social cost of carbon and clarifying when and with

[520] Karine Péloffy and Meinhard Doelle, *NEB Modernization under the Climate Test: Part III* (2017), pp. 12-13

what caveats each should be used in evaluations of policy options and other applications;

- differentiating among GHGs that will be subject to a carbon price, those that will be abated (as it may not correlate) and those that will be emitted unabated. For unabated emissions, using the social cost of GHGs as an estimation of global damages associated with a project's GHG emissions, only after consistency with climate commitments has been established;
- designing and applying climate- and sustainability-based matrices to compare alternative policy, planning, program or project options with different GHG implications;
- establishing the best means to
  - account for GHG emissions and sinks;
  - recognize the differences among greenhouse gases, including their different timescales of impacts, and their implications for decision making;
  - account for emissions and sink effects stemming from land disturbances and protecting existing sinks and reservoirs;
  - adjust the carbon price and regulatory regime to match the current and expected increases of mitigation ambition under the *Paris Agreement*;
  - adopt and ensure transparent use of the social cost of carbon in evaluations of climate-significant proposals (e.g., in regulatory impact assessments, and project and strategic assessments);
  - attribute emissions, including indirect ones, to particular undertakings, over their full lifecycles,
  - incorporate attention to just transition imperatives in planning and decision making climate-significant undertakings; and
  - evaluate the legitimacy of proposed offsets;
- establishing financial and other tools to guarantee that commitments to and requirements for future GHG reductions and offsets are fulfilled;
- ensuring transparency and convenient public accessibility of climate-relevant information, including important data and assumptions for climate-related studies including the modelling of alternative climate change policy options; and
- improving coordination between and among the federal, provincial, territorial and Indigenous and municipal governments;

Together, these advances would provide a reasonable strong and explicitly justified foundation for clear, rigorous and consistent decision making in assessments of projects and strategic level undertakings under the new federal *Impact Assessment Act*. Indeed, some of the steps listed above could be initiated, elaborated and pilot-tested in assessment practice before the new law is passed and comes into effect.

Part 4. Translating Canada's *Paris Agreement* commitments into rules for decision making on major undertakings: key implications for assessment law

In February 2018, the federal government introduced a new federal *Impact Assessment Act* to replace the *Canadian Environmental Assessment Act, 2012*, which was deemed to have failed the test of public credibility. The impending new law requires attention to whether proposed projects (and perhaps strategic level undertakings) subject to assessment would "contribute to sustainability" and be consistent with meeting Canada's climate change commitments.

Under section 63(e) of the law,[521] federal assessment decision makers (the Minister of Environment and Climate Change or the Cabinet) will have to determine

> (e) the extent to which the effects of the designated project hinder or contribute to the Government of Canada's ability to meet its environmental obligations and its commitments in respect of climate change.

This requirement is a welcome indication of government intent to recognize and respond to its climate commitments. However, effective practical application will depend on suitable clarification and specification of how the analysis is to be done, and how the foundations for due attention to climate matters are to be established in many other aspects of the law's application.

The preceding parts of this report have been devoted to translating Canada's international climate change commitments, especially under the *Paris Agreement,* into implications for Canada. They have identified many complexities and uncertainties but have also pointed to reasonably robust working understandings and paths forward. Our analysis shows that Canada's international commitments entail obligations to cut our domestic anthropogenic GHG emissions effectively to zero by 2050 at the latest, to achieve more rapid progress wherever possible, and to make substantial contributions outside Canada to the global effort to keep global average temperatures well below 2ºC. It also identifies a suite of approaches and tools for Canadian efforts to meet these obligations.

Part 4 takes on the next step. It examines the implications for assessments and decision making on proposed new projects and other undertakings that may have important consequences for meeting Canada's now clearer climate change mitigation obligations. In particular, Part 4 considers how meeting Canada's *Paris Agreement* commitments can

[521] House of Commons of Canada, *Impact Assessment Act,* part 1 of Bill C-69, *An Act to enact the Impact Assessment Act and the Canadian Energy Regulator Act, to amend the Navigation Protection Act and to make consequential amendments to other Acts*, as passed by the House of Commons, 20 June 2018, online: <https://www.parl.ca/LegisInfo/BillDetails.aspx?billId=9630600&Language=E>. At the time of writing, the Act was under review by the Senate. Further amendments are possible and, presuming passage, proclamation and coming into force are not expected before June 2019.

best be served through the design and application of federal assessment law. It begins with the basic tests to be met, considers what assessment legislation must deliver, and proceeds to consider the core purpose and aims of the law, needs for specific climate-centred criteria and trade-off rules, application of assessment requirements to particular categories of projects and other undertakings, associated needs for information and evaluations, assessment process characteristics and means of fostering inter jurisdictional collaboration.

4.1 From commitments to applications: climate tests for assessment applications

The findings from Parts 1-3 provide a foundation for translating the implications of our climate commitments to implications for assessment for proposed new projects and other undertakings under the new law.

As a beginning, the Parts 1-3 findings can be combined in a basic set of climate tests for application in assessments and similar deliberations and decision making. The tests are summarized in the Box 8, below.

Box 8. Tests to be applied to determine whether a proposed undertaking would or would not contribute to meeting Canada's international climate change mitigation commitments

The core test is that all projects and other proposed undertakings that may be GHG significant over their lifetime must

- contribute to meeting Canada's international climate change mitigation commitments, and not hinder Canada's transition to GHG neutrality in time to meet those commitments.[522]

The international commitments currently established chiefly under the *Paris Agreement* require Canada to do its fair share

- to keep overall climate warming "well below 2ºC" and to pursue efforts to limit the increase to 1.5ºC above pre-industrial levels" (Article 2.1);
- to achieve global peaking of GHG emissions as soon as possible and to reach GHG neutrality in the second half of this century at the latest, "on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty" (Article 4.1.); and
- to anticipate regular review and revision of signatories' commitments to reflect progressively increasing nationally determined contributions that represent each signatory's "highest possible ambition" (Article 4.3, Article 14).

[522] This is a restatement of s.63(e) of the *Impact Assessment Act,* as proposed, as it apples to climate change mitigation. See Box 6, below.

These commitments are to be met while also ensuring respect for human rights, including Indigenous rights, and pursuing other sustainability objectives such as biodiversity.

More specific tests that elaborate on the core test can be based on analyses using a suite of complementary available tools for determining whether a proposed undertaking will contribute to or hinder meeting our international commitments. The following list includes analyses that can be used in an elementary way now but need be developed and specified further for Canadian application.

Tests based on particular analyses using a range of tools would, for example, require a proposed undertaking

- to contribute to the major transformations that are needed in key sectors – including energy, transportation, buildings, manufacturing, resources, agriculture, and possibly forestry – to achieve GHG neutrality in Canada in time to meet our international commitments;
- to avoid any direct or indirect effects that would hinder timely transition to GHG neutrality;
- to fit on a credible sectoral or regional pathway to meeting Canada's international commitments;
- to be consistent with staying within an equitable GHG budget for Canada (and within the global GHG budget consistent with meeting international objectives), as further specified for a sector or region;
- to be viable if the proponents of the undertaking had to pay the full costs associated with all GHG emissions and sink impairments properly attributable to the undertaking over its lifespan and lifecycle, with these full costs determined by the GHG price needed to achieve timely transition to a GHG-neutral economy or the full social cost of associated climate change (the share of overall anticipated global damages attributable to the undertaking's GHGs);
- to avoid, or compensate for, any addition to the costs of making a timely transition to GHG neutrality;
- to avoid any properly attributable GHG emissions and sink impairments past the Canadian deadline for GHG neutrality entailed by Canada's current international commitments, or provide legitimate new domestic offsets[523] to neutralize any such emissions or sink impairments; and
- to be consistent with ensuring that Canadian GHG mitigation and sink enhancement initiatives reflect "highest possible ambition" and best efforts, while not impeding or delaying more promising options.

Tests based on existing domestic policy guidance can also be used, if that guidance is adjusted to reflect our current and anticipated international commitments. Such tests would need to favour transparently developed and credible policies. In every case the

[523] The *Paris Agreement* allows for internationally transferred mitigation outcomes through cooperation but international offsets should be considered only after robust methodologies and governance systems have been developed.

guidance would have to be consistent with meeting Canada's international commitments.

For illustration, given current domestic policy guidance, a proposed undertaking would be required

- to be consistent with meeting Canada's current Nationally Determined Contribution (NDC), plus additional requirements to address the gap between the current NDC and the more demanding commitments of the *Paris Agreement*, and to anticipate needs for increasing ambitions in future national commitments under that Agreement; and
- to be consistent with the requirements implied by the *Pan-Canadian Framework on Clean Growth and Climate Change* and its implementing legislation, plus additional requirements to address the gap between the Framework components and the current NDC, as well as the gap between the current NDC and the *Paris Agreement*.

Specifying these tests through open and meaningfully participative strategic policy making, including application of legislated strategic assessment requirements, would be preferable to relying on case-by-case debates on the test requirements and implications. Also, these tests would need to be applied to all existing and proposed activities and undertakings affecting prospects for meeting Canada's climate change mitigation commitments, including those that would not be subject to legislated assessment requirements.

All climate tests will need to be updated regularly in light of tightening international commitments, the evolution of climate science and learning from application experience.

These tests, simply stated, will not be sufficient by themselves. To support the tests, and ensure clear expectations and common understandings for meeting Canada's climate commitments under the new Act, a suite of regulatory and policy steps will be needed.

4.2 What is needed in assessment law

4.2.1 The role of assessment law

Assessment law and associated processes are used in the vast majority of jurisdictions around the world to ensure due consideration of key long term public interest concerns in the planning and decision making on important undertakings. Often the applications are limited to major new projects and in many cases the focus is largely on mitigating adverse effects on the biophysical environment. Increasingly, however, assessment requirements have been applied to policies, plans and programs (strategic undertakings) as well as projects. Also, the scope of assessments has gradually expanded to cover socio-economic, cultural and health as well as ecological considerations, and the core objectives have begun to move from mere mitigation of adverse effects to ensuring

positive contributions to sustainability. Because of its influence in the planning and approval of major new undertakings, assessment law is among the most powerful available means Canada and other countries have for acting on their international climate change mitigation commitments.

In Canada, most of the undertakings that have been subject to assessment requirements have been physical projects. These have included projects with important long as well as short term implications for meeting climate change mitigation commitments such as hydrocarbon extraction, transportation and energy generation projects that involve GHG emissions. Canada also has had a non-transparent policy-based process for strategic assessment since the early 1990s, and has often been pressed to establish a more rigorous and credible law-based approach to assessing major strategic undertakings, including policies, plans and programs with important climate implications.

Together, assessment of climate-significant projects and strategic undertakings could play a major role in helping Canada act on its international climate change mitigation commitments.

4.2.2 The record of Canadian assessment law treatment of climate commitments

Effective mobilization of assessment law for climate purposes entails incorporation of climate-related requirements in the law, application of these requirements to strategic as well as project-level undertakings, and clarification the implications of the country's international commitments and for decision making on proposed undertakings. None of that is yet in place, though steps in the needed direction are underway.

To date, Canada has paid no effective attention to climate change mitigation in assessment practice. The word "climate" did not appear in either of the main versions of the *Canadian Environmental Assessment Act* (1995 and 2012). Canadian climate change mitigation commitments and responsibilities are not recognized in the current Act as key matters of federal jurisdiction, as grounds for requiring assessments, or as factors for consideration in federal assessments. Also the current law focuses on identifying particular "significant adverse environmental effects." That has facilitated arguments that an individual project's GHG emissions have no distinguishable particular biophysical effects and the emissions are not significant at the global scale where climate effects are broadly attributed to the combined effects of all GHG emissions and GHG sink losses.

Moreover, federal authorities have not translated their international climate change commitments into implications for projects subject to assessment. Lacking the needed guidance, assessors and decision makers have failed to determine the implications in individual cases. Even the most recent assessments of projects with evident climate change implications – including assessments of highly controversial pipelines for transporting diluted bitumen – have made no serious attempts to determine whether approving the projects would be consistent with meeting Canada's climate commitments. The results of this inattention have included approvals of projects with

lifetimes and attributable GHGs continuing long after Canada should have achieved net zero anthropogenic GHG emissions.

The current federal government, however, has indicated a major shift. It signed the *Paris Agreement,* and engaged actively in new climate initiatives including negotiation of the *Pan-Canadian Framework for Clean Growth and Climate Chang,* which sets out federal, provincial and territorial commitments.[524] As well, it initiated a review of federal assessment processes,[525] during which it indicated interest in ensuring greater attention to climate issues under the new law.[526] Finally, it has introduced proposed new assessment legislation, the *Impact Assessment Act*, which promises more serious attention to meeting Canada's climate change commitments.[527]

4.2.3 The proposed new *Impact Assessment Act*

Bill C-69, which was introduced in the federal House of Commons on 8 February 2018, includes two proposed statutes that will govern deliberations and decision making on projects and certain other undertakings with important consequences for meeting climate change commitments. These statutes are a new federal *Impact Assessment Act* and a new *Canadian Energy Regulator Act.*

The *Impact Assessment Act* sets out requirements and processes for assessment and decision making on designated projects and provides for broader regional and strategic assessments. The *Canadian Energy Regulator Act* is focused regulation of hydrocarbon pipelines, electrical power transmission lines and offshore renewable energy projects within federal jurisdiction. We focus here on the *Impact Assessment Act,* since its provisions are likely to apply also to the major projects covered by the *Canadian Energy Regulator Act.*

As noted above, the new federal *Impact Assessment Act* explicitly requires consideration of whether proposed projects subject to assessment will "hinder or contribute to"

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[524] *Pan-Canadian Framework* (2016).

[525] The assessment law reform process began in 2016 and included an extensive public review by an Expert Panel: Expert Panel for the Review of Environmental Assessment Processes, *Building Common Ground, a New Vision for Impact Assessment in Canada: The Final Report of the Expert Panel for the Review of Environmental Assessment Processes*, 2017, online: <https://www.canada.ca/content/dam/themes/environment/conservation/environmental-reviews/building-common-ground/building-common-ground.pdf>, followed by release and public response to a subsequent government Discussion Paper *: Discussion Paper* (June 2017).

[526] The *Discussion Paper* (June 2017), p.9, raised the possibility of a strategic assessment to clarify the implications of the *Pan-Canadian Framework for Clean Growth and Climate Change* for assessments under federal law. Since then the federal Minister of Environment and Climate Change has stated that the strategic assessment will also address Canada's international climate commitments.

[527] House of Commons of Canada, *Impact Assessment Act,* part 1 of Bill C-69, *An Act to enact the Impact Assessment Act and the Canadian Energy Regulator Act, to amend the Navigation Protection Act and to make consequential amendments to other Acts*, as passed by the House of Commons, 20 June 2018.

meeting Canada's climate change commitments.[528] What is less certain is how these assessment and decision-making requirements are to be met, what climate-important projects will be assessed, how the provisions for strategic assessments will be used to clarify the implications of Canada's climate commitments for particular undertakings and how the analysis of hindering or contributing to meeting climate change commitments will be done.

At the time of writing, Bill C-69, including the *Impact Assessment Act*, is still in the midst of its journey through the legislative process. The Bill was passed by the House of Commons in June 2018. Senate review is proceeding and regulations to set out crucial specific requirements for practical application (including what categories of projects are subject to assessment requirements and what information is required at key steps in the assessment process) are under development. Current opinion is that, even if the government is successful in winning passage of the Bill, the *Impact Assessment Act* will not be given royal assent and come into force before June 2019.

The statute, however, is only part of the story. As is common, the proposed *Impact Assessment Act* leaves many specifics to be set out in regulations and/or policies. Regulations are legally enforceable. Policies, generally, are not. The *Impact Assessment Act* as proposed includes provisions that authorize the Governor in Council (Cabinet) and the Minister of Environment and Climate Change to make regulations on many matters needing elaboration under the Act, including determination of what categories of projects are subject to assessment requirements. Together the statute as passed and the regulations made under the Act will constitute the new federal assessment law.

4.2.4 The foundations and substance of following discussion

The following discussion identifies the key questions to be addressed and provides initial responses on how best to incorporate due attention to Canadian climate change mitigation commitments in the new law. Some of the needed responses are included in the *Impact Assessment Act* as proposed. Others may be addressed through amendments to the statute before it is passed. No less crucial will be regulations that specify or elaborate broad provisions in the statute. Finally, application of the law is likely to rely on policy guidance, which does not have the weight of law, but can nonetheless be influential.

Five key points concerning agenda and assumptions inform our approach to the questions and response options:

- Guidance for project and program assessments based on Canada's commitments made under the *Paris Agreement* needs to be developed in a broader context of

[528] The requirement appears in the Act in identical language in two places: in the list of factors to be considered in all assessments s.22(1) and as one of five core factors that are to provide the basis for decisions on assessed projects made by the Minister of Environment and Climate Change or the Governor in Council (Cabinet) s.63.

climate justice, which implies respect for human rights, including the rights of Indigenous peoples, and be guided by the precautionary principle.[529]

- Assessment law is only one of several key means of acting effectively to meet Canada's international commitments concerning climate change mitigation. As we note below, requirements applied to proposed new undertakings need to be accompanied by requirements applied to other climate-important activities not covered by assessment law. Moreover, even the most effective assessment law needs support from a Canadian climate law as a broad foundation for initiatives to meet climate change mitigation commitments.
- Similarly, our focus here on addressing Canada's international commitments on climate change mitigation does not diminish needs for due attention to other key climate-related issues, especially needs for climate change adaptation.
- We assume that to accommodate learning from experience, the rising ambitious of international and national climate change mitigation goals, and other requirements for flexibility, the statute itself should incorporate only the fundamental legislative requirements concerning matters related to climate change mitigation and provide for the specifics to be set out in regulations. As well, the statute should incorporate requirements for regular review and updating of the climate change mitigation components in light of experience, new learning and the anticipated rising ambition of international and national climate change mitigation goals.[530]
- Finally, we support and build upon the government's decision to propose a new assessment law that will require public interest determinations informed by evidence of contribution to sustainability. Adoption of a sustainability-based approach to assessment and assessment decision making has been widely recommended, including by the government's Expert Panel. Moreover, a sustainability-based assessment foundation is well suited to addressing the demands of climate change mitigation and integrating these demands with other expectations and obligations.

The usual way of approaching assessment requirements in law is to begin with what sorts of undertakings are to be assessed, and then move on to what information is to be required in support of each proposed undertaking, what analyses are to be done, and finally how decisions are to be made about whether or not the undertaking should go ahead and if so with what conditions, monitoring and other follow-up. All of these steps, however, depend on what is to be accomplished. What undertakings are proposed, what information and analyses are required and how decisions are made turn on the objectives to be served and the test to be applied.

[529] These and related considerations are addressed in the preface to the *Paris Agreement*.

[530] As proposed, the *Impact Assessment Act* would be subject to mandatory review after 10 years [s.167]. The initial Canadian federal assessment law was subject to mandatory review first after five years and then after seven years. Given the newness of climate change requirements in assessment law, the likely changes in climate change understanding and commitments, and the need to learn from early experience, the climate-related assessment criteria, trade-off rules and other guidance for analyses and other determinations should be subject to relatively frequent regular review.

Consequently, this section will begin by discussing matters of purpose and criteria, and then proceed to matters of application, information and analysis. The discussion then addresses decision making, recognizing that climate change considerations must be integrated with other considerations in the planning and assessment of relevant undertakings, and must help inform the comparative evaluation of reasonable alternatives to determine which option has the best prospects for contributing to sustainability, while avoiding significant adverse effects. The final topics in this section are interjurisdictional collaboration and the nature of the provisions to be included in the statute in contrast to those to be left for regulation and policy guidance.

4.3 The purposes, scope and core objectives of the law

Climate change mitigation is an atypical consideration for assessment law. The usual concerns have been the traceable local and regional effects of projects. Useful consideration of climate change mitigation effects requires a focus on long-term global consequences. It is best centred on project implications for meeting international climate change commitments, including needs for transformation as well as more conventional mitigation. Because of the nature of these commitments, the law needs to deliver best efforts rather than only being consistent with specific compliance requirements such as those implied by national or provincial targets. This approach in turn is best supported by assessment requirements that aim for overall positive contributions to sustainability from each approved project, and thus include climate change mitigation with other mutually supporting means of achieving and preserving lasting wellbeing.

As will be discussed in some detail below, the *Impact Assessment Act*, as proposed, provides a promising base. It requires consideration of whether an assessed project will hinder or contribute to meeting Canada's climate change commitments. It also establishes a "contribution to sustainability" test and context for climate change considerations. Finally, it requires consideration of alternatives, providing an opening for identification of best options. What remains uncertain is the extent to which these good foundations will be specified clearly in regulations and policy guidance and applied effectively in practice.

4.3.1 Needed purposes, scope and core objectives

In assessments of individual projects and other undertakings, climate change is one of many compelling issues to be addressed. Assessment decision making needs to pay due attention to all these issues, in an integrated manner that reflects an appropriate understanding of what is needed in the long as well as short term public interest. The basic objective that has underpinned assessment law in most jurisdictions for the past 40-some years has been avoidance or reduction of significant adverse environmental effects (with "environmental" sometimes limited to biophysical considerations and sometimes extended to the social, economic and cultural realms). For climate change mitigation purposes, and increasingly for other areas of concern, this traditional focus on adverse effects is not sufficient.

Meeting Canada's climate change commitments under the *Paris Agreement* clearly entails achieving a substantial transformation of important aspects of the national economy, soft and hard infrastructure and entrenched behaviour. Much the same is true in other areas of concern. In sectors as diverse as reconciliation with Indigenous peoples, management of ocean fisheries and planning for urban growth, needs for positive alternatives to long-established practices are well recognized. Simply reducing negative effects – doing things less badly – is not a potentially adequate objective.

As with these other areas, climate change mitigation imperatives entail efforts not only to preserve and protect valued existing qualities but also to foster positive transformation from undesirable present conditions and trajectories to ones that are more attractive and viable.

Typically, the key components that establish the core objectives in assessment law are set in the purpose and scope sections of the statute, reflected in the statutory decision criteria, and elaborated in accompanying regulations and policies. These components also need to be supported by more specific provisions concerning, for example, what gets assessed, how mandatory assessment considerations and evaluations are defined, and how process credibility is ensured.

For Canadian federal assessment law, the key needs centred on purposes, scope and core objectives are as follows:

- The law should establish its core objective as ensuring that approved undertakings make positive contributions to sustainability while avoiding significant adverse effects.
- More specifically to address climate change mitigation objectives, the law's purpose and scope and key decision factors should
  - include the specific purpose of contributing to meeting Canada's international commitments to climate change mitigation and maintaining a healthy and stable climate for future generations;
  - ensure that positive contributions to sustainability are defined explicitly to emphasize intergenerationally lasting contributions (such as climate change mitigation);
  - define the general scope of assessment considerations to include all factors that may affect lasting wellbeing, and their interactions[531] (whether the factors are identified in the common social economic, biophysical/ecological, cultural and health categories, or in more directly relevant cross-cutting

[531] This breadth is crucial to ensure that all key climate-related factors are taken into account and integrated in ways that also fit into the larger context of sustainable development and poverty eradication, as required under the *Paris Agreement*, Article 4.1.

categories of basic requirements for progress towards lasting wellbeing,[532] or some combination);
    - require attention to cumulative as well as undertaking-specific effects, interactive as well as individual effects, indirect as well as direct effects, effects beyond Canada as well as domestic effects, and lifetime/lifecycle as well as more immediate effects; and
    - require, in each case, comparative assessment of reasonable alternatives, including the null option of not proceeding with the proposed undertaking, and identification of the best option for positive contributions to sustainability, including climate change mitigation (in contrast to assessing only whether the proposed undertaking is "acceptable").

Additional provisions related to the basic objectives of the law are needed to recognize the unique set of challenges raised by climate change mitigation. Two special challenges of attention to climate change effects in assessments merit particular attention:

The first challenge arises from the atypical characteristics of climate change issues. These are that the effects of GHG emissions and sink losses are cumulative at the global scale, and their most significant consequences are intergenerational. Consequently, they cannot be addressed usefully by traditional assessment approaches that identify particular effects attributable specifically to particular undertakings. Instead, climate effects assessments must focus on doing our part in the global efforts to avoid devastating climate change. That includes compliance with international climate change mitigation commitments and it entails that assessments determine whether the GHG implications of a proposed undertaking are consistent with meeting global needs for GHG emission reductions and sink enhancements that are set out most authoritatively in international commitments, currently led by the *Paris Agreement* commitments. Accordingly, the assessment law must base the test for climate change effects on consistency with meeting international commitments. That is one key reason why meeting international climate change mitigation commitments should be one of the purposes of the law. Two complementary steps are also needed:

- To ensure that climate change effects assessment is centred on consistency with the implications of international commitments, the law should
    - require decision makers to ensure decisions are consistent with meeting international climate commitments/obligations;[533] and
    - provide for regulations to specify suitable approaches to assessing effects on climate change commitments.

[532] The basic categories of widely applicable sustainability requirements can be summarized as follows: maintaining ecological integrity, enhancing foundations for sustainable livelihoods, building intra- and inter-generational equity, maintaining resources and expanding efficiencies, practicing precaution, deepening learning and engagement, and seeking mutually reinforcing gains in all these areas at once. See R.B. Gibson and others, *Sustainability Assessment: Criteria and Processes* (London: Routledge, 2005), chapter 5, online: <https://doi.org/10.4324/9781849772716>.

[533] This option raises possibilities for similar approaches to other areas of international concerns and commitments, including biodiversity and human rights.

The second special climate change challenge for assessments is that any potentially adequate global mitigation efforts must go well beyond the usual approaches to effects mitigation in assessment practice. In the case of climate change, GHG reduction and sink enhancement must reflect best efforts and must achieve substantial transformations – for example, transformation of current energy, transportation and other systems and associated institutions, structure and practices.

- To ensure that climate change effects assessment addresses needs for transformations as well as more conventional mitigation, the law should
  - clarify that the legislated purpose of compliance with climate change commitments entails fostering necessary transformations as well as contributing to the reduction of net GHG emissions in line with what is required to meet the commitments;
  - provide for regulation making and other guidance to clarify how to determine the transformational needs of relevant sectors and/or regions;[534]
  - provide for regulation making and other guidance on how to determine whether a proposed undertaking will or will not contribute adequately to meeting transformational needs, and if not, to determine whether and how the proposed undertaking could be redesigned to meet transformational needs; and
  - provide for regulation making and other guidance on how application of requirements centred on meeting climate change mitigation commitments is to be integrated with consideration of other requirements for progress towards sustainability.

4.3.2 How the *Impact Assessment Act*, as proposed, addresses purposes, scope and core objectives?

As proposed, the *Impact Assessment Act* clearly and repeatedly recognizes climate change commitments as serious imperatives – most notably in the list of factors to be considered in all assessments [s.22(1)] and as one of five core factors for attention in decisions on assessed projects made by the Minister of Environment and Climate Change or the Governor in Council (Cabinet) [s.63]. The language used requires assessors and decision makers to consider:

> (e) the extent to which the effects of the designated project hinder or contribute to the Government of Canada's ability to meet its environmental obligations and its commitments in respect of climate change.[535]

[534] If a comprehensive new federal climate act were passed, the assessment statute could reference clarifications provided under that law.

[535] House of Commons of Canada, Bill C-69 (as passed by the House of Commons, 20 June 2018), Part 1, *Impact Assessment Act*, section 22(1)(i) and section 63(e). Identical language is used in the two sections.

Moreover, the mandatory attention to climate change commitments and other such obligations comes in a section setting out decision making criteria that begin with the broader requirements to consider contributions to sustainability and reduction of adverse effects.[536] See Box 9, below. The sustainability-based decision making is supported by a suitably broad assessment scope. Most of the key sustainability-related effects categories and other considerations are incorporated explicitly[537] and those that are not – notably interactive and intergenerational effects – are arguably covered implicitly as being inherent in any serious assessment of contribution to sustainability.

Box 9. The *Impact Assessment Act's* core considerations for decision making, in section 63

63 The Minister's determination under paragraph 60(1)(a) in respect of a designated project referred to in that subsection, and the Governor in Council's determination under section 62 in respect of a designated project referred to in that subsection, must be based on the report with respect to the impact assessment and a consideration of the following factors:

(a) the extent to which the designated project contributes to sustainability;

(b) the extent to which the adverse effects within federal jurisdiction and the adverse direct or incidental effects that are indicated in the impact assessment report in respect of the designated project are adverse;

(c) the implementation of the mitigation measures that the Minister or the Governor in Council, as the case may be, considers appropriate;

(d) the impact that the designated project may have on any Indigenous group and any adverse impact that the designated project may have on the rights of the Indigenous peoples of Canada recognized and affirmed by section 35 of the Constitution Act, 1982; and

(e) the extent to which the effects of the designated project hinder or contribute to the Government of Canada's ability to meet its environmental obligations and its commitments in respect of climate change.

Oddly, the purposes section of the Act as proposed does not contain a clause on meeting environmental and climate change commitments. This may be a simple oversight. Also, given that mandatory attention to these matters is required in the sections discussed above, the silence of the purposes section is probably not consequential. It may however, be identified for correction through amendments to the statute during the legislative process.

[536] Section 63 (a) and (c).

[537] See especially s.22(1).

Together, these provisions incorporate essential contents consistent with the needs set out above. Especially important is the focus on meeting the Government of Canada's commitments, which certainly include those made in the *Paris Agreement*, and the explicit requirement to consider potential for hindering the needed steps towards meeting climate commitments as well as potential for positive contributions to meeting the commitments.

Limitations remain, however. The s.63 criteria apply only to assessment decisions on proposed projects; no equivalent decision making rules are set out for assessments of strategic and regional assessments (addressing policies, plans, programs and other broader initiatives) that could have major implications for meeting the climate. Also, while the law requires consideration of alternatives, it does not clearly required that the s.63 criteria be applied in a comparative evaluation of potentially reasonable alternatives to identify the best option for climate and other purposes.

Further uncertainties surround key specifics. These include how the assessment and decision-making requirements are to be met – what climate-important projects (and other undertakings) will be assessed, what specific criteria are to be applied, what analyses must be undertaken and how the provisions for strategic assessments will be used to clarify the implications of Canada's climate commitments for individual cases. Like many other statutes, the *Impact Assessment Act* establishes only the bare bones of requirements on many topics and leaves details for determination in regulations, policy guidance and case-by-case practice. Consequently, many of the particulars remain to be addressed, possibly through amendment of the statute before it is passed, but more likely through the development of regulations and associated guidance.

One expected venue and vehicle for specification of requirements is a strategic assessment of the implications of climate commitments for project level deliberations. Such an assessment was identified as a matter under consideration in a federal government discussion paper on assessment process reform released in June 2017. While no announcement has yet been made and the terms of reference are not yet known, a climate-centred strategic assessment could provide a useful forum for deliberation on the issues and options raised in the following pages.

4.4 Climate-related analyses and criteria for assessments and decision making under the law

The *Impact Assessment Act* as passed by the House of Commons incorporates two crucial fundamentals for effective attention to climate change mitigation imperatives. The Act has sustainability-based core objectives and decision factors, and it sets out explicit requirements for considering whether proposed undertakings will "hinder or contribute to" meeting Canada's climate change mitigation commitments.

By themselves, these two components of the new statute represent a major and laudable step towards serious attention to climate imperatives. As noted above, however, these

fundamentals and their implications are unlikely to be understood or addressed reliably and predictably unless they are accompanied by specific directions for application and compliance. The directions will need to set out the necessary analytical approaches, criteria for evaluations, specific tests to be used and means of applying these tests, and the information required to serve these activities so that proponents, assessors, and other process participants share a common understanding of what is involved. Perhaps most importantly, the specific directions are needed for decision makers, not only to establish clear expectations but also to confirm that the rules will be applied authoritatively and consistently.

For that, several key areas of vagueness and uncertainty need attention.

4.4.1 Identification of best options through comparative evaluation of alternatives

In all assessments, the public interest is best served by processes designed to identify best options, rather than require a yes (with conditions) or no decision on the acceptability of a proposed undertaking. This is especially important for climate-significant projects. As we have found in parts 1-3 of this report, meeting Canada's climate commitments requires best efforts to reduce and eliminate GHG emissions and sink impairments.

Experience in jurisdictions that have required attention to alternatives suggests that comparative evaluation of reasonable alternatives can lead to some of the most significant contributions of assessment processes to better decision making and better decisions. To facilitate identification of best options, including for climate change mitigation, assessment law should

- require comparative evaluation of alternatives to proposed undertakings (including the "no-go" alternative) in light of context-specified sustainability criteria;
- ensure that the range of alternatives to be considered in assessments is centred on potentially feasible and desirable options and is sufficiently broad to identify possibilities for substantially greater contributions to lasting public interest.
- provide strong anticipatory guidance on consideration of alternatives;
- establish an early planning stage in assessments that clarifies the range of potentially reasonable alternatives to be addressed, and avoids premature selection of the preferred alternative to be assessed as the proposed project;
- clarify assignment of responsibility for considering the relevant alternatives, including responsibility of government bodies to consider alternatives that may lie outside the capacities and authority of the proponent;
- require decision makers to include comparative evaluation of alternatives (in light of sustainability-based criteria) as a basis for their decisions; and
- emphasize use of strategic assessments to address broad alternatives as well as major cumulative effects and big policy issues.

The *Impact Assessment Act* as proposed provides a basis for addressing most if not all of these points but with few of the necessary specifics. The Act begins well establishing that all assessments must consider, among of the factors,

> (d) the purpose of and need for the designated project;
> (e) alternative means of carrying out the designated project that are technically and economically feasible, including through the use of best available technologies, and the effects of those means;
> (f) any alternatives to the designated project that are technically and economically feasible and are directly related to the designated project;[538]… [s.22(1)].

How the consideration of alternatives is to be incorporated in to proponent submissions, assessment reviews and decision making is not delineated in the Act. Also unclear is how assessments would consider the extent to which project alternatives would hinder or contribute to meeting climate commitments, as required under section 63(e).

The Act does introduce a "planning phase" for assessments [s.10-15]. If that planning phase were to begin early enough, it could facilitate identification and examination of reasonable alternatives before the preferred option is selected as the specific project to be proposed. As well, it could provide an opportunity to assign responsibilities to government bodies for evaluating alternatives beyond the proponent's capacities. However, the Act does not require any of this. It provides no guidance on how the alternatives are to be identified or evaluated. Although alternatives are to be considered in every assessment, there is no explicit reference to comparative evaluation of these alternatives as a basis for justifying the project as proposed.

If the Act's requirements to consider alternatives and to address climate change implications are to be applied effectively, the existing provisions of the Act will need to be supplemented by authoritative regulatory and policy guidance

- to clarify that the selection of the proposed project, and decision making on whether or not to approve the project, must be based on a comparative evaluation of the alternatives;
- to specify how reasonable alternatives for assessment purposes are to be identified;
- to specify how climate tests (see Box 8) will be used in the comparative evaluations;

[538] The final phrases in s.22(1)(f) were added as amendments proposed by the Standing Committee and passed by the House of Commons. The requirement to consider "alternatives to" is now limited to "any alternatives to the designated project that are technically and economically feasible and are directly related to the designated project. The intent may have been to narrow the scope of "alternatives to". However it seems unlikely that technically and economically infeasible alternatives would have been considered in any event, and it is not yet clear what reasonable alternatives "directly related to the designated project" might exclude.

- to specify how the proponent is to compare alternatives, including with climate tests before selection of the preferred alternative as the proposed project; and
- to specify how the Agency, review panels and the decision makers (the Minister and the Governor in Council) are to do comparative evaluations of the project as proposed, the project with recommended conditions of approval, and other alternatives (alternatives to, alternative means of designing and carrying out the project and the null option of not proceeding with the project).

Some of these needs concerning the identification and comparative evaluation of alternatives could be addressed very broadly through amendments to the statute in the latter parts of the Parliamentary review process. However, most guidance will have to be provided in regulations made under s.109 and s.112(a) of the Act and in associated policy directives. For particular issues, regions and sectors, regulatory and policy guidance for identifying and comparing alternatives may be informed by strategic and regional assessments.

4.4.2 Specification of overall sustainability-based criteria and approaches to evaluations

The core criteria for assessments and decisions are set out in section 63 of the *Impact Assessment Act*[539] and reproduced in Box 9, above. The criteria combine the climate change mitigation obligation with imperatives to seek overall contributions to sustainability, avoid or mitigate adverse effects and respect the interests and rights of Indigenous peoples. All of these criteria need clarification and specification through regulations with further detail in policy guidance. Otherwise, uncertainties and inconsistencies will cloud interpretations of the existing broad provisions and undermine both the effectiveness and efficiency of assessment law application.

The needed guidance on criteria and evaluations would have to cover the Act's overall sustainability-based agenda as well as its more focused requirements concerning climate and other issues. The full set of contribution to sustainability criteria would extend across the broad scope of the legislation, covering ecological, social, economic and health considerations and their interactions, recognizing the main generic requirements for progress towards sustainability, and addressing major Pan-Canadian requirements such as those for human rights, gender equity, and reconciliation and respect for the interests and rights of Indigenous peoples.

The overall sustainability-based guidance would include

- more specific criteria setting out the generic requirements for progress towards sustainability, the interactions among these requirements, and their links to other key considerations in Canadian assessment law (including human rights, gender

[539] In the *Impact Assessment Act*, the core criteria for decision making by the Minister of Environment and Climate Change and the Governor in Council (Cabinet) are set out in s.63. Important related considerations are set out in s.22(1), which lists key considerations for all assessments.

equity, reconciliation and respect for the interests and rights of Indigenous peoples, and meeting environmental and climate change commitments);
- means of further specifying the criteria in individual assessments to recognize the particulars of the case and context;
- criteria for considering trade-offs; and
- procedural and methodological approaches for applying these criteria (e.g., in the comparative evaluation of alternatives) in assessments and decision making.

The requirements for climate-specific criteria and trade-offs are discussed in the following sections.

4.4.3 The challenge of specifying climate-related criteria for evaluations and decisions

The Act includes a core decision criterion that is explicitly tied to climate (section 63(e), see Box 9). It requires consideration of the extent to which proposed projects may "hinder or contribute to" meeting Canadian climate change commitments. In light of the discussion above concerning alternatives, we will assume that the analyses supporting application of this core legislated criterion would need to include determination of the extent to which a proposed project *and its reasonable alternatives* may "hinder or contribute to" meeting Canadian climate change commitments. The big challenge, however, is not in determining what alternatives to assess but in translating Canada's climate commitments, especially those in the *Paris Agreement,* into implications for individual cases subject to assessment requirements.

The "hinder or contribute" determination is inevitably complex – technically, ethically and politically. As is evident from the preceding parts of this report, a host of challenges must be addressed in interpreting what the *Paris Agreement* commitments imply for overall GHG reduction obligations for Canada. Many different approaches and tools are available and likely to be needed for determining deadlines, allocating responsibilities, identifying viable pathways to compliance, enhancing motivations, ensuring fair transitions, and addressing other concerns and opportunities. Applications in individual assessments must accommodate a diversity of cases and contexts. The climate-change considerations need to be addressed in ways that respect and support other sustainability objectives. And the whole climate and sustainability agenda demands creative ways of bridging immediate pressures and long-term imperatives.

Despite the complexities, however, all assessment participants will need a credibly developed, shared base of guidance on how to determine the extent of hindering or contributing in particular cases. Consequently, the core climate-related decision criterion in section 63(e) needs to be elaborated in some detail.

4.4.4 The tests to be applied

Parts 1-3 of this report examined in some detail the major considerations and options for translating the *Paris Agreement* commitments into implications for Canada and projects

assessments in Canada. The findings indicate that the criteria developed to guide determination of whether a project or other undertaking will "hinder or contribute" to meeting climate commitments must

- be centred on our best understanding of what Canada must accomplish to meet its international commitments;
- recognize that meeting our commitments requires both our best domestic efforts and assistance to less advantaged and less culpable nations, since we have already delayed effective action past the point where meeting our full fair share obligations domestically was possible;
- make use of multiple approaches and tools – for example to identify compliance pathways, allocations, economic measures, attributable emissions and sink damages, and legitimate offsets;
- respect the role of projects and other individual undertakings in needed broader transformations (e.g., decarbonisation of particular sectors by a specified deadline);
- favour capacity to deepen GHG emission cuts or increase sink enhancements to address higher future requirements arising from the increasingly ambitious future national commitments expected under the *Paris Agreement*;[540] and
- ensure that Canadian GHG mitigation and sink enhancement initiatives reflect "highest possible ambition" or best efforts and not impede more promising options.

The results point to the initial set of core tests set out in Box 8, above. These tests would be applied to all proposed undertakings that may hinder or contribute to meeting Canada's commitments.

4.4.5 Elaborating on the tests through climate-centred criteria for assessments and decision making

The tests in Box 8 clarify how to apply the core statutory requirement for determining whether a proposed undertaking will hinder or contribute to meeting Canada's climate commitments. For practical application, however, the tests would need to be elaborated in considerable detail for informed and consistent application.

A credible process is required. As should be evident, developing detailed guidance for these tests through open and meaningfully participative strategic policy making (e.g., through application of legislated strategic assessment requirements) would be preferable to relying on gradual clarification through experience with diverse and inconsistent case-by-case interpretations and debates on the test requirements and implications.

[540] *The Paris Agreement*, Article 4.3

The elaborations would also need to be authoritative. While some reliance on policy guidance is likely to be helpful, the essential specifics that need to be taken seriously must be set in enforceable regulations. Finally, these tests would need to be applied to all activities and undertakings affecting prospects for meeting Canada's climate change mitigation commitments, including existing activities and undertakings and ones otherwise not subject to legislated assessment requirements. Consequently, the tests provide a basis for identifying what categories of undertakings should be subject to the legislated assessment process. They can also be used for finding equivalent means of dealing with activities and undertakings that are climate-significant but not properly subject to assessment law.

Elaborating the tests begins with the core statutory climate requirement in s.63(e). Means of understanding and applying this requirement and the tests would be best specified at two levels. The first level is detailed climate-centred criteria established by regulation and meant for application in all assessments and decision making where there is a need to determine the extent to which a proposed undertaking may hinder or contribution to meeting the climate commitments. The second level is further case-by-case specification of the criteria in individual assessments to recognize the particulars of the case and context.

The criteria established by regulation would provide for common understanding and consistent application to all assessments involving undertakings with potential effects on meeting the climate change mitigation commitments. The criteria themselves would be accompanied associated guidance for criteria application. The case-specific criteria would be based on the criteria established by regulation, but would be elaborated for each particular undertaking and its context.

The climate change criteria and associated guidance would need to be responsive to learning. Their design and application should feature flexibility and regular review to adjust the criteria and resulting decision making and conditions of approvals in response to more demanding future international commitments as well as evolving climate change understanding, technological innovations and other emerging practicable options.

Also, as will be discussed below, successful application of specified climate change criteria will depend on ensuring an adequate information base and consistent approaches to gathering and interpreting the information (e.g., about attributable emissions and sink damaging effects, and about potential offsets and their potential permanence).

4.4.6 Particular issues to be addressed in the criteria

The specific climate-related criteria to be set out in regulation and supported by associated policy guidance would need to cover the *Paris Agreement* commitment implications for all sectors represented by individual undertakings subject to assessment,

and address the full range of climate change mitigation issues commonly faced in individual assessments.

The specific climate-related criteria to be set out in regulation should

- cover the steps towards GHG neutrality within the deadlines implicit in Canada's international commitments, including steps to ensure sufficiently complete and timely reduction of GHG emissions, to protect and enhance existing GHG sinks, and create permanent new GHG sinks;
- require positive contributions to the transition to a low-GHG future as needed to meet Canada's current commitments and retain sufficient flexibility to accommodate more demanding future obligations;
- specify what is needed to apply the multiple climate change mitigation policy tools and climate change mitigation tests set out in Box 8, above;
- clarify the full scope and nature of effects that could hinder the Government of Canada's ability to meet its climate change commitments and specify appropriate means of determining the extent to which such effects would hinder progress towards meeting climate change commitments;
- require proposed undertakings to avoid, or provide legitimate new domestic offsets to neutralize, any properly attributable GHG emissions or sink impairments past the Canadian deadline for GHG neutrality entailed by Canada's current international commitments; and
- require proposed undertakings to be consistent with ensuring that Canadian GHG mitigation and sink enhancement initiatives reflect "best efforts" and not impede more promising options; and
- favour capacity to deepen GHG emission cuts or increase sink enhancements to address higher future requirements arising from the increasingly ambitious future national commitments expected under the *Paris Agreement.*

Further direction through regulation and policy guidance should be provided to clarify

- how the climate change mitigation obligations are to be met in ways that also serve other sustainability-based purposes and criteria under the law; and
- how requirements, including conditions of approval, may be amended in light of evolving climate change understanding and changes in future international commitments, technological and other innovations that affect the availability of new options (e.g., for additional and/or less costly mitigation, or for more effective sink enhancements and newly proven permanent offsets).

4.4.7 The process for developing climate-related regulations

Perhaps even more than other regulations that are needed for the *Impact Assessment Act*, those for climate change will be complex, demanding and controversial as well as crucial. Moreover, as noted above, climate-related assessment regulations would need to be elaborated in considerable detail for informed and consistent application. A credible

process for the development -of these regulations – with meaningful public participation and rigorous and independent assessment – is therefore required.

One possibility is use of an open and accountable strategic assessment process. A process for strategic assessments is introduced in the *Impact Assessment Act*[541] and the federal government has indicated that it is planning a strategic assessment on the implications of Canada's climate change commitments. This climate strategic assessment should not await passage of the new legislation.[542] If done with suitable participation, rigour and independence, it could provide both regulatory clarification of climate-related assessment requirements and a model for future strategic assessments. Unfortunately, the results of such a strategic assessment, or any equivalent credible process, are not likely to be available soon for translation into regulations.

4.4.8 Areas of assessment regime decision making in which the criteria should be applied

The climate-related criteria may be designed mainly to guide deliberations and decision making on individual proposed undertakings, but they should also be applied in many other deliberations and decisions in the assessment regime.

- The climate-related criteria should be designed for use in
  - decision making in management of the overall assessment regime, including decision making on what categories of undertakings are to be subject to legislated assessment requirements, in guidance for assessment reviews, and in rationales for decisions (and decision conditions and follow-up requirements) on particular undertakings;
  - decision making in the assessment of individual undertakings, including in assessment reviews and deliberations concerning approval, rejection and/or determination of needed terms and conditions of approval, follow-up, effects and compliance monitoring, and responses to monitoring findings; and
  - the planning of undertakings subject to assessment, including in early determination of whether a contemplated undertaking may be able to meet climate change mitigation criteria, in the identification and comparison of reasonable alternatives, in the selection of one option as the proposed undertaking and in the proponent's justification of the decision making leading to the proposal.

[541] *Impact Assessment Act*, s.92-103. See the discussion below under heading 4.6.1.
[542] Government of Canada, *Discussion Paper: Developing a Strategic Assessment of Climate Change* (Gatineau: ECCC, July 2018), online: <https://www.strategicassessmentclimatechange.ca/discussion-paper>.

4.4.9 Core associated information requirements

Key information requirements to be met in all assessments should be established in the statute, and where appropriate elaborated in regulations and policy directives. Section 4.8, below, sets out the main categories of needed information requirements for sustainability-based assessments and indicates where climate change mitigation requirements fit in those categories. It also covers the main provisions needed for specification and elaboration of key information and analysis requirements related to climate change mitigation. The points immediately below present the main considerations related to climate change mitigation commitments.

The basic climate-related information requirements are implied by the statutory obligation to consider effects that may hinder or contribute to meeting Canada's climate change commitments. That includes information on the following matters, all of which should be specified by regulation:

- effects that would increase or decrease GHG emissions and/or GHG sink capacities that are attributable to the undertaking and assessed alternatives (including effects that are direct and indirect, cumulative, over the undertaking's entire lifecycle and lifetime and over relevant parts of the lifecycle and lifetime, domestic and beyond Canada);
- means of reducing the anticipated GHG emissions and adverse effects on GHG sinks;
- means of enhancing existing GHG sinks and/or establishing new GHG sinks;
- proposed legitimate (new, domestic, permanent, etc.) offsets;
- proposed follow-up plans including for monitoring and response to monitoring findings about the accuracy of effects predictions and the adequacy of achievements in meeting climate commitments, and
- overall consistency with meeting the broad Canadian commitments to climate change mitigation with reference to the several tools and tests noted in Box 8, and with meeting any more fully specified climate-related (as well as other) criteria that have been developed through a strategic assessment or other credible public process.

Associated regulations and policy directives should provide guidance on how to address the identified factors for consideration related to meeting climate change mitigation commitments:

- how to determine what GHG emissions and effects on GHG sinks are properly attributable to an individual undertaking;
- how to determine what initiatives would qualify as legitimate offsets for GHG emissions and adverse sink effects;

- how to determine consistency with climate-related criteria, including what information is needed and what analytical approaches are appropriate; and
- how, in the absence of broadly elaborated criteria, to proceed on a case-by-case basis to determine consistency with meeting the broad Canadian commitments to climate change mitigation.

4.5 Climate-related trade-off rules and processes

4.5.1 Key issues related to trade-off rules and processes

Trade-offs in sustainability-based decision making involve sacrificing one possible contribution to sustainability to gain another. Since sustainability objectives are typically interdependent, trade-offs are undesirable.[543] Sustainability-based assessment laws and processes should be designed to discourage trade-offs in favour of mutually-reinforcing gains across the criteria categories. Nonetheless, trade-offs are not entirely avoidable.

We can anticipate cases where proposed undertakings would deliver important contributions to sustainability in some areas (e.g., by protecting intact ecological systems, providing lasting livelihood opportunities where these are lacking, or supplying particular minerals required for the transition to renewable energy), but be incompatible with meeting climate commitments (e.g., by blocking part of a pathway to transition from fossil to biomass or other renewable energy sources). Also, we can anticipate undertakings that would contribute to meeting climate commitments (e.g., by replacing fossil fuels with biomass fuels), but have adverse effects in another area of sustainability concern (e.g., by adding to pressures on forests or food systems). Consequently, special climate-specific trade-off rules are likely to be important to encourage integration of climate change mitigation obligations with other sustainability-based objectives in assessments so that all are served to the extent possible in mutually reinforcing ways.

Among the difficult questions to be addressed are the following:

- If a proposed undertaking would entail a trade-off that would compromise meeting climate change commitments (i.e., proceeding with the undertaking would not meet the Box 8 tests), should this result in
  - assigning the case to a special process addressing serious trade-off issues? and/or
  - mandatory re-examination of possible alternatives to identify ways of avoiding the trade-offs, including through additional legitimate offsets?
- Should it be possible to accept a trade-off that would allow approval of a proposed undertaking or alternative that would not comply with the core climate-related purpose and criterion requiring consistency with meeting Canada's international climate change mitigation commitments (e.g., inconsistency with

[543] R.B. Gibson and others, *Sustainability Assessment: Criteria and Processes* (2005), chapter 6.

national, regional or sectoral efforts needed to meet those commitments) if the undertaking offered positive contributions to other sustainability-based objectives?

- If trading-off compliance with the basic climate-related criterion were potentially acceptable, how should the opening for a trade-off be limited, for example,
  - by establishing specific thresholds beyond which compromises to climate commitments will not be considered and no proposal for an undertaking entailing such a compromise can be accepted for review;
  - by requiring identification and support for feasible new initiatives (e.g., legitimate offset initiatives not already anticipated in pathway delineations) to make up for any climate commitment compromise due to the undertaking in question?
- Should it be possible to accept a trade-off that would allow approval of a proposed undertaking or alternative that would make a positive contribution to the core climate-related objective but have negative effects on other sustainability-based objectives (e.g., extend or worsen existing inequities), and if so with what limitations?

4.5.2 Means of addressing trade-off concerns in the law and associated guidance

Trade-offs pose some of the biggest challenges in assessment process design and those involving climate change mitigation are particularly difficult. Because climate change is increasingly disastrous the longer it remains unchecked, climate change mitigation is increasingly a non-negotiable imperative. But because climate change is also gradual and has delayed effects, mitigation action has been easily compromised. Accordingly, anticipating how to deal with climate-related trade-offs is crucial.

Efforts to set out climate-related trade-off rules and other guidance must recognize that undertakings subject to assessment processes must also deliver other needed contributions to sustainability. Requirements focused on climate change matters must therefore be well integrated with other considerations in the planning and assessment of relevant undertakings. Moreover, all assessments should centre on the comparative evaluation of alternatives so that the result is the undertaking or version of the undertaking that has the best prospects for contributing to sustainability, including climate change mitigation and adaptation, while avoiding significant adverse effects.

To address the need for basic direction on trade-off rules and processes, the statute and associated regulatory clarification and guidance should

- clarify that application of the core sustainability-based purpose of the assessment regime must pursue sustainability-based objectives in ways that to the extent possible ensure that progress towards all objectives is achieved in mutually reinforcing ways;
- specify basic trade-off rules including rules

    - precluding any trade-off that would displace any significant adverse effect to future generations (including the effects of non-compliance with climate change commitments) unless all other options are worse for those generations;
    - limiting possible compromises of consistency with meeting climate commitments, including compromises that would increase difficulties in meeting Canada's international and domestic commitments (e.g., difficulties for keeping within our GHG budget, staying on a viable pathway, being viable given the full social costs of the GHGs involved, or achieving a necessary sectoral transformation; and
    - elaborating and providing guidance for all evaluations and decision making related to possible trade-offs that would compromise prospects for meeting climate change mitigation commitments.
- require identification and evaluation of potential trade-offs in all assessments, including in the comparative evaluation of alternatives and incorporation of legitimate offsets;
- require reasons for decisions on proposed project and other assessed undertakings to identify and provide justification for all anticipated trade-offs;
- establish particular requirements for decision making attention to trade-offs, emphasizing the desirability of avoidance and minimization, including in the selection among alternatives;
- require any assessment recommendation or decision supporting a proposed undertaking that involves a climate-related trade-off (or any other significant trade-off) to document efforts to identify a viable alternative that avoids the trade-off;
- in particular, require justification of any accepted trade-off that would make meeting climate mitigation commitments more difficult in light of trade-off rules established under the Act, with explanation of how the compromise of prospects for meeting climate change mitigation commitments will be made up through other new initiatives;
- require that the conditions of approval in any decision involving a trade-off include requirements for regular review of and reporting on any emerging possibilities for meeting the compromised criterion or criteria;
- require clear delineation and evaluation of the future development opportunities foreclosed as a result of the trade-off;
- require continued monitoring of the cumulative implications of all trade-offs involving compromises to prospects for meeting climate change mitigation commitments, with regular public reporting and mandatory responses to findings;
- establish and guide application of trade-off rules through regulations under the Act;
- provide particular trade-off rules for cases involving potential compromise of prospects for meeting climate change mitigation commitments;
- provide regulatory and policy guidance on the limits to possible compromises of consistency with meeting climate commitments; and

- provide specifically for refusal to review any proposal for an undertaking that would exceed any such limits.[544]

4.6 Application of assessment requirements to potentially climate-significant project-level undertakings

Federal assessment law in Canada so far has applied only to projects (mines, hydrocarbon extraction and pipelines, hydropower dams, highways, etc.). In many international jurisdictions, and in some Canadian provinces, assessment requirements are also applied to strategic-level undertakings (especially policies, plans and programs). The new *Impact Assessment Act*, sections 92-103, introduces strategic assessment and regional assessment provisions. Following assessment tradition, this section will begin with application of the law to projects. Application to strategic level policies, plans and programs will be addressed in the following section.

4.6.1 Means of identifying climate-important projects that are to be subject to assessment requirements

The *Canadian Environmental Assessment Act, 2012* relies on a projects list, established by regulation,[545] to identify categories of projects that are subject to assessment under the law. Other possible approaches include use of a triggering mechanism that ensures mandatory application of assessment obligations to all projects that a permit or licence under specified laws.

Regulatory triggers have the advantage of avoiding questions of jurisdiction, since federal permitting and licensing requirements tend to be accepted as within federal jurisdiction. Unfortunately, triggers tied to regulatory permitting have two major limitations. The first is that the regulatory licence requirements were put in place for a variety of non-climate purposes and represent only some matters of federal jurisdiction. The second limitation is that determination of assessment obligations through permitting triggers may happen very late in project planning, long after assessment studies, consultations and incorporation of findings in project selection and design ought to have been initiated. Generally, then, it is better to use the Project List to cover the same categories of projects in a more anticipatory manner.

The new *Impact Assessment Act,* section 109(b), provides for a designated projects list. With that list, application of assessment law to climate-important projects would be accomplished by adding categories of foreseeable projects that could have important consequences for meeting Canadian climate change mitigation commitments.

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[544] Section 17(1)(b) of the *Impact Assessment Act* empowers the Minister generally to order refusals to assess where "the designated project would cause unacceptable effects within federal jurisdiction or unacceptable direct or incidental effects."

[545] *Regulations Designating Physical Activities* (SOR/2012-147), online: <http://laws-lois.justice.gc.ca/eng/regulations/SOR-2012-147/page-1.html>.

Identification of the categories could be informed, for example by the considerations about compliance with pathways, GHG budgets, etc. as listed in Box 8.

In addition, the new Act, section 9, establishes that the Minister of Environment and Climate Change may designate for assessment particular projects beyond those in the projects list. Moreover, these designations may be in response to public requests. In decision making about designations, the Minister must consider the potential for adverse effects linked to federal jurisdiction and public concerns related to those effects.

For both Project List and individual designation decisions, the key climate-related questions include what more specific criteria should be applied in listing or designating projects that could affect prospects for meeting climate commitments, and what processes should be used in for deliberations leading to listing or designation.

4.6.2 Considerations for identifying potentially climate-significant projects that should be subject to assessment

Provisions for the development of the Project List should ensure that the categories of climate-relevant projects included in the list cover all projects that individually or cumulatively[546] could have a substantial effect on prospects for meeting Canada's climate change mitigation commitments, including effects that would hinder meeting these commitments.

Identification and definition of climate-relevant project categories to include in the list should take into account multiple factors, including potential for

- annual attributable (including direct and indirect)[547] GHG emissions and/or sink impairments over a certain threshold;

[546] Projects that would have modest individual implications for meeting climate commitment, but contribute to cumulative problems, would be more effectively and efficiently addressed through strategic level assessments, if they were undertaken. In the absence of strategic level assessments, use of the project level option may be necessary.

[547] Attention to indirect emissions and sink impairments involves complexities both in decision making on which undertakings require assessment and in decision making within the assessment process. Most fundamental among these complexities is the matter of indirect effects outside Canada (e.g., effects outside Canada resulting from the facilitation of GHG-emitting undertakings in the supply of non-domestic components for a Canadian project or in the use of Canadian products abroad). For the immediate purposes of meeting Canadian commitments for climate change mitigation, emissions and sink impairments abroad do not count towards the national inventory. They are the responsibility of the jurisdiction in which the emissions and sink impairments occur. But in the larger context of climate change mitigation and the *Paris Agreement*, those emissions and sink impairments do matter to the world and consequently to Canada.
In any event, indirect emissions and sink impairments properly attributable to individual projects (or strategic initiatives) would need to be defined in the regulations, with elaborations on methods of calculation provided in policy guidance. They would include, for example, the upstream and downstream effects of fossil hydrocarbon pipelines that facilitate GHG emissions upstream in extraction and processing and downstream emissions in processing and combustion.

- lifetime attributable emissions and/or sink impairments over a certain threshold;
- attributable emissions and/or continued sink impairments in Canada beyond the established or reasonably anticipated deadline for GHG neutrality in Canada overall and in the relevant sector;
- contribution to cumulatively significant GHG emissions or sink impairments at a level that would make meeting specific mitigation commitments (e.g., for a sector or region) more difficult to meet;[548]
- contribution to further entrenching or extending fossil dependency or activities that impair GHG sinks;
- important roles in a sector that is understood to require significant transformation to ensure climate mitigation commitments are met;
- inconsistency with steps required to stay on a recognized or reasonably anticipated pathway to meeting Canada's climate mitigation commitments, remain within a defensible Canadian carbon or other GHG budget, or demonstrate viability if the social cost of the emissions or sink impairments and the costs of transition to GHG neutrality were fully charged; and
- inability to meet any other requirement entailed by the climate change mitigation tests set out in Box 8, above.

Any one of these would qualify as sufficient grounds for requiring assessment of the project.

Additional important considerations include the following:

- Identification and definition of climate-relevant project categories to include in the list should, where possible, use identifying characteristics that are evident at the outset of project planning, so that the application of assessment requirements is known and respected from the earliest stages of project conception and development.
- Identification and definition of climate-relevant project categories to include in the list should define categories, especially those involving thresholds, in ways that preclude project splitting and other threshold-avoiding behaviours to avoid assessment obligations.
- The process for developing the designated projects list should be transparent and consultative and development of the climate-relevant Project List categories should be led by the government agency most expert in and responsible for meeting Canada's climate change mitigation commitments.
- Development of the designated projects list under federal assessment law should involve collaboration with other Canadian jurisdictions with overlapping responsibilities. This is a matter of practicality as well as principle. Authority for assessment processes and for decision making related to climate-significant undertakings is shared among jurisdictions under the Canadian Constitution.

[548] For example, any project with significant attributable GHG emissions and a project life extending over ten years may be judged likely to lock in emissions past the date for virtual elimination of anthropogenic GHG emissions in Canada.

> While the federal government can act to assess climate-significant undertakings,[549] many aspects of such undertakings are likely also to be subject to provincial, Indigenous and/or territorial authority. Moreover, effective action on climate change mitigation is likely to depend on informed and committed interjurisdictional collaboration. That should include collaboration in the assessment of climate-significant undertakings and should begin with the designated projects list.

For decision making on what to include in (or later add to or delete from) to the designated projects list and on individual designations, the processes should

- be transparent and provide for meaningful public participation;
- be open to proposals from proponents, other jurisdictions, organizations and members of the public, as well as from within government;[550]
- apply explicit criteria centred on the potential of the project, individually or cumulatively, to make meeting Canada's climate change mitigation commitments more difficult; and
- require public reasons for decisions, based on the criteria.

Finally, the projects list should be reviewed regulatory for amendment needs. Given the likely pace of change and the needed pace of learning, review of the climate-related categories every three years would be appropriate.

4.7 Application of assessment requirements to potentially climate-significant strategic-level undertakings

While the *Impact Assessment Act* focuses on assessment of projects, it also establishes a process for assessment of strategic undertakings – new or revised policies, plans, programs and other such government initiatives. The Act's provisions for strategic-level assessments (sections 92-103) are bare bones. They represent a long awaited step into

[549] The issue of federal jurisdiction over climate change is complex. There are no constitutional jurisdictional issues when it comes to the information-gathering step of the assessment but the decision making step may be limited to the federal jurisdiction to act on climate change. Federal jurisdiction to implement a carbon price under its taxation power, and to regulate GHG emissions under its criminal law power, is well established. Additional possible grounds for federal jurisdiction include the interprovincial and international nature of the impacts of climate change, and residual federal powers over matters of national concern and emergencies under the principle of Peace, Order, and Good Government (POGG). While none of these powers establishes unlimited federal jurisdiction over climate change, they collectively do offer clear federal jurisdiction to act.

[550] Openness to requests is already incorporated, though without process specifics, in the section 9(1) provisions for designation of individual projects by the Minister. Also, public consultations on the new Project List regulation were initiated in February 2018, with the existing Project List as the starting point. See Government of Canada, "Consultation Paper on Approach to Revising the Project List", 2018, online: <https://www.canada.ca/en/services/environment/conservation/assessments/environmental-reviews/environmental-assessment-processes/consultation-paper-approach.html>.

law-based assessments of policy, plan, program and regional initiatives, but the Act does little more than enable such assessments. Specifics about the process and anticipated products are left for subsequent attention, perhaps in regulations.

For climate change mitigation purposes, the new opening for legislated strategic assessments introduces two possible uses of strategic assessment:

- to help build Canadian climate policy, including filling the gap between the Paris commitments and due attention to climate commitments in project level decision making; and
- to ensure due attention to climate commitments in the planning and approval of climate-relevant policies, plans, programs and regional initiatives.

The latter possibility raises questions about what climate-significant policies, plans, programs and regional strategic initiatives should be subject to legislated strategic assessment. For all possible strategic assessments, however, there remain needs to establish more specific requirements and guidance to ensure that the assessments are properly independent, rigorous, participative and attentive to the key issues to be credible and effective.

4.7.1 Using strategic-level assessment to address climate commitment implications

At the strategic level, assessments involve the planning and approval of new or revised policies, plans, programs and other such government initiatives. Sometimes they are undertaken as means of policy (or plan or program) development where there is an identified unmet need.

For the purposes of meeting Canada's climate change mitigation commitments, strategic assessments would be useful for two related purposes:

- to play a key role in developing policy and associated guidance translating Canada's international climate commitments into implications for deliberations and decision making on specific undertakings, including individual projects subject to assessments; and
- to guide the planning, review and decision making on particular policies, plans or programs that could have important consequences hindering or contributing to meeting the climate commitments.

For both purposes, the strategic assessments would need to be open, participative, rigorous, independent and authoritative to provide credible results.

Credible strategic assessments are valuable because strategic undertakings can have a much broader and more powerful influence in moving towards sustainability than individual projects. Moreover, strategic assessments can address serious cumulative

effects more effectively and efficiently than assessments at the project level. Meeting climate change mitigation commitments represents both an important subject for attention in the development of influential policies, plans and programs and the most dramatic and fully global example of cumulative effects. It is therefore leading candidate for attention in the application of strategic-level assessment requirements.

The new *Impact Assessment Act,* as proposed, provides for strategic assessments (and for regional assessments that are also at the strategic level).[551] The provisions [sections 92-103] are not well elaborated. For example, it is not clear to what strategic undertakings the new assessment requirements will be applied, what processes are to be used in the assessments, what may be done in response to strategic assessment reports, or what authority these responses may have. However, the assessments are to ensure opportunity for public participation [s.99] and make the information used in the assessment publicly available [s.98].

The government has already signalled interest in undertaking a strategic assessment on climate change policy matters, presumably as the first strategic assessment under the new law. The assessment has not yet been announced and no terms of reference have been released for the strategic assessment on climate matters. However, the expected core task is to determine how to translate broad climate change mitigation commitments into implications for assessment of specific proposed projects.[552] Such an assessment would have to address many of the issues and options raised in this paper.

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[551] Law-based strategic assessment will be an innovation at the federal level. Since 1990, the federal government has formally required assessments of federal policies, plans and programs under a policy-based Cabinet Directive. Since 1990, the federal government has formally required assessments of federal policies, plans and programs under a policy-based Cabinet Directive (Government of Canada, *The Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals* (Ottawa: The Privy Council Office and the Canadian Environmental Assessment Agency, 2010), p. 18, online: <https://www.canada.ca/content/dam/ceaa-acee/documents/strategic-environmental-assessment/cabinet-directive-environmental-assessment-policy-plan-program-proposals/cabinet_directive_on_environmental_assessment_of_policy_plan_and_program_proposals.pdf> .) This process is non-transparent and the federal Commissioner for Environment and Sustainable Development in various reviews has found serious deficiencies in the application of the policy requirements (see for example Auditor General of Canada, *2004 Report of the Commissioner of the Environment and Sustainable Development: Chapter 4—Assessing the Environmental Impact of Policies, Plans, and Programs*, 2004, p. 38, online: <http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200410_04_e_14917.html>.) Legislated federal strategic assessment requirements have long been advocated. See House of Commons Standing Committee on Environment and Sustainable Development, *Sustainable Development and Environmental Assessment: Beyond Bill C-9* (Ottawa: Parliament of Canada, March 2003) at 34; and Robert Gibson and others, "Strengthening Strategic Environmental Assessment in Canada: An Evaluation of Three Basic Options", *Journal of Environmental Law and Practice*, 20.3 (2010), 175–211, online: <https://works.bepress.com/denis_kirchhoff/3/>; Multi-Interest Advisory Committee.

[552] *Discussion Paper*, p.9. In that paper, the government's raised the possibility of a strategic assessment to clarify the implications of the *Pan-Canadian Framework for Clean Growth and Climate Change* for assessments under federal law. Since then there have been indications that the focus may not be limited to the *Pan-Canadian Framework*. The language in the *Impact Assessment Act* s.63(e) presents the relevant assessment criterion as the extent to which a proposed project would hinder or contribute to meeting climate change commitments, without any qualification that would limit the commitments to domestic

In addition to guidance for project-level assessments, the initial strategic assessment on climate commitments could also consider how best to apply assessment requirements to subsequent strategic undertakings that could have climate-significant implications. That would involve determining

- what climate-important policies, plans and programs, including regional strategic initiatives, should be subject to strategic assessment requirements; and
- what particular strategic assessment process characteristics and requirements need to be established to ensure that assessments of climate-significant strategic level undertakings are rigorous and credible.

However, on both of these matters the government should have basic working positions for interim application while the climate strategic assessment is considering the specifics.

Ideally, all climate-related strategic assessments would be undertaken under an overarching climate agenda supported by a comprehensive legislative initiative covering Canadian climate commitments and their implementation. Since neither the overarching agenda nor the comprehensive federal climate law is in place, the anticipated climate-centred strategic assessment could play a major early role in establishing the rules and processes for ensuring due attention to climate commitments in the development of federal policies, plans and programs as well as projects.

As the first strategic assessment under the new the *Impact Assessment Act,* the climate assessment would establish the initial character of federal strategic assessments. In the absence of specifics in the *Impact Assessment Act* concerning strategic assessment processes and products, the government's decisions about this assessment's mandate, basic process characteristics, expected analyses and report contents will establish the initial standard and path for other strategic assessments.[553]

4.7.2 Determining what climate-significant policies, plans, programs and regional strategic initiatives should be subject to legislated strategic assessment

Beyond the fundamental strategic need for clarification of the implications of Canada's climate commitments for project level assessments, many strategic undertakings merit law-based strategic assessment for climate-related reasons. Development of an infrastructure funding program and associated policies for implementation, for example, would benefit from assessment under the *Impact Assessment Act*. So would hydrocarbon industry subsidy programs and agricultural support arrangements that facilitate activities that deplete soil organic matter.

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ones. The strategic assessment on meeting climate commitments would presumably adopt a similar scope, covering Canada's international as well as domestic commitments.

[553] See also section 4.12.1, below.

As with projects, however, application of assessment requirements would not be needed on climate grounds for policies, plans and programs with minimally consequential implications for meeting Canada's climate change commitments. Therefore, provisions will be needed to identify what strategic undertakings are to be subject to legislated assessment requirements.

The general approach to applying legislated assessment requirements to strategic undertakings could follow the one for application to projects. That approach involves establishment by regulation of a list that identifies and delineates categories of undertakings to which assessment requirements apply and supplements the list with a process for designating particular undertakings that are not on the list but merit assessment.

For climate-significant strategic-level undertakings. automatic application of assessment requirements could be established on the basis of the following recommendations:

- A regulation-based Strategic Undertakings List should be established to set out categories of policies, plans and programs to which law-based assessment requirements apply, including categories of strategic undertakings that individually or cumulatively[554] could have a substantial effect on prospects for meeting Canada's climate change mitigation commitments. Those categories would include all strategic undertakings that
  - could facilitate GHG emissions or sink impairments at levels or over periods incompatible with meeting one or more of the climate tests in Box 8, above;
  - could otherwise make meeting Canada's climate change mitigation commitments more difficult; or
  - could fail to identify and adopt the most positive feasible means of reducing GHG emissions or sink impairments.
- Identification and definition of climate-relevant categories of strategic undertakings to include in the list should take into account multiple factors similar to those set out above for the climate-related categories in the Project List, except that greater emphasis would need to be placed on the potential for indirect effects on GHG emissions and sink impairments through support for or other facilitation or maintenance of activities that could
  - contribute to GHG emissions and/or sink impairments or to entrench lifetime attributable emissions and/or sink impairments in Canada over a certain threshold;
  - contribute to GHG emissions and/or sink impairments beyond the established or reasonably anticipated deadline for GHG neutrality in Canada overall and in the relevant sector;

[554] Projects that would have modest individual implications for meeting climate commitment, but contribute to cumulative problems, would be more effectively and efficiently addressed through strategic level assessments, if they were undertaken. In the absence of strategic level assessments, use of the project level option may be necessary.

    - contribute to cumulatively significant GHG emissions or sink impairments at a level that would make meeting specific mitigation commitments (e.g., for a sector or region) more difficult to meet;
    - contribute to further entrenching or extending fossil dependency or activities that impair GHG sinks;
    - play important roles in a sector that is understood to require significant transformation to ensure climate mitigation commitments are met;
    - be inconsistent with steps required to stay on a recognized or reasonably anticipated pathway to meeting Canada's climate mitigation commitments, remain within a defensible Canadian carbon or other GHG budget, or demonstrate viability if the social cost of the emissions and sink impairments, or costs of transition to GHG neutrality were fully charged; and
    - be unable to meet any other requirement entailed by the climate change mitigation tests set out in Box 8, above.

  Any one of these would qualify as sufficient grounds for requiring assessment of the strategic undertaking.
- Where possible, the delineation of strategic undertaking categories for assessment would use identifying characteristics that should be evident at the outset of development of the strategic undertaking so that the need to meet assessment obligations is known and respected from the earliest stages of deliberations about potential strategic undertakings.
- The process for developing the Strategic Undertaking List would be transparent and provide for meaningful public participation.
- Development of the climate-relevant list categories would be led by the government agency most expert in and responsible for meeting Canada's climate change mitigation commitments, though the ultimate decisions on assessment of strategic undertaking will lie with the Governor-in-Council.
- As with development of the Projects List, development of the Strategic Undertakings List should involve collaboration with other Canadian jurisdictions with overlapping responsibilities.

As with projects, there will be climate-important policies, plans and programs not anticipated or for other reasons not included in the initial version of the Strategic Undertakings List. In addition, there will be policy, plan and program gaps – subjects of importance that are in evident need of credible policy clarification, forward planning, or suitable program response. Some of these gaps – such as the need for policy direction on the implications of climate change commitments for project assessments – may be recognized and addressed by the government. In other cases, however, gaps may be first identified in project assessments or other processes, or recognized most clearly by other jurisdictions, non-government bodies or individuals. For both unanticipated strategic undertakings and undertakings needed to fill strategic gaps, provisions for case-by-case designation are needed.

Designation of individual strategic issues and undertakings for assessment under the *Impact Assessment Act* is included with minimal elaboration in section 95 of the Act as proposed. The approach emphasizes Ministerial authority and also provides for public requests for designations [s.97]. It may be possible to establish more robust specifics by regulation, setting out more clearly the criteria and process for designation decision making.

- The regulations should establish specifics for the process for designation of individual strategic undertakings and for adding new categories to the Strategic Undertakings List to cover individual cases and categories that were not anticipated in the List or that are needed to address identified strategic gaps.
- The processes for designation of individual strategic undertakings and adding new categories to the Strategic Undertakings List should
  - be transparent and provide for meaningful public participation;
  - be open to proposals for a designation of an individual strategic undertaking or a new category in the Strategic Undertakings List from authorities, interests and individuals outside the government;
  - apply explicit criteria centred on the potential of the undertaking, to make meeting Canada's climate change mitigation commitments more difficult; and
  - require public reasons for decisions based on the criteria.
- The process for adding new categories to the Strategic Undertakings List should be supported by a requirement for review and potential amendment, at least of the climate-related contents of the list, every three years.
- For the designation of strategic undertakings needed to address perceived policy, plan or program gaps, the law would need to establish responsibility for
  - determining what bodies are to be assigned to propose the needed strategic undertaking;
  - ensuring that those bodies are adequately resourced for the task; and
  - making and providing public rationales for decisions on the designation requests.
- The law should also identify any special criteria for designating new strategic undertakings to address gaps.

4.7.3 Establishing a rigorous and credible process for strategic assessments, including those addressing climate-significant policies, plans, programs, regional strategic initiatives and issues arising from strategic gaps

A rigorous and credible process is needed for all strategic assessments. Few process details are set out in the statute as proposed. Needed specifics may be possible to establish by regulation. The priorities are to strategic level process features to ensure that every assessment of strategic level undertakings

- is open and transparent;
- encourages and supports meaningful participation;

- applies explicit sustainability-based criteria, including those based on the core climate change mitigation criterion in section 63, to deliver positive contributions to meeting Canada's climate change mitigation commitments and to block strategic undertakings that would hinder meeting these commitments;,
- compares a suitable range of reasonable alternatives; and
- is otherwise likely to be rigorous and worthy of public credibility.

4.8 Climate-related information and standards

In the *Impact Assessment Act*, the core decision considerations set out in section 63 (see Box 9, above) are support by a longer list of factors to be considered in all assessments, which is set out in section 22(1). The considerations cover environmental, health, social and economic conditions and changes, and represent broad categories of factors (purposes and needs, alternatives, rights, cumulative and other effects, diverse kinds of knowledge, and comments from key sources, etc.). Due attention to all of these matters entails information gathering. In most cases, analyses of some sort are also involved.

For clarity of expectations and consistency of practice, regulatory guidance and policy guidance will be needed. Detailed elaborations of expectations and approaches will be especially crucial for information and analyses concerning the climate change considerations, because they are new to federal assessments.

4.8.1 Needs for information and standards in project and strategic assessments

Once it is clear that a climate-important project- or strategic-level undertaking is subject to legislated assessment requirements, two further sets of overlapping questions arise. Both concern assessment expectations. The first is about what information about the proposed undertaking and alternatives and their predicted effects must be provided in the key documents at successive stages in assessments. The second is about what standard rules or guidance (e.g., concerning concept definitions and methods) are to underlie the information gathering and assessment analyses, the resulting decisions on approval or rejection and throughout follow-up.

For project assessments the main steps involving information and associated standards are represented by

- the initial project notices prepared by the proponent (s.15(1));
- the case-specific guidance documents provided by the Agency to the proponent (s.18(1)(b)), especially
    - the guidelines for information or studies (which are called the "impact statement" in consultation documents);[555]

[555] The *Impact Assessment Act* does not establish a requirement for the proponent to submit an Impact Statement. Nor does the Act mention impact statement guidelines. However, the terms are used in consultation documents and the requirement appears to be assumed. See also Government of Canada, *Consultation Paper on Information Requirements and Time Management Regulations*, 19 April 2018, p. 5

    - plans for "cooperation with other jurisdictions," "engagement and partnership with the Indigenous peoples of Canada," and "public participation"; and
    - permitting plans.
- the impact information and studies (or impact statement) submitted by the proponent;[556]
- the impact assessment report prepared by the Agency (s.25-28) or a review panel (s.51) for decision makers;[557]
- the decision statement with detailed reasons provided by the Minister (s.65(1) and(2)); and
- the reports produced by any follow-up program (s.64(4), 105(2)(e) and 105(3)(e)).

For strategic and regional assessments, the Act does not set out established process steps. These remain to be established through regulations and/or gradual consolidation of case-by-case practice, but steps very roughly similar to those for project assessments may be anticipated.

Given the sustainability-based approach to assessments under the *Impact Assessment Act*, the factors to be considered and the needed guidance for information provision must also address the potential for contributions to (and adverse effects on) sustainability, including potential for hindering or contributing to meeting climate change mitigation commitments.

To provide a base for assessing a project's or strategic undertaking's potential for hindering or contributing to meeting climate commitments the following discussion begins with information requirements and then considers specific concerns related to standards and approaches to analysis.

4.8.2 Core requirements for information

The essential information requirements for assessments are established at least implicitly by the aims of the legislation, the list of mandatory factors for consideration in assessments, and the factors or criteria to be applied in decision making. In the new *Impact Assessment Act,* as proposed, Section 63 sets out the five decision making factors on which assessment decision making must be based: – contribution to sustainability, adverse effects in federal jurisdiction, mitigation measures, impact on Indigenous groups and rights, and effects on meeting Canada's climate commitments (see Box 9, above). The longer list of mandatory considerations in assessments in section 22(1) covers more

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< https://www.canada.ca/en/services/environment/conservation/assessments/environmental-reviews/environmental-assessment-processes/consultation-paper.html>.

[556] Government of Canada, *Consultation Paper on Information Requirements and Time Management Regulations*, 19 April 2018, p. 5

[557] The Act presents the Agency or review panel's work as the "impact assessment" (not the review of the proponent's assessment. The proponent's submissions are "information" and "studies" (e.g., s.18(1)).

specific matters that merit attention, especially because they affect understanding and judgements on the five core decision making factors.

The requirements for consideration, and consequently information, established in section 22(1) include the climate-centred consideration on whether the project's effects would hinder or contribute to meeting Canada's climate commitments [s.22(1)(i)]. The other factors provide further supporting grounds for attention to effects, information sources and analyses that are likely to be important in determining a project's implications for meeting climate commitments.

Each factor for consideration entails needs for information and analyses. The factors are presented concisely and leave needs for clarifying definition and elaboration of suitable methods for analysis. For consistency of interpretation and applications, many of factors for consideration will have to be elaborated in regulations and policy directives.

Taken together, the list of factors to be considered in assessments, plus elaborations in regulatory and policy guidance should support information gathering and analysis needed to determine a project's implications for meeting Canada's climate commitments and to follow-up decisions based on these determinations of climate implications.

That information gathering and analysis would need to serve the following climate-related assessment elements:

- description of the characteristics of the proposed undertaking and its reasonable alternatives, including characteristics that may affect GHG emissions and sinks and consequently may affect prospects for meeting Canada's climate change mitigation commitments;
- development and application of case-specified sustainability-based criteria and trade-off rules (clarifying how the core criteria are to be elaborated in light of the undertaking and alternatives and their context), including specified criteria and trade-off rules related to meeting Canada's climate change mitigation commitments;
- the potential and predicted effects of the proposed undertaking and its reasonable alternatives, including all of the usual general categories of sustainability-related effects (positive and adverse, individual and cumulative, direct and indirect, short and long term, simple and interactive, more or less certain or uncertain, etc.) and their significance (magnitude, extent, timing, duration, intensity, distribution, reversibility, etc.) plus effects on potential consistency with meeting Canada's climate change mitigation commitments, and more particularly
    - the potential and predicted effects of the proposed undertaking and its reasonable alternatives on GHG emissions and GHG sinks (including effects that are direct and indirect, cumulative, over the undertaking's entire lifecycle and lifetime and over relevant parts of the lifecycle and lifetime, domestic and beyond Canada); and

    - proposed measures to mitigate potential adverse effects and to enhance potential beneficial effects, including on GHG emissions and GHG sinks and prospects for consistency with efforts to meet Canada's climate change mitigation commitments;
- comparative evaluation of alternatives, through application of sustainability-based criteria, including the criterion on consistency with meeting Canada's climate change mitigation commitments, as the means of and justification for selecting the proposed undertaking;
- determination of overall contributions to sustainability, including consideration of consistency with efforts to meet Canada's climate change mitigation commitments;
- determination of whether any climate-related and other trade-offs would be entailed;
- determination of how the climate-related and other effects and trade-offs of the proposed undertaking compare with those of the alternatives; and
- follow-up monitoring needs and plans, including components addressing the accuracy of predictions concerning GHG emission and sink effects and consistency with meeting Canada's climate change mitigation commitments.

Not all of these assessment components are set out explicitly in the *Impact Assessment Act,* as proposed. Most importantly, comparative evaluation of alternatives is implied by the requirements to consider alternatives to the project and alternative means of carrying it out, but not mentioned directly in the Act. Also, the Act includes no direct reference to identification and justification of trade-offs, which are implied by the requirement to consider contributions to sustainability. On these matters and the others, the core requirements for consideration set out in the statute will need to be elaborated in regulations and policy directives.

4.8.3 Specifics on definitions, standards and methods of analysis

The *Impact Assessment Act*, as proposed, needs clarification and elaboration in many areas. As noted above, this is usually the case with legislation that addresses highly complex issue areas and is therefore designed largely to enable development and application of needed responses. Some of the needs for elaboration involve matters that affect all assessment cases, not just ones with climate commitment consequences. Clarification of how to carry out comparative evaluation of alternatives in light of sustainability-based criteria, and how to specify and apply trade-off rules, for example, is needed for all assessment applications.

The following discussion focuses on needs for elaboration of how to address key climate-specific assessment needs.

i) Determination of what GHG emissions, sink losses and offsets are to be reported and counted in assessments.

To clarify what GHG emission and sink effects are to be considered, through regulatory specification and additional policy guidance is needed for the following:

- approaches to identifying potential individual and cumulative effects of the undertaking and its alternatives on GHG emissions and sinks, including particular and cumulative, direct and indirect, annual and lifetime effects;[558]
- means, including criteria, for determining what GHG emissions and carbon sink impairments are properly attributed to a proposed project or strategic undertaking and its alternatives,[559] including attention to how emissions and sink impairments beyond Canada should be considered; and more specific guidance for determining what indirect GHG effects, domestic and non-domestic) are properly attributable to particular kinds of undertakings (e.g., pipelines and other hydrocarbon transportation projects with export markets, highways, hydropower dams, shipping terminals, mines) over their lifetime and after closure;
- means, including criteria, for determining what qualifies as a positive effect on anthropogenic GHG sink enhancement that may be taken into account in assessments (e.g., guidance on determining the likely performance and permanency of proposed enhancements); and
- means, including criteria, for determining what, if any, offsets for domestic GHG emissions or GHG sink degradation may be taken into account in assessments (e.g., guidance on determining the likely performance and permanency of proposed offsets).

ii) How to assess the implications of predicted GHG emissions, sink losses and offsets for meeting Canada's climate change mitigation commitments.

In the new *Impact Assessment Act*, the basic climate test for each proposed undertaking is that it must be consistent with (contribute to and avoid hindering) meeting Canada's international climate change mitigation commitments. That clearly involves contributing to the timely transition to GHG neutrality that is entailed by these commitments. However, more specific tests are clearly needed. Box 8 identifies a set of tests that would provide complementary means of applying the core test using available tools (that need further development and specification for Canadian application), and on existing Canadian policy guidance (that need to be adjusted to reflect our current and anticipated international commitments).

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[558] Here and elsewhere, a proposed requirement for climate change mitigation purposes may also merit broad application in support of many other purposes. For example, the range of potential effects listed here should probably be generally required in the statute for all applications.

[559] The regulation making should recognize that the specified requirements may appropriately differ for different categories of undertaking (e.g., rules for attribution of indirect GHG emissions and sink effects for metal mining could be different from those for hydrocarbon extraction and transportation undertakings).

The implications may now be considered directly in light of Canada's *Paris Agreement* and other international climate commitments as further informed by existing domestic commitments with adjustments to address the gap between Canada's current Nationally Determined Contribution and the more demanding commitments of the *Paris Agreement.* Further near-term specification of complementary tests could be assigned to the strategic assessment on climate change commitment implications discussed above. As that happens, and as other credible processes are used to expand the available official guidance for applying climate tests in the assessment of particular undertakings, the results can be incorporated in regulations under the statute.

- The regulations under the Act should elaborate on the core statutory tests that require undertakings to contribute to and avoid hindering steps to meet Canada's climate change mitigation commitments. The tests to be described, and supported by guidance on specific requirements and application methods, should include ones set out in Box 8.
- The regulatory clarification of these tests should anticipate needs for more specific guidance, for example to illuminate
  - how to determine whether and how well proposed undertakings (and alternative options) will contribute to timely progress along the identified pathways and to respect for GHG budget limitations through their lifetimes;
  - how to incorporate calculation of the costs of mitigation and/or damages associated with GHG emissions (and carbon sink losses) in evaluations of overall project costs and associated project viability (e.g., using the social cost of GHGs used in Canada and the US or the shadow price or marginal abatement cost used in UK and Europe);
  - how to calculate global, national and local costs (e.g., costs associated with future stranded assets, further entrenchment of GHG-emitting sectors, structures and practices) in cost and risk calculations; and
  - how to estimate future costs and gains?
- The regulatory clarification of the tests should also anticipate needs for guidance on
  - how to recognize and address uncertainties (e.g., about likely future changes in international climate change mitigation commitments) reporting of climate-related factors and application of climate-related criteria; and
  - how to address the conflicting implications of different climate change mitigation commitments (e.g., the overall Canadian commitment in the *Paris Agreement*, the weaker commitment in Canada's Nationally Determined Contribution (NDC)[560], the incomplete response to the NDC commitment in the *Pan-Canadian Framework* and its implementation so far).[561]

[560] The current NDC dates from the period when a global maximum of 2ºC warming was the target.
[561] *Pan-Canadian Framework* (2016).

- In light of the number of test approaches, the benefits of complementary applications, and the probably uneven pace of their elaboration, the likelihood that some may serve more effectively in applications in some cases than others, the statute should include provisions for use of multiple approaches to assessing the GHG-related aspects of proposed undertakings.

As noted in the general discussion of information needs, interim approaches will be required for application in near term cases. In the matter of climate effects evaluation, the tests listed above in Box 8 are available in the absence of formally accepted national policies and detailed regulations. For interim application, they can be elaborated modestly in basic initial working policy guidance and applied, individually or collectively, for pilot use in determining the implications of emission and sink effects on meeting Canada's climate change mitigation commitments. In the absence of more fully established protocols for using these approaches, debating and testing versions of them in individual assessments could contribute to greater understanding as well as serve as workable means of informing the necessary judgements about the climate commitment effects of assessed undertakings.

Reliance on case-by-case application and clarification of these tests, however, raises many difficulties. For equity as well as effectiveness, the tests should be designed and used in applications to all activities and undertakings that affect prospects for meeting Canada's climate change mitigation commitments. In addition to assessment cases, they should apply to existing activities and undertakings and ones otherwise not subject to legislated assessment requirements.

Case-by-case specification and application of these tests can continue to guide individual assessments and to enrich the base of learning while the overall climate tests are elaborated and associated policy of broad application is developed. However, timely attention to the strategic level attention to establishing consistent and defensible guidance for all cases and for major sectors and regions of activity should ensure substantial gains in effectiveness, efficiency and fairness by clarifying expectations, improving the consistency of interpretations and decisions, and reducing burdens at the project assessment level.

iii) Climate-related aspects of the suite of difficult issue areas that are commonly confronted in assessments, including broad alternatives, major cumulative effects and important policy concerns.[562]

To address needs for clarification of how alternatives are to be identified and properly considered in cases involving implications for climate commitments, regulatory requirements and supporting policies should be developed to guide identification and comparative assessment of the range of reasonable alternatives to be considered in

[562] For project-level assessments, the needed guidance on key alternatives, cumulative effects and large policy issues may come from strategic and regional assessments. Some such strategic and regional assessments could involve multiple proponents and collaboration among multiple jurisdictions.

individual cases with implications for meeting climate commitments,[563] with particular attention to means, including criteria and processes, to be used to determine

- what alternatives are within the capacity and authority of the proponent;
- what broader alternatives lie beyond the capacity and authority of the proponent but merit attention in the assessment; and
- what government bodies are to address these broader alternatives, what credible process is to be used, and how the results are to be incorporated in the assessment.

To address needs for clarification of how broad cumulative effects are to be identified and properly considered in cases involving implications for climate commitments, regulations and policies are needed to guide identification and comparative assessment of the range of climate-related cumulative effects to be considered in individual cases, with particular attention to guidance on the criteria and processes to be used to determine

- what potential cumulative effects are within the capacity and authority of the proponent;
- what potential cumulative effects lie beyond the capacity and authority of the proponent but merit attention in the assessment; and
- what government bodies are to address these broader cumulative effects and suitable responses to them, what credible process is to be used, and how the results are to be incorporated in the assessment.

To address needs for clarification of how large policy issues are to be identified and properly considered in cases involving implications for climate commitments, regulations and policies are needed to guide identification and comparative assessment of any big policy issues that arise in individual cases, with particular attention to guidance on the criteria and processes to be used to determine

- what big policy issues merit attention in the assessment; and
- what government bodies are to address these big policy issues and suitable responses to them, what credible process is to be used, and how the results are to be incorporated in the assessment.

To address needs for clarification of what, if any, offsets for GHG emissions or GHG sink degradation may be taken into account in assessments, regulations and policies are

[563] Guidance on the broad options for reasonable alternatives will have to recognize that relevant alternatives for project assessments will be different from alternatives for assessments of strategic undertakings – and alternatives for the various categories of projects and various types of strategic undertakings (strategic policies, programs, sectoral and regional plans) will differ.

needed to establish the criteria (e.g., permanency) and other guidance for evaluating the potential legitimacy of proposed offsets.

To address needs for careful attention to potential trade-offs in cases involving implications for climate commitments, regulations and policies are needed to guide the identification and consideration of climate-related trade-offs in assessments submitted by proponents, in assessment reviews and in decision making as elaborated above.

iv) Other needs for guidance for key aspects of assessment deliberations and decision making that are likely to affect climate-related considerations.

For application in decision making in all aspects of the application and review of the legislation, regulations and policies are needed on how Indigenous rights, including Aboriginal and treaty rights (and the associated duty to consult and accommodate), and rights under the UN Declaration on the Rights of Indigenous Peoples to free, prior and informed consent, are to be incorporated, including in climate-significant assessment decision making.

Also for decision making in the common cases of potential for effects in and overlapping responsibility with, other Canadian jurisdictions (especially provincial, Indigenous, and territorial jurisdictions), regulations and policies are needed on sharing information, seeking collaborative involvement and other such matters.

To address needs for guidance in decision making about applications of assessment requirements to categories of undertakings and designation of individual undertakings, regulations and policies are needed to

- specify criteria for defining, assessing and including categories of climate-important undertakings in the Project List and Strategic Undertakings List; and
- set out information requirements for proposed designations of individual undertakings for inclusion in the Project List or Strategic Undertakings List.

For consistency in climate-related criteria development in individual cases, regulations and policies are needed to guide the integration of climate change mitigation criteria into case-specified criteria for comparative evaluation of effects, alternatives, and trade-offs.

To address needs for clarity on how uncertainties should be considered in assessments and follow-up monitoring of individual undertakings, regulations and policies are needed on key categories of uncertainty related to climate change mitigation issues, including guidance about appropriate approaches to technological uncertainties (e.g., where there is reliance on potentially emerging or fading technological options), and guidance on how to establish capacity to adapt to changes in overall mitigation requirements (e.g., in light of potential tightening of overall global GHG abatement

deadlines and consequential adjustments to Canada's national responsibilities and changes within Canada on matters such as the allocation of carbon and other GHG budgets).

To address more general needs to improve the information base for assessments, regulations and policies are needed to

- guide how uncertainties are to be considered in assessments, including follow-up monitoring, of individual undertakings (e.g., where there is reliance on potentially emerging or fading technological options) and in the overall guidance (e.g., in light of potential tightening of overall global GHG abatement deadlines, and adjustments to Canada's national fair share, etc.);
- guide identification of assessment components (including on climate-related matters, such as climate-related models) that should be subject to peer review; and
- ensure long-term, open public access to assessment predictions and monitoring findings (including on climate related matters, such as effects on GHG sinks.

For post-decision implementation, monitoring and follow-up, regulations and policies are needed to

- clarify means and responsibilities for setting and enforcing terms and conditions of approval to ensure approved activities comply with terms and conditions, including those related to meeting climate change mitigation commitments (e.g., providing specifics on requirements for surety bonds for cover the possible costs of providing additional offsets if the undertaking fails to deliver the promised positive GHG reduction effects);
- clarify through regulations and policy guidance mechanisms for adjustments to the conditions of approval for undertakings [for projects under s.68-69] for cases where climate-related effects predictions turn out to be wrong, where mitigation efforts do not work as predicted, where climate change mitigation commitments are tightened, and/or where new technological options or other opportunities arise to adjust the activity to minimize negative or maximize positive contributions; and
- provide regulations and policy guidance to assign responsibilities and establish and specify protocols for monitoring and reporting GHG emissions, sink damages and enhancements, and other climate-related effects of individual undertakings.

4.9 Multi-generational interests and learning

Climate change mitigation is a long-term objective that requires broadly informed intergenerational vision and commitment. The same is true for the broader objective of progress towards sustainability. Both demand significant, though gradual multi-generational transitions. While the transitional steps offer great opportunities as well as inevitable challenges, they are not easy.

Serious attention to the long-term transition needs is not common in conventional decision making practices. Even assessment processes, which centre on the anticipation of future effects, have a disappointing record on inter-generational matters. Two major problems are involved. The first is that future generations are not present now to defend their own interests, including their interests in avoiding disastrous global climate change. The second is that multi-generational transitions for climate and sustainability purposes are highly complex, and considerable effort is required to understand why they are needed and how they can be achieved.

Because the core decision factors of the new assessment law include sustainability and climate change, the regulatory and other tools guiding application of the Act should pay special attention to

- strengthening and supporting intergenerational equity, and
- facilitating use of assessment processes to foster learning, including learning about climate change mitigation needs and opportunities.

Both objectives require attention in the elaboration of criteria for evaluations and decisions. They should also affect processes – the design and application of deliberative practices for assessments and decision making on individual climate-significant undertakings and on other major assessment matters (e.g., decisions on process application and on development of regulations and policies).

4.9.1 Key measures to respect the interests of future generations and enhance associated learning in assessments

Several measures to respect the interests of future generations and to foster and facilitate learning, including about climate change mitigation needs of options, have already been discussed in the earlier sections. The points below consolidate and add to these.

To recognize and protect the interests of future generations that are not present to defend their own interests, including their interests in avoiding disastrous global climate change, the elaboration of provisions in the Act through regulations and policy guidance should

- emphasize that the Act's provisions that establish contribution to sustainability as a core requirement, entail a focus on contributions to *lasting* wellbeing and

obligations to identify and assess long term effects, including intergenerational effects and the legacy effects of limited-life undertakings;
- ensure that the more specific criteria established by regulation to clarify the requirement to consider "contribution to sustainability" [s.63(a)] include a criterion for enhancement of intergenerational equity;
- ensure that more specific criteria established by regulation to clarify the requirement to consider the undertaking's potential to hinder or contribute to meeting Canada's climate commitments [s.63(e)], include criteria centred on the respect for the interests future generations (intergenerational equity); and
- ensure that the trade-off rules set elaborated in regulations include a rule prohibiting displacement of any significant adverse effects to the future unless all other options are worse for future generations.

Measures to enhance learning, including about climate change issues and options, begin with the basic imperatives for credible service to the public interest. For process credibility the assessment law and its application must deliver openness, meaningful public participation, independent critical review, impartial administration, accountable decision making for the development and review of applications, regulations and policies (including for criteria and standards) as well as in individual case deliberations and decisions.

In addition to overall process design and implementation for process credibility, regulations and associated policy guidance should incorporate particular measures foster learning about multigenerational climate change mitigation needs and opportunities. Major requirements include the following:

- ensure that the more specific criteria established by regulation and associated policy guidance to clarify how to consider "contribution to sustainability" (s.63(a)) incorporate;
  - a criterion emphasizing learning, including intergenerational learning;
  - a criterion for enhancement of awareness and understanding of sustainability-related issues and options, including over the long term;
  - a criterion for enhancement of intergenerational equity;
- ensure that more specific criteria established by regulation to clarify the core climate change requirement (s.63(e)), include a criterion centred on contributions to broad learning as a necessity for meeting Canada's climate commitments;
- design criteria and process requirements to emphasize meaningful public participation, including in the elaboration and open use of the climate commitments compliance tests set out in Box 8 above (e.g., in development of pathways to decarbonisation, establishment of national and more specific carbon budgets, applying carbon pricing and the social cost of carbon in the evaluation of undertakings);
- encourage participative construction and comparison of long-term climate and sustainability scenarios;
- ensure independent critical evaluations of contentions climate analyses; and

- make regular use of strategic assessments to address big climate and other sustainability issues in credible public processes.

4.10 Interjurisdictional collaboration

The *Impact Assessment Act* emphasizes collaboration between the federal government and other jurisdictions. For climate change purposes, the collaboration should be built jointly on acceptance of federal responsibility to lead action to meet the country's international climate change commitments, and active encouragement and facilitation of interjurisdictional collaboration in meeting those responsibilities.

4.10.1 Interjurisdictional collaboration needs and challenges

Canadian success in meeting its international commitments in climate change mitigation will depend heavily on efforts by all Canadian jurisdictions – provincial, Indigenous, territorial, municipal, as well as the federal government. To the extent possible, the approaches taken should be collaborative. This imperative arises in part from the overlapping assignment of powers and rights, especially among federal, provincial and Indigenous authorities, in the Canadian Constitution. But collaborative approaches are also important for practical reasons of political feasibility, long term effectiveness and efficiency, fairness and consistency with expectations for good practice, including in assessment processes.

These matters of interjurisdictional engagement and collaboration are to be faced broadly in all activities related to meeting the nation's international commitments on climate change mitigation. Certainly, they apply to all of the steps addressed in this paper. The key questions are as follows:

- What relations between and among federal and provincial, territorial, Indigenous and municipal authorities, and their assessment laws and processes on climate matters, would best enhance prospects for positive contributions from assessment law in meeting the *Paris Agreement* commitments (and likely stronger ones to follow)?
- How can these relations be fostered and facilitated most effectively in provisions in the assessment statute, regulations and other related initiatives?
- How should federal assessment legislation recognize both the central federal responsibility for meeting climate change mitigation commitments, and the need to engage with provincial, Indigenous and territorial jurisdictions that have complementary authority (e.g., in resource extraction and land use matters contributing to and affected by climate change)?

4.10.2 Means of enhancing prospects for interjurisdictional collaboration, especially in climate-significant cases

As proposed, the *Impact Assessment Act* recognizes the importance of cooperation with other jurisdictions, including Indigenous ones (especially s.6(1)(e) and (f)). It also establishes requirements to offer to consult and cooperate with other jurisdictions in both project and regional assessments (s.21 and 94) and empowers the Minister of Environment and Climate Change to enter into assessment agreements with other jurisdictions (s.114). Elaboration of how these cooperative arrangements are to be define and delimited is left to regulations, policy guidance and case-by case practice.

Building interjurisdictional collaboration on climate change mitigation matters cannot be accomplished through assessment law alone. It needs to be part of a larger agenda and suite of gradually built understandings, relationships, processes, shared commitments, conventions, etc. Assessment law must, however, provide openings, structures and other means of facilitating collaborative actions. On that basis of the provisions already incorporated in the proposed Act, regulatory and policy guidance should be able to enhance prospects for effective cooperation. The following points set out some initial priorities.

Regulatory and policy guidance for application of the Act's commitments to cooperation and to meeting Canada's climate commitments should be built jointly on

- acceptance of federal responsibility to lead action to meet the country's international climate change commitments (e.g., by using potential effects on meeting those commitments as a criterion for applying federal assessment obligations to anticipated undertakings); and
- active encouragement and facilitation of interjurisdictional collaboration in meeting those responsibilities.

To encourage interjurisdictional collaboration on climate change mitigation matters, regulatory and policy guidance under the Act should

- anticipate and encourage interjurisdictional collaboration in joint initiation of climate-related regional strategic undertakings (e.g., preparation of regional climate change mitigation plans that would contribute to meeting the international commitments), in joint assessments of these undertakings, and in joint monitoring of approved undertakings and response to the monitoring findings;
- provide similarly for interjurisdictional collaboration in the initiation of climate relevant undertakings at the project level, also including assessment review, implementation, monitoring and response to findings;
- clarify the potential forms and uses of core mechanisms for joint engagement in designating, assessing and monitoring climate-relative projects, including those proposed private sector proponents where federal, provincial, Indigenous and/or territorial authority applies; and

- elaborate more specifically the provisions for government-to-government collaboration between federal and Indigenous authorities, in decision making on climate-related matters (e.g., on application of assessment requirements to climate-important projects and strategic-level undertakings, and the assessment of such undertakings), recognizing that climate-change mitigation successes and failures will affect Indigenous rights, including treaty rights, and interests and require the free, prior and informed consent of Indigenous groups and authorities.

4.11 Roles for the statute, regulations and policy guidance

The discussions above on meeting Canada's climate commitments through assessments under the new *Impact Assessment Act* have focused on needed specifics. The Act itself could and may be amended further before it is passed to flesh out some of its bare bones contents. The bulk of the concerns raised above, however, will be left to regulations and policies.

Of the two, enforceable regulatory direction is the stronger tool. While policies are valuable for supporting details and interim measures, their application at least in assessment matters has been unreliable and largely ineffective unless carefully anchored in statute and regulations. Both, however, will be crucial in meeting the climate commitments in the *Impact Assessment Act*.

For climate change mitigation purposes, relying on elaboration in regulations and policies is appropriate. The Act provides a reasonably strong basic foundation. The requirement in sections 22 and 63 to consider "extent to which the effects of the designated project hinder or contribute to the Government of Canada's ability to meet its environmental obligations and its commitments in respect of climate change" is clear and suitably demanding. It recognizes that global nature of climate change effects entails that climate effects must be examined in reference to meeting the commitments needed to avoid intolerably severe consequences. It incorporates attention not only to contributing to meeting those commitments but also to the less obvious imperative to avoid hindering necessary progress. Also, since the climate-centred decision criterion is one of five that must be addressed in reasons for Ministerial and Cabinet decisions, there is some basis for confidence that the climate considerations will be taken seriously.

The Act could have provided more detail on how the foundational climate requirement should be interpreted and addressed. The advantage would have been that inclusion in a statute provides greater certainty of authority and continuity. While requirements in regulations are enforceable, they can also be changed more easily than statutes. In the case of climate-related requirements in assessments, however, ease of adjustment is likely to be important.

At best, Canada has a weak existing base of guidance for and experience in addressing climate change mitigation commitments seriously in assessment practice. The gap

between the *Paris Agreement* and assessments of particular undertakings has been largely neglected in assessment practice and our best efforts in this report have only begun the needed deliberations. Specific climate assessment rules and guidance will need flexibility to accommodate learning from continuing advancements in climate science and from the results of experience in applying the new climate provisions in this legislation. As noted above, the rules and guidance will also have to be adjusted to deal with increasing ambitions in future national commitments under the *Paris Agreement*. In that context, it is sensible to rely heavily on regulations to specify the core climate requirements in the Act.

Non-enforceable policy guidance is even more flexible than regulation, but provides guidance only. Application depends on the varying commitments and capacities of the responsible authorities and Canadian experience with policy guidance in assessment applications has been dominated by examples of selective compliance and general disregard.[564] Policy guidance can, nevertheless, be useful for interim purposes, for setting out viable options, for pilot testing of new approaches, and for providing detailed specifics concerning matters addressed clearly but broadly in regulation.

4.11.1 Use of regulations and policies to clarify and elaborate climate assessment matters under the *Impact Assessment Act*

To clarify and elaborate the implications and means of addressing the Act's core climate assessment requirements:

- regulations should be used as the primary vehicle for establishing the specifics of expectations, approaches, processes and methodologies needed for consistency of assessment practice, adequacy of analytical rigour and sufficiency of information for decision making purposes;
- policy-based guidance can play a valuable supplemental role in providing detailed specifics concerning matters addressed clearly but broadly in regulation, including setting out suitable methodological options;
- policy-based guidance may also be appropriate for interim purposes, providing needed information for practice and building a base of experience while more carefully considered regulations are being developed;
- both regulation making and policy development must be undertaken in transparent processes with meaningful public participation; and
- the regulations and policy directives under the Act should be subject to mandatory review no later than four years from the date of publication and with similar frequency thereafter.

[564] Weak commitment to policy application typified experience under the policy-based federal processes that served from the early 1970s to 1995, and continues to characterize experience with the federal strategic assessment process established under a Cabinet Directive in 1990.

4.12 Developing climate-related regulations and policy guidance

4.12.1 The process for developing climate-related regulations

Perhaps even more than other regulations that are needed for the *Impact Assessment Act*, those for climate change will be complex, demanding and controversial as well as crucial. Moreover, as noted above, climate-related assessment regulations would need to be elaborated in considerable detail for informed and consistent application. A credible process for the development of these regulations – with meaningful public participation and rigorous and independent assessment – is therefore required.

Development and application of needed climate guidance for assessments would need to be based on credibly developed overall analyses of what is needed to cover the gap between the Paris commitments and Canadian obligations addressed in the earlier parts of this report, and then clarify implications for assessment of particular undertakings.

That would be a suitable mandate for the strategic assessment on climate and assessment matters that the federal government has promised and for which it is now preparing an initial consultation paper. Such a climate strategic assessment could be initiated before the new legislation comes into effect. If done with suitable participation, rigour and independence, it could provide credible recommendations for regulations and policies that establish a reasonably comprehensive set of climate-related assessment requirements and policies. It could also serve as a model for future strategic assessments.

Unfortunately, the results of such a strategic assessment, or any equivalent credible process, are not likely to be available soon. The issues explored above are numerous and complex, and the implications will be variously uncomfortable for many interests. Difficult analyses and delicate deliberations are unavoidable and credible conclusions will take time.

In the interim, we can expect new proposals for designated projects and new strategic undertakings that will have consequences for meeting Canada's climate commitments and merit assessment under the *Impact Assessment Act*. Given needs for immediate best efforts to reduce GHG emissions and protect sinks, there can be no justification of delaying careful attention to climate commitment implications in assessments until the strategic assessment is completed. Moreover, the climate factor for decisions set out in s.63(e) will apply with the rest of the Act as soon as it is proclaimed in force.

4.12.2 Interim means of addressing climate commitments in assessments while adequate regulatory and policy criteria and other guidance are being developed

For the period before the strategic assessment is completed and its conclusions established as authoritative guidance, the law will need to ensure suitable arrangements for addressing these matters effectively and credibly at the project level and. One option would be to use the broad regulation making-provision of section 109 to issue interim

regulations to clarify how project and strategic level assessments are to determine whether and to what extent a proposed project or strategic undertaking (in comparison with alternatives) would hinder or contribute to meeting Canada's climate commitments, as is to be required by section 63(e).

In the interim, it is prudent to consider how the climate change mitigation tests in Box 8, above, could be specified and applied in the absence of adequate policy guidance, and how climate-related decisions should be made in assessments of particular proposed undertakings in the absence of detailed climate-related evaluation and decision making criteria set out in regulation under the new assessment statute.

The obvious starting point for developing interim regulations and associated policy guidance is recognition that Canada's climate commitments and the obligations for decision makers under section 63(e) of the *Impact Assessment Act* apply whether or not their implications have been formally elaborated. Because of the decision-makers' obligations, consistency with meeting the climate commitments must be addressed in impact statements and the assessment reviews, upon which decisions are to be based. Whether a proposed project will contribute to or hinder meeting climate commitments will be addressed case-by-case in the assessments of individual undertakings with or without interim regulations and policy.

At all stages, however, some criteria and/or set of tests will be applied. As is the tradition in environmental assessment processes in most jurisdictions, the proponent is required to make the case for the proposed undertaking in light of the law's purposes and more specific requirements. That would apply to cases with implications for meeting climate change mitigation commitments. The proponent's submitted impact statement – effectively the proponent's case for the project, including its climate-relevant aspects – would face evaluation by a review panel or the Agency, with participation from government bodies and other authorities, experts, stakeholders and members of the public, all of whom would apply some criteria and tests. The relevant review panel or the Agency would make recommendations, with specified rationales, and the decision-makers would take final responsibility for determining, and justifying their decision on, whether the proposed undertaking would contribute to or hinder meeting the climate change commitments.

Even in the interim period, the evaluations and rationales at all stages would be more consistent and probably also less aggravating and less vulnerable to challenge if guided by a basic structure of credibly developed initial regulatory and policy guidance.

With at least some credible guidance, proponents would have the relatively modest task of determining the particular planning and assessment implications for their undertakings and subsequent reviews would have some roughly common path to follow. In the absence of such guidance, each proponent would have a much more onerous task

in making the case for the proposed undertaking, and face a much less predictable review. The tasks for reviewers in each case would be similarly greater.

Box 8, above, provides an initial framework of the major components of a potentially defensible set of tests. Many of them rely on specifics that are not yet available. For example, we do not have officially defined sectoral and regional pathways to meeting the Paris commitments, or an elaborated a GHG budget for Canada. But we do have incomplete beginnings that can be at least roughly adjusted to serve as working bases for interim tests. As noted in Box 8, we could at estimate what additional efforts would be needed to fill the gap between Canada's current Nationally Determined Contribution and the more demanding commitments of the *Paris Agreement*, plus flexibility to address the expected increasing ambitions under that Agreement. We could do the same with the requirements implied by the *Pan-Canadian Framework on Clean Growth and Climate Change*.

Interim guidance could then recognize the Box 8 tests, make initial efforts to provide basic working specifications and thereby provide a foundation for participants in case-by-case assessments to prepare and deliberate on more advanced versions. In the absence of interim guidance, participants in climate-significant assessment cases are likely to engage in their own elaborations of suitable tests without the benefit of a shared initial framework.

The case-by-case route is preferable to early regulatory and policy guidance that arbitrarily imposed and substantively indefensible. Eventually, a case-by-case debates and decisions could build greater mutual understanding and a set of precedents that would stand as reasonably reliable policy guidance. In the absence of well-considered, openly debated early guidance that is seriously designed meet the Paris commitments, the following points would represent the fall-back option:

- In the absence of a full set of credibly developed regulatory and policy guidance or direction from criteria established in or under the assessment statute, deliberations and decision making on climate-related matters in particular assessments should proceed with critically examined use of the best available information in support of specifying and applying the tests set out in Box 8, above.
- Where the available guidance is ambiguous or contested by alternative guidance from reputable sources, the relative merits of options become issues to be resolved case-by-case in the particular assessment.

4.13 Feasibility

Any analysis focused on the implications of the *Paris Agreement* and Canada's associated Canadian international commitments to climate change mitigation will raise

concerns about the feasibility of implementation. Inevitably, doubts will be expressed about whether the transitions involved can be accomplished politically, economically and institutionally, and whether the costs will be acceptable. Almost as inevitably, the discussants will need reminding that the effects of the "do little" alternative are more surely unacceptable. Climate change damage is already substantial and growing. Allowing overall warming and other changes across the Paris thresholds and beyond threatens the planet's life-sustaining systems and the civilizations we have built upon those systems. The feasibility questions are about how, not whether, to meet our international commitments.

None of that makes the feasibility questions any less important. But we may wish to frame them differently. Rather than treating feasibility concerns as the enemy of effective climate action, we might ask how meeting our international commitments can be done in ways that have the most beneficial effects – how they can maximize understanding, protect the most vulnerable, deliver lasting economic prosperity, and build mutually reinforcing support among all relevant authorities and stakeholders.

The core requirements of the *Impact Assessment Act* as proposed establish core decision factors that combine climate change mitigation obligations with an imperative to seek overall contributions to sustainability, avoid or mitigate adverse effects and respect the interests and rights of Indigenous people. That package provides a fully workable foundation for pursuing climate change mitigation with multiple lasting benefits.

Conclusions and recommendations from Part 4

The proposed new federal *Impact Assessment Act* is sustainability-based and requires consideration of whether assessed undertakings would "hinder or contribute to" meeting Canada's climate change commitments. However, the Act's promising basic requirements are unlikely to be understood or applied reliably and predictably unless accompanied by specific directions for application and compliance.

Recommended amendments to the Act, or regulations and supportive policy under the Act, would deliver the following specifics:

- clarify how contributing to (and not hindering) meeting the commitments entails consistency with viable pathways towards GHG neutrality within the deadlines implicit in Canada's international commitments;
- clarify how assessments should incorporate
  - contributing to transitions to a low-GHG future,
  - avoiding or offsetting GHG emissions or sink impairments past the Canadian deadline for GHG neutrality,
  - avoiding entrenchment of climate-inappropriate structures, practices and dependencies,
  - ensuring "best efforts" for GHG mitigation and sink enhancement, and
  - favouring capacity to meet increasingly ambitious future national commitments;

- clarify how the climate change mitigation obligations are to be met in ways that also serve other sustainability-based purposes and criteria under the law;
- specify requirements for all assessments to include comparative evaluation of alternatives as well as the proposed undertaking, with particular attention comparisons to identify best options for contributing to meeting climate commitments;
- establish trade-off rules and processes affecting climate commitments, ensuring that climate trade-offs are avoided to the extent possible, subject to explicit limitations, supported by explicit public justification;
- ensure that the Project List, which identifies and delineates categories of projects to which the law-based assessment requirements apply, covers all projects that could have important consequences for meeting Canadian climate change mitigation commitments, with particular attention to
- annual and lifetime attributable (direct and indirect) GHG emissions and/or sink impairments over a certain threshold, as well as those that extend beyond the deadline for GHG neutrality;
- contribution to cumulatively significant GHG emissions or sink impairments that make specific mitigation commitments more difficult to meet, as well as the contribution to further entrenching fossil fuel dependency; and
- sectors that require transformation to ensure climate commitments are met.
- establish at the strategic level a similar list that identifies and delineates categories of policies, plans, programs and strategic issues that require assessment, including strategic undertakings that, individually or cumulatively, could have important consequences for meeting Canadian climate change mitigation commitments;
- specify processes for regional and strategic assessments, including the anticipated strategic assessment on meeting climate commitments, to ensure transparency and meaningful participation, apply sustainability-based criteria, compare a suitable range of alternatives, and be rigorous and worthy of public credibility;
- clarify means of responding to strategic assessment findings, including those on climate matters, though authoritative guidance for project level assessments;
- while comprehensive regulations and policy guidance are being prepared, establish interim working direction on how the extent to which proposed undertakings and alternatives would hinder or contribute to meeting Canada's climate commitments is to be determined and documented in individual assessments;
- set out detailed expectations and approaches to climate-related information and standards for evaluations, including best means for determining
    - which GHG emissions and sink effects are properly attributed to particular undertakings, including attention to lifecycle and lifespan direct, indirect and cumulative effects;
    - the extent of positive effects on anthropogenic GHG sink enhancement;
    - legitimate offsets for GHG emissions or sink degradation;
    - how to identify and compare the climate implications of alternatives;

    - how to use carbon pricing, social cost of carbon, costing of future stranded assets and entrenchment of GHG-emitting sectors, and other means of identifying the economic implications of climate-important undertakings;
    - contributions to the major transformations needed to achieve GHG neutrality, including means of ensuring just transition; and
    - effects on intergenerational equity;
- clarify means of fostering and facilitating interjurisdictional collaboration, including joint climate-related strategic undertakings, joint assessments of climate-related undertakings, and joint monitoring, as well as government-to-government collaboration between federal and Indigenous authorities; and
- extend opportunities for learning and adjusting climate assessment regulations and policies.

Finally, for application in both project and strategic assessments, we propose a suite of climate tests (Box 8, above), based on the findings of this report that should guide the comparative evaluation of alternatives and decision making on proposed undertakings. Applications of the climate tests, duly elaborated in regulations and policy guidance under the new *Impact Assessment Act*, could play a major role in ensuring the assessment practice, including decision making, makes positive contributions to Canadian efforts to meet our *Paris Agreement* commitments.

Part 5 Summary of full report recommendations

Serious gaps in law, policy and practice lie between Canada's commitments under the *Paris Agreement* and individual assessments of proposed undertakings with significant implications for meeting those commitments. Filling those gaps is not going to be easy, and the deadlines for major accomplishments are near.

In this report we have attempted to set out the needed steps and their main implications, especially for new assessment law, regulation and policy. The steps are not fully defined and many components include a range of possible options. Our intent and expectations have not been to deliver final answers but to establish a firm basis for informed conversation of a matter of pressing importance. The challenges identified in this report are numerous and demanding but reasonably clear.

When Canada signed on to the *Paris Agreement* in 2015, we made an international commitment to do our fair share "to limit global average temperature rise to well below 2°C above pre-industrial levels, and to pursue efforts to limit the increase to 1.5 °C."[565] With this commitment come a number of obligations.

Internationally, Canada must make substantial contributions to the global efforts to keep global average temperatures within this new temperature goal to well below 2°C. Meeting these commitments clearly has numerous domestic implications. One necessary component of serious efforts to meet the *Paris* commitments is proper planning and assessment of climate-significant projects and strategic undertakings (policies, plans and programs). While current assessments do not ensure projects contribute to meeting our climate commitments, this will change under the new *Impact Assessment Act* that is now before Parliament.

Informed and effective efforts to close the broad gap between Canada's international climate commitments and assessments of individual undertakings involve two core components. First, the *Paris Agreement* and Canada's associated international climate commitments must be translated into implications for what Canada needs to do and accomplish. Second, particular requirements must be specified for assessment legislation and application to the planning, approval and implementation of individual undertakings.

5.1 Translating the *Paris Agreement* and associated commitments into specific implications

The translation component in turn involves two steps: one to determine the overall implications of the *Paris Agreement* commitments for Canada, and a second to determine what implications entailed for the development and application of particular

[565] *The Paris Agreement*

tools for understanding what needed to be accomplished and tests for evaluating available options and proposals.

5.1.1 The overall implications of the *Paris Agreement* commitments for Canada

Determining the overall implications entailed reviewing the overarching principles within the *Agreement,* understanding what the temperature goals implied for GHG reduction targets, and evaluating different interpretations of "fair share" approaches.

Our key findings begin with the fundamental starting principle is that climate change mitigation must be pursued in ways that support and are supported by efforts to meet the suite of other sustainability imperatives, including human rights, the rights of Indigenous peoples and biodiversity.

While significant uncertainties remain in understanding the implications of the new temperature goal of the *Paris Agreement* for greenhouse gas (GHG) mitigation imperatives globally and nationally, some initial answers are possible:

- Keeping overall global warming to the *Paris Agreement* limit of well below 2ºC and aiming for 1.5ºC will require immediate and sustained best efforts, especially by the most advantaged countries.
- Using a carbon budget approach as a means of translating the *Paris Agreement's* temperature goal into a global maximum of further GHG emissions, reveals that the remaining global budget for allocation among countries is much smaller than is currently acknowledged in policy making and would be exhausted within 8 to 19 years at the current emissions rate.
- A profound transformation of energy and economic systems is necessary to stay within this finite total budget.
- GHG sinks and reservoirs such as peatlands and forests are a critical component of the global GHG mitigation targets, but accounting approaches need to be improved by better understanding of anthropogenic impairments and the potential for their permanent enhancement.
- Large scale, risky and uncertain future negative emissions technologies should not be relied upon in establishing GHG mitigation targets or used to justify abatement delay.
- Allocating responsibility for GHG reductions requires facing complex questions about who is responsible, which emissions are counted, over what time period are emissions counted, and how equity is considered. While there is little established agreement on the best answers to any of these questions, it is clear that current efforts are inadequate. Nations, including Canada, have not yet begun serious efforts to make "fair share" allocations or act on them.
- Canada's and most developed countries' current approach focuses on national actors and emissions only in recent years, is weak on limiting further extraction of GHG-generating hydrocarbons and other undertakings likely to entrench more deeply GHG-generating practices, and ignores equity considerations and exported and embedded emissions.

- Determining Canada's fair share allocation of the global carbon budget involves choices among various options based on competing equitable considerations.
    - From the Canadian "fair share" allocations that have been calculated by independent researchers, all but the most marginally equitable option find that the remaining Canadian "fair share" of the global carbon budget is negative. That means every tonne of GHG emitted today and tomorrow simply adds further to Canada's climate indebtedness towards other nations.
    - Even under the most marginally equitable option, Canada would exhaust its share of the global carbon budget within a decade if our GHG emissions continue at current levels.

5.1.2 Implications for development and application of particular tools and tests

With the basic goals established, we then turned to what they entailed for the development and application of particular tools for understanding what needed to be accomplished and tests for evaluating available options and proposals That entailed reviewing Canadian climate policy and decarbonization pathways, identifying key gaps for making climate-responsible decisions, and crafting suitable recommendations for how the gaps might be addressed.

Our main broad conclusions about the overall policy context are as follows:

- While there are positive steps within Canada's existing climate policy landscape, such as the *Pan-Canadian Framework on Clean Growth and Climate Change*, the ambitions of the existing policies fall well short of what is needed to meet Canada's *Paris Agreement* commitments, and critical gaps remain between our objectives and clear guidance for particular climate-significant decisions.
- So far, the earliest technologically feasible date identified in any of the studies for decarbonization in Canada is 2050. Given that our fair share decarbonisation deadline is most likely passed or, at best, looming in the next decade, 2050 as the earliest feasible achievement date should be adopted as Canada's latest possible deadline for achieving decarbonisation.
- Reconsidering what is politically, culturally, and behaviorally possible could bring the feasible decarbonization deadline closer to the short term and reduce the gap between mitigation efforts in Canada and what is considered to be our fair share under *the Paris Agreement*.
- Any working deadline for decarbonization must be accompanied by always attempting to do better and by international assistance in support of mitigation and adaptation abroad to compensate for our past inaction and domestic lateness.

For planning and decision making on particular new and existing undertakings, including those subject to assessment requirements, the current and developing package of targets, frameworks and applied tools needs extensive strengthening to provide an adequate basis for determining what activities would be consistent with meeting Canada's commitments under the *Paris Agreement*. This strengthening will entail the following:

- raising the level of specific domestic commitments to reflect the 2050 working deadline for decarbonisation, plus best efforts to do more and to make substantial contributions beyond Canada to meet international commitments;
- developing more ambitious pathways to decarbonization, examining alternative future scenarios, testing the feasibility of different GHG neutrality deadlines and comparing alternative routes to meeting particular deadlines;
- adopting a carbon budgeting system, roughly following that of the UK to clarify expectations and track accomplishments over time;
- building explicit long range energy policies, incorporating means of meeting the decarbonization deadline and encouraging best efforts;
- mobilizing economic and regulatory tools more effectively, including by recognizing both carbon pricing and the social cost of carbon and clarifying when and with what caveats each should be used in evaluations of policy options and other applications;
- differentiating between GHGs that will be subject to a carbon price, those that will be abated (as it may not correlate) and those that will be emitted unabated. For unabated emissions, using the social cost of GHGs as an estimation of global damages associated with a project's GHG emissions, only after consistency with climate commitments has been established;
- designing and applying climate and sustainability-based matrices to compare alternative policy, planning, program or project options with different GHG implications;
- establishing best means to
    - account for GHG emissions and sinks;
    - recognize the differences among greenhouse gases, including their different timescales of impacts, and their implications for decision making;
    - account for emissions and sink effects stemming from land disturbances and protecting existing sinks and reservoirs;
    - adjust the carbon price and regulatory regime to match the current and expected increases of mitigation ambition under the *Paris Agreement*;
    - adopt and ensure transparent use of the social cost of carbon in evaluations of climate-significant proposals (e.g., in regulatory impact assessments, and project and strategic assessments);
    - attribute emissions, including indirect ones, to particular undertakings, over their full lifecycles;
    - incorporate attention to just transition imperatives in planning and decision making climate-significant undertakings; and
    - evaluate the legitimacy of proposed offsets;
- establishing financial and other tools to guarantee that commitments to and requirements for future GHG reductions and offsets are fulfilled;
- enhancing public understanding, including through open deliberations, decision making transparency and convenient public access to climate-relevant information (important data and assumptions for climate-related studies, and the modelling of alternative climate change policy options; and
- improving coordination between and among the federal, provincial, territorial and Indigenous and municipal governments.

Together, these advances would provide a far better foundation for clear, rigorous and consistent decision making including about policies, plans, programs and projects. The next step is to ensure that these foundations and gap-filling approaches are specified translated into clear and authoritative requirements, and applied effectively.

5.2 Specifying requirements for assessments of climate-significant undertakings

The federal *Impact Assessment Act* that is currently before Parliament has considerable potential as a vehicle for progress on climate change mitigation. It is sustainability-based and requires consideration of whether assessed undertakings would "hinder or contribute to" meeting Canada's climate change commitments. However, the Act's promising basic requirements are unlikely to be understood or applied reliably and predictably unless accompanied by specific regulatory directions and policy guidance for application and compliance.

To ensure clear expectations and common understandings for applying Canada's climate commitments under the new Act, we recommend (failing further positive amendments to the Act) regulations and supportive policy under the Act, to deliver the following specifics:

- clarify how contributing to (and not hindering) meeting the commitments entails consistency with viable pathways towards GHG neutrality within the deadlines implicit in Canada's international commitments;
- clarify how assessments should incorporate
  - contributing to just transitions to a low-GHG future;
  - avoiding or offsetting GHG emissions or sink impairments past the Canadian deadline for GHG neutrality;
  - avoiding entrenchment of climate-inappropriate structures, practices and dependencies;
  - ensuring "best efforts" for GHG mitigation and sink enhancement; and
  - favouring capacity to meet increasingly ambitious future national commitments.
- clarify how the climate change mitigation obligations are to be met in ways that also serve other sustainability-based purposes and criteria under the law;
- specify requirements for all assessments to include comparative evaluation of alternatives as well as the proposed undertaking, with particular attention comparisons to identify best options for contributing to meeting climate commitments;
- establish trade-off rules and processes affecting climate commitments, ensuring that climate trade-offs are avoided to the extent possible, subject to explicit limitations, supported by explicit public justification;
- ensure that the Project List, which identifies and delineates categories of projects to which the law-based assessment requirements apply, covers all projects that

could have important consequences for meeting Canadian climate change mitigation commitments, with particular attention to
    - annual and lifetime attributable (direct and indirect) GHG emissions and/or sink impairments over a certain threshold, as well as those that extend beyond the deadline for GHG neutrality;
    - contribution to cumulatively significant GHG emissions or sink impairments that make specific mitigation commitments more difficult to meet, as well as the contribution to further entrenching fossil fuel dependency; and
    - projects playing significant roles in sectors that require transformation to ensure climate commitments are met;
- establish at the strategic level a similar list that identifies and delineates categories of policies, plans, programs and strategic issues that require assessment, including strategic undertakings that, individually or cumulatively, could have important consequences for meeting Canadian climate change mitigation commitments;
- specify processes for regional and strategic assessments, including the anticipated strategic assessment on meeting climate commitments, to ensure transparency and meaningful participation, apply sustainability-based criteria, compare a suitable range of alternatives, and be rigorous and worthy of public credibility;
- clarify means of responding to strategic assessment findings, including those on climate matters, though authoritative guidance for project level assessments;
- clarify how, while regulatory direction is being prepared, individual assessments are to evaluate the extent to which proposed undertakings and alternatives would hinder or contribute to meeting Canada's climate commitments;
- set out detailed expectations and approaches to climate-related information and standards for evaluations, including best means for determining
    - which GHG emissions and sink effects are properly attributed to particular undertakings, including attention to lifecycle and lifespan direct, indirect and cumulative effects;
    - the extent of positive effects on anthropogenic GHG sink enhancement;
    - legitimate offsets for GHG emissions or sink degradation;
    - how to identify and compare the climate implications of alternatives;
    - how to use carbon pricing, social cost of carbon, costing of future stranded assets and entrenchment of GHG-emitting sectors, and other means of identifying the economic implications of climate-important undertakings;
    - contributions to the major transformations needed to achieve GHG neutrality, including means of ensuring just transition; and
    - effects on intergenerational equity;
- clarify means of fostering and facilitating interjurisdictional collaboration, including joint climate-related strategic undertakings, joint assessments of climate-related undertakings, and joint monitoring, as well as government-to-government collaboration with Indigenous authorities; and
- extend opportunities for learning and adjusting climate assessment directions and guidance.

Finally, for application in both project and strategic assessments, and as a foundation for developing interim and more permanent regulatory and policy guidance, we propose a suite of climate tests, based on the findings of this report that should guide the comparative evaluation of alternatives and decision making on proposed undertakings. The tests are summarized above in Box 8. Applications of the climate tests, duly elaborated in regulations and policy guidance under the new *Impact Assessment Act*, could play a major role in ensuring that assessment practice, including decision making, makes positive contributions to Canadian efforts to meet our *Paris Agreement* commitments.

Annex: Supplementary Information of Methods and Tables

1. Effort sharing approaches considered for Figure 1 in Part 2

There are many approaches to sharing what is left of the global carbon budget, either from a sum total or from annual emissions along a global emissions path/trajectory. Here we use a combination of methods to derive the results in Figure 1 and Table A1. Note that this work was undertaken prior to the release of the IPCC's "Global Warming of 1.5°C special report" and therefore does not include carbon budgets associated with a 66% chance of limiting global warming to 1.5°C.

Effort-Sharing Approaches	1.5°C (50%) [Gt CO_2eq]	2°C (66%) [Gt CO_2eq]	Paris Allocation [Gt CO_2eq]
CERP 1850 | High Progressivity	-45	-32	-39
CERP 1950 | Medium Progressivity	-37	-24	-35
CPC 1850	-28	-14	-21
Median excluding "unfair" metrics	-18	-8	-13
CERP 1990 | Low Progressivity	-18	-7	-13
CPC 1960	-17	-8	-13
CPC 1990	-7	0	-4
EPC 2018	4	9	7
C&C 2030	7	11	9
C&C 2050	10	15	12
Grandfathering	15	26	21

Table A1. Effort-sharing approaches to allocating the remaining carbon budget.

Cumulative emissions are shown in the legend in billion tonnes of carbon dioxide equivalents (Gt CO_2eq), and represent Canada's share of the entire world's total remaining GHG emissions between 2018 and 2100. The Paris Allocation is calculated by taking the mean of the carbon budgets at the temperature target bounds. "Median excluding 'unfair' metrics" takes the median of the values of all the listed effort-sharing approaches except "Contraction and Convergence" (C&C) 2030, C&C 2050, and Grandfathering since these are considered to be unambiguously "unfair."

There are three main projects that have undertaken the challenge of estimating "equitable" or "fair" shares of the remaining carbon budget or mitigation pathway: 1) Paris Equity Check (PEC, http://paris-equity-check.org/), 2) Climate Action Tracker (CAT, http://climateactiontracker.org/), and Climate Equity Reference Project (CERP, https://climateequityreference.org/). However, there are significant methodological differences between approaches used in the effort-sharing literature by these three research groups. The main issues concern differing underlying methodologies that

reflect debate over the definition of "equitable" outcomes. Other concerns centre on more technical methodological differences (though, of course, any difference in method has implications for what is defined as "equitable", even if it is not a consciously or deliberately normative decision).

CERP uses a mixed approach to determine historic responsibility, including both past emissions, as well as current capacity to act as judged by the income of a country. Only emissions and income of those earning above the development threshold of $7500/year (USD, PPP-adjusted) are counted towards this measure of responsibility and capacity. Emissions and incomes of those above this development threshold are estimated using a lognormal distribution parameterized by the country's Gini coefficient. There is an option to weight emissions of countries above a luxury threshold at a higher rate than those between the development and luxury threshold (effectively discounting the emissions of those between the development and luxury thresholds), and the emphasis on "responsibility" and "capacity" can be weighted in any combination that sums to unity. Adjusting the emphasis on either responsibility or capacity tends to have little effect on effort sharing pathways for most countries, and so only outcomes with equal weighting of both are used in this study. This lack of sensitivity is due to the fact that historic emissions are linked to current states of economic development, and the current wealth of developed nations largely predicated on their advantages due to industrialization relying on use of fossil fuels with associated GHG emissions.

Three settings are used to create the range of CERP pathways exhibited here. CERP asserts that the most equitable results in the most stringent share for Canada, and is derived by employing the most progressive measures, including counting of luxury income at a higher weight to increase the responsibility of those earning above $50,000/year (USD, PPP-adjusted), and counting all emissions from industrialization (1850) to present. The medium equity setting also counts 100% of luxury income towards responsibly and capacity but includes emissions only from 1950 onwards. The lowest equity setting includes only emissions occurring after the year 1990, and lowers the development threshold to an individual income of $2500/year.

Other allocations are derived using CAT's pathways and sharing calculator. Cumulative Per Capita (CPC) shares all emissions equally per capita over time also starting from the earliest point in industrialization (1850), and up to 2100, using a projection of population and emissions along a 1.5°C and 2°C trajectory. Equal Per Capita (EPC) shares all remaining emissions equally per capita, hence ignoring historic inequities from overuse of atmospheric capacity by the developed world, and also ignoring current and future inequities of wealth garnered from this historic inequality. We therefore consider this allocation to be considerably less fair, compared to the CPC and CERP allocations; however, despite EPC's low-equity, no developed nation has succeeded in achieving even this level of ambition (see CAT website above), either with or without considering aid measures and projected negative emissions.

We have also included other allocation methods for reference purposes that we consider to be based on inequitable allocation principles. Contraction and Convergence (C&C)

sets a future target of equal per-capita emissions, which perpetuates existing asymmetries in per capita emissions between developed and developing nations. Grandfathering, by partitioning remaining emissions proportionally to historical usage, is by far the most unfair allocation method, as it does not include any mechanism to correct current inequities, and rather perpetuates these inequities indefinitely. Grandfathering emissions is like adopting C&C allocations with a convergence date set at infinity.

The population projections used here are highly uncertain, though we consider this preferable to the use of historical population data to allocate future emissions, which would also be subject to high uncertainty with respect to whether current population distributions can fairly represent future population distributions. Also note that all pathways share emissions up to the year 2100, and that quoted figures in cumulative emissions are the sum of annual emissions from 2018 to 2100, inclusive.

PEC, CAT, and CERP use different pathways from which shares are derived, so that even if the method employed was identical, the results would still differ since they would be apportioning emissions from different global pathways (though both are labeled as 1.5°C and 2°C pathways for limiting warming to below these thresholds by 2100 with a 50% and 66% chance of success, respectively).

That being said, certain metrics that share the same name differ in method. For example, the way that C&C is calculated in CAT and CERP is equivalent to EPC from PEC since PEC's EPC method uses a convergence date when countries reach equal per capita emissions (making it in practice equivalent to C&C). The convention in the literature would be to refer to this as C&C; however, in the PEC methodology, it is deemed impossible to achieve equal per capita emissions immediately, and so there must be a period to allow for convergence, rather than parameterize cumulative emissions so that this discrepancy is corrected). It is therefore in the opinion of the authors that the EPC method as outlined by the PEC project is mislabelled, when in fact it is a form of C&C, since it has a start date in the future when emissions will be shared equally per capita by nations, which is the definition of the C&C approach and not the EPC approach, which will allocate emissions equally per capita starting immediately.[566]

We refrain from using any PEC pathways in our analysis. Their omission is for consistency in our analysis, since we feel that its inclusion warrants more detailed comparative analysis. Also, in the spirit of full disclosure, the authors of this portion of the report have either helped create or have already worked with the approaches included in this study, and are therefore better versed in and more comfortable using methods and output from CAT and CERP. With that said, the authors maintain that the methodologies used in these projects represent equity consideration effectively. Future research should explore the differences between methodologies further, though a brief comparison is included to demonstrate certain methodological differences in Fig A1.

[566] In private correspondence with the author it was later revealed that the study refrained from using the common name in order to avoid paying royalties since "Contraction and Convergence" and "C&C" are now trademarked terms.

Of the three effort sharing projects, PEC generally gives the largest allocations to Canada, while CERP is most stringent. For the purposes of this report, carbon budget allocations (referred to as Paris Quotas in the main text) were derived using solely CERP and CAT effort-sharing methods and approaches in order to illustrate "fair share" estimates.

For example, what is labeled as Greenhouse Development Rights (GDR) effort sharing follows a significantly altered process (one that has been outlined in CERP and its predecessor GDR,[567] and for this reason it is has been omitted from the graph.

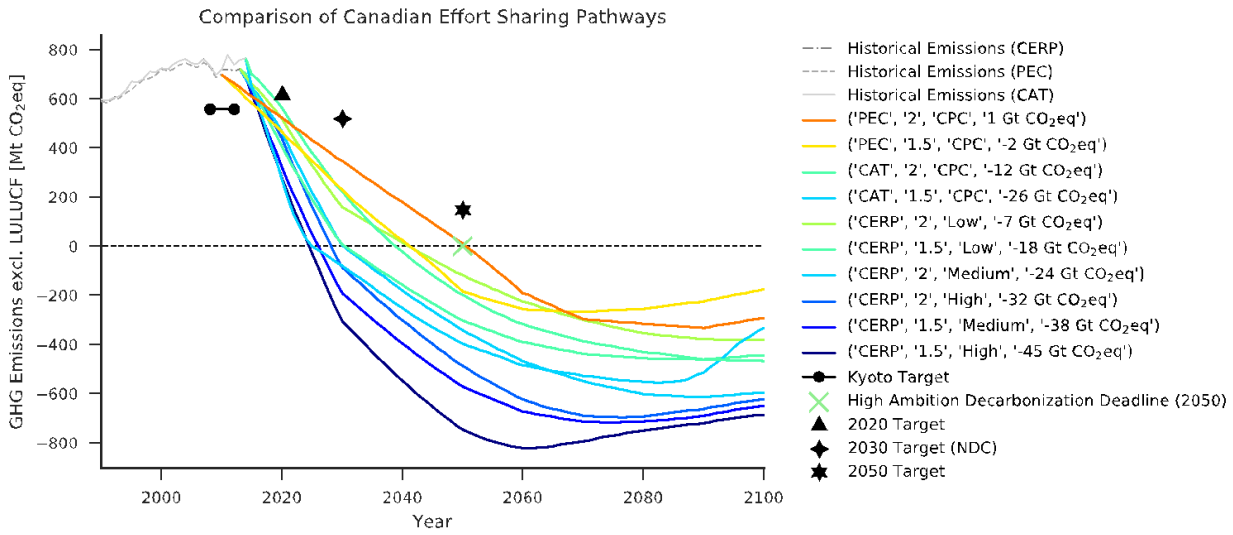

Figure A1. Comparison of select effort sharing pathways for Canada.

The above figure contains effort-sharing pathways, which share annual global emissions along a modeled trajectory to meet a specified temperature target. Annual emissions are in million tonnes carbon dioxide equivalents (CO2eq), and exclude emissions from Land Use, Land Use Change, and Forestry (LULUCF), in order to standardise the data for comparison. Three projects are shown: 1) Paris Equity Check (PEC, http://paris-equity-check.org/), 2) Climate Action Tracker (CAT, http://climateactiontracker.org/), and Climate Equity Reference Project (CERP, https://climateequityreference.org/). PEC generally gives the largest allocations to Canada, while CERP is most stringent. Cumulative emissions are shown in the legend in billion tonnes of carbon dioxide

[567] See supplementary data table accompanying Christian Holz, Sivan Kartha, and Tom Athanasiou, "Fairly Sharing 1.5: National Fair Shares of a 1.5 °C-Compliant Global Mitigation Effort", (2018). Such reduction obligations going beyond 100% would imply a dual obligation where a "country can be in compliance with its allocation through a combination of domestic emission reductions and enabling emission reductions outside its borders, with the specific balance of these two options determined by various factors, including ethical, political, social, technological, and cost-effectiveness considerations."

equivalents (Gt CO_2eq), and represent the Canada's share of world total remaining GHG emissions between 2018 and 2100.

Only the most stringent of the PEC allocations for Canada are included for comparison in Figure A1. PEC's approach can be seen to differ significantly from the method employed by CAT. CPC used by PEC does not include all historic emissions while CAT does unless otherwise specified; note the large difference in cumulative emissions attributed to Canada using the two methods, where CAT's approach of sharing all emissions equally from 1850 to 2100 yields a projected allocation (tantamount to a projected climate debt) of -12 and -26 Gt CO_2eq while PEC's method allocates Canada a share of 1 and -2 Gt CO_2eq for 2 and 1.5-degree pathways respectively. CPC as defined by PEC more closely aligns with CAT's CPC with a 1990 cumulative historic emissions start date as defined by CAT (not shown here in time series form; however cumulative emissions are quoted in Table A1 (0 and -7 for 2 and 1.5-degree pathways respectively).

To summarize, EPC uses a 30-year convergence period from 2011 onwards, which is equivalent to C&C with a 2041 convergence date. CPC uses a 1990 historical emissions start date, and discounts emissions occurring before the start date at a rate of 1.5%, extending from the start date backwards into the past. Consequently, it is not equivalent to ECP but is a modified version where most historic emissions are significantly discounted. It lies between EPC and CPC as defined by the convention used in this study.

As the effort-sharing research community seeks a stronger consensus by working together through open and transparent research collaboration, the debate continues in the literature.[568]

2. Data sources on Canadian Pathways and Sectors definition for Figure 3 / Part 3

Chosen Pathways	Data Source / Chosen Scenario	Type of Modeling Project
BAU	Range provided by DDPP and EMRG BAU modeled projections	n/a
Reference	Range provided by DDPP and EMRG BAU modeled projections	n/a
DDPP	Regulations and Carbon Pricing (w/low oil prices)	Decarbonization model: economy-energy-emissions model
EMRG	Flexible Pathways (w/low oil prices)	Decarbonization model: economy-energy-emissions model
TEFP	S8b_TEFP_R60	Decarbonization model:

[568] Sivan Kartha and others, "Cascading Biases against Poorer Countries", *Nature Climate Change*, 8.5 (2018), 348–49, online: <https://doi.org/10.1038/s41558-018-0152-7>.

		economy-energy-emissions model
ECCC	PCF + additional measures extended to 2050 Midcentury target	Decarbonization model: economy-energy-emissions model
Solutions Project	Canada interpolated between present emissions, near term, and long-term objectives	Utility model: civil engineering, utilities, grid dispatching

Table A2. Data sources for decarbonization pathways used in this report's analysis.

Data from DDPP, EMRG, and TEFP are not publically available and were made available upon request.

The Trottier Futures Energy Project (TEFP) is omitted from the graph since the sectoral classification scheme used differs too greatly from the conventions used in the models displayed here. Agriculture is excluded from this comparison table and panel since it is unclear how it is distributed amongst the sectors in the DDPP project. The reader should note one particularly important caveat that these sectors have not been fully harmonized, and so some discrepancies between models may cause significant differences in modelled decarbonization pathways and emissions trajectories. Two of the above sectors are newly aggregated by the author: 1) "Manufacturing, Mining, and Industry" is comprised of Chemical Products, Industrial Minerals, Iron and Steel, Metal Smelting, Mineral Mining, Paper Manufacturing, Other Manufacturing, and Coal Mining (same distinctions are made for both EMRG and DDPP). Coal mining is including in Manufacturing, Mining, and Industry rather than listed alone as the other Canadian fossil fuel extraction sectors are since it is insignificant by comparison; 2) "Renewable Fuels" comprises Ethanol and Biodiesel production.

Sector	DDPP [Mt CO_2eq]	EMRG [Mt CO_2eq]	Share of total emissions
Renewable Fuels	124	390	2%
Petroleum Refining	241	571	3%
Waste	153	763	4%
Residential	333	928	5%
Commercial	481	950	6%
Natural Gas Extraction	682	1023	7%
Electricity	1070	905	8%
Transportation Personal	1455	1459	12%
Transportation Freight	1432	2036	15%
Agriculture	n/a	1992	15%
Manufacturing, Mining, and Industry	1313	2437	16%
Petroleum Crude Extraction	2226	2491	20%

Sum [Gt CO_2eq]	9.5	16	100%

Table A3. Cumulative emissions from 2018 to 2050 (inclusive) by sector.

The emissions are measured in million tonnes carbon dioxide equivalents (Mt CO_2eq) and are listed in increasing order. Both models predict that the largest greatest cumulative emitter from present to mid-century will be petroleum crude extraction. This is commensurate with today's distribution of emissions where upstream emissions from unconventional oil production are the largest and fastest growing source of greenhouse gas emissions in Canada. The sector's dominance in emissions share will only continue as other sectors continue to decarbonize if emissions from oil and gas extraction do not fall as well. Percent shares are derived using the mean of DDPP and EMRG of the mean total (except in the case of Agriculture, which only is represented in EMRG).

Data from the Solutions Project are excluded form the comparative analysis since only EMRG and DDPP are sectorial-explicit models for Canadian decarbonisation. The Solutions Project is an entirely different kind of model, which only looks at optimizing technical constraints of utilities, grid and efficiency.

The Trottier Futures Energy Project (TEFP) is omitted from the graph since the sectoral classification scheme used differs too greatly from the conventions used in the models displayed here. Agriculture is excluded from this comparison table/panel since it is unclear how it is distributed amongst the sectors in the DDPP project. The reader should note one particularly important caveat that these sectors have not been fully harmonized, and so some discrepancies between models may exist. Two of the above sectors are newly aggregated for this research report: 1) "Manufacturing, Mining, and Industry" comprises Chemical Products, Industrial Minerals, Iron and Steel, Metal Smelting, Mineral Mining, Paper Manufacturing, Other Manufacturing, and Coal Mining (same distinctions for both EMRG and DDPP). Coal mining is included in this category rather than listed alone as the other Canadian fossil fuel extraction sectors since it is insignificant in comparison; 2) "Renewable Fuels" comprises Ethanol and Biodiesel production.

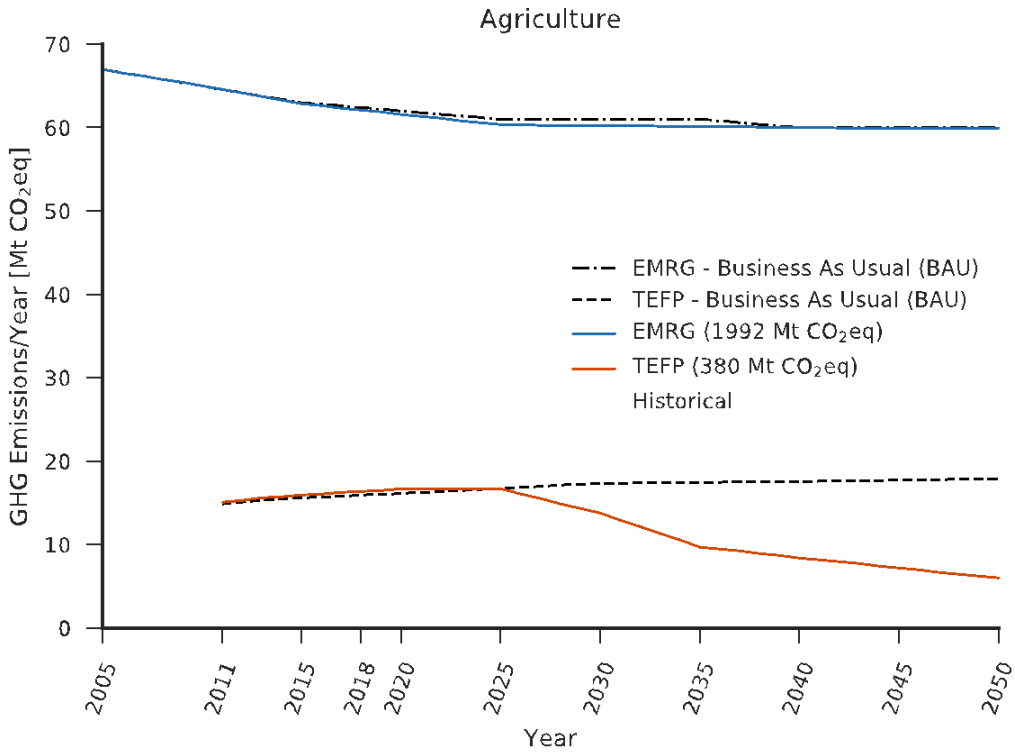

Figure A2. Decarbonization pathway for the agriculture sector.

Note the difference in category definition, and that this sector has been aggregated into others, into its more primary inputs, in the DDPP project. Agriculture appears to be very unresponsive to mitigation measures. It merits more targeted analysis than can be provided in this report.

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