NEB MODERNIZATION

Aligning Energy Project Assessment with Climate Policy

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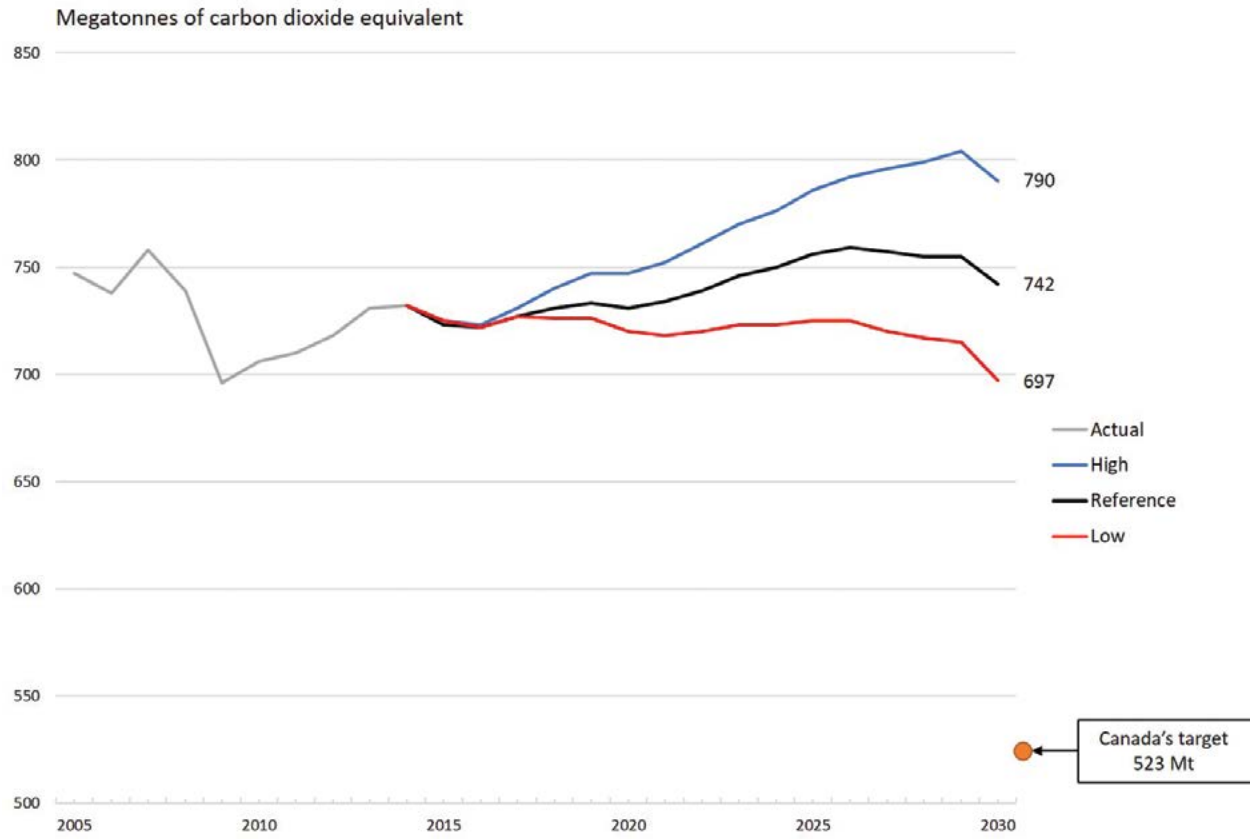

Canada's Emission Trends: Environment and Climate Change Canada (2016). Canada's 2016 Greenhouse Gas Emissions Reference Case

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EXECUTIVE SUMMARY

Public interest groups, governments and other key stakeholders have highlighted the need for a "climate test" to be included in the assessment of new major energy infrastructure projects. Long-lived energy infrastructure projects can affect Canada's greenhouse gas (GHG) emissions for decades after their construction; hence, they can have a consequential impact on Canada's ability to achieve its climate policy objectives and commitments.

A climate test would check a project's climate impact against Canada's climate commitments and other relevant benchmarks, and would assess the project's economic viability in a carbon constrained future. There are currently no strong links between energy project assessment and climate policy. The modernization of the National Energy Board (NEB) provides a unique opportunity to explore and identify how a climate test could be incorporated into the assessment of energy projects to better align with climate policy and the public interest of Canadians.

To develop recommendations for the NEB Modernization Expert Panel on integrating a climate test into the evaluation of major energy infrastructure projects, we reviewed the latest literature and conducted primary research via interviews with a select group of experts. Below are our main conclusions, followed by specific recommendations.

Based on the evidence revealed by this research, we reached the following conclusions.

- The lack of a climate test puts Canada's climate change commitments at risk and poses a major business risk for project proponents
- A climate test needs to address both the emissions and economic dimensions of assessing major energy infrastructure projects and other proposals
- The economic part of a climate test can help to capture the downstream impacts of a project by considering fossil fuel supply and demand in a carbon constrained world
- A climate test needs to be applied beyond projects that fall within the NEB's mandate to a wide range of proposed projects, programs, and policies
- There is an urgent need to separate climate policy discussion from the individual project assessment process
- Achieving consensus on the final design of a climate test and how and where it should be applied requires further consultation and dialogue
- A major bottleneck in the development of a climate test is the lack of a comprehensive carbon budget allocated at the economic sector level
- The lack of an overarching integrated Canadian energy and climate change strategy is a key barrier to federal-provincial alignment on climate policies, programs, and tools (e.g., a climate test), as well as a challenge for the NEB
- Federal-provincial alignment is critical for both the development of carbon budgets and establishing procedures for the application of the climate test to the full range of policies and programs that affect Canada's current and future GHG emissions

This white paper was limited by available time and resources. However, it resulted in the following recommendations supported by the research and informed by expert opinion.

1. Include a 2-part Climate Test in the Evaluation of Major Energy Projects

PART 1: Include a climate test based on the economic viability of energy projects in a carbon constrained world. This test would determine if the project is economically viable in a carbon constrained world. For a project to be economically viable, the long-run market price for the products it produces, refines or transports (e.g., oil or other fossil fuels) needs to exceed its long-run cost of production. This part of the test would be based on best available global energy-economy-emissions models that include the future price of carbon and future supply and demand for oil and other fuels. This test "fits" within the existing NEB mandate, but it requires a broader analysis of economic viability that considers market constraints and the effects of domestic and international climate policy on the price of fossil fuels and production costs, among other factors. For example, for crude oil pipelines, the test could be applied as part of the *National Energy Board Act's (NEB Act)* provisions related to the existence of markets and economic feasibility assessment (section 52-2 b-c).

PART 2: Include a climate test based on carbon budgets. This test would determine if the project fits within a pre-defined carbon budget. An example is provided in Figure 3. This test requires a determination of national and sector carbon budgets in line with Canada's 30 per cent GHG emissions reduction target by 2030 (from a 2005 base year), as well as the Paris commitment to limit global warming to 2 C and strive for 1.5 C. This test would be conducted outside the NEB at a strategic level, perhaps within a revised environmental assessment process or at a political level where broader stakeholder interests and sustainability impacts and benefits are evaluated.

2. Refine the Climate Test via a Stakeholder Workshop or Forum and Ongoing Process.

This white paper was prepared in a very short period of time (five weeks). However, we believe the literature reviewed and the expert opinion gathered for this report provide a high level of confidence in the value of a climate test for projects within the NEB mandate and beyond. The design principles and main structure of the test are also reasonably clear. What is also clear is designing and applying an effective climate test that has the buy-in of key stakeholders is a challenge that requires a variety of skills and expertise. To build on work to date and to achieve the level of detail necessary to agree on the final design of a climate test and its application, we strongly recommend a climate test workshop be held with leading experts and key stakeholders to focus on the development, design, adoption, implementation, and application of a climate test.

3. Put in Place Resources to Ensure the Climate Test Succeeds.

Effectively incorporating a climate test within and/or outside the NEB will require new and existing data to be gathered and integrated into decision making processes. This will require human and financial resources, and possibly new processes and decision support tools. It will be necessary to develop a detailed implementation plan that identifies the primary outcomes, accountable organizations and managers, resources, training needs and other information required to effectively execute a climate test. We recommend that these details be addressed in conjunction with the finalization of the test.

4. Develop an Overarching Integrated Energy and Climate Change Strategy

The lack of an overarching integrated Canadian energy and climate change strategy is a key barrier to federal-provincial alignment as well as a challenge for the NEB. The pan-Canadian framework on clean growth and climate change was noted by several experts as an important step toward a national climate change strategy. However, more detail is needed to ensure policies and projects align with climate science, and that the commitments of the federal and provincial governments meet Canada's obligations under the Paris Agreement. Such a strategy should address the development, application, and review of the carbon budget portion of the climate test. It should also address future carbon prices and should include necessary actions to drive innovation on energy sources and technologies that reduce the overall carbon intensity of the economy.

1. INTRODUCTION

Public interest groups, governments and other key stakeholders have highlighted the need for a "climate test" to be included in the assessment of new major energy infrastructure projects.[1] Long-lived energy infrastructure projects can affect Canada's greenhouse gas (GHG) emissions for decades after their construction; hence, they can have a consequential impact on Canada's ability to achieve its climate policy objectives and commitments.

A climate test would check the project's climate impact against Canada's climate commitments (e.g. 30 per cent reduction in GHG emissions by 2030, from a 2005 base year) and other relevant benchmarks (e.g., Paris commitment to limit global warming to 2 C and strive for 1.5 C, Canada' Mid-Century Long-Term Low-Greenhouse Gas Development Strategy, provincial climate commitments). A climate test would also assess the project's economic viability in a carbon constrained future. Project proponents and investors may also support a climate test to reduce stakeholder opposition, uncertainty, and financial risks associated with the energy project approval process. There are currently no strong links between energy project assessment and climate policy. The modernization of the National Energy Board (NEB) provides a unique opportunity to explore and identify how a climate test could be incorporated into the assessment of energy projects to better align with climate policy and the public interest of Canadians.

This paper explores:

- The need for a climate test that helps align energy project assessment and climate policy
- Guiding principles for aligning energy project assessment and climate policy
- The importance of alignment with climate policy, emissions reduction targets, carbon budgets, and decarbonization pathways over the lifetime of the energy project
- Economic rationale for aligning energy policy with supply and demand scenarios consistent with global and domestic climate commitments (e.g. avoiding the risk of stranded assets)
- Current efforts to align energy project assessment with climate policy
- The design of a climate test
- The expertise and information needs required to operationalize a climate test

2. METHODOLOGY AND APPROACH

To develop this paper, primary research was conducted via interviews with experts and stakeholders and secondary research was undertaken via a literature review. The information gathered is organized and summarised around five main themes:

- The need for a climate test
- Assessing the climate impact of energy projects
- Benchmarks against which to compare the climate impact of energy projects
- Examples of climate tests
- Operationalizing a climate test

The "References" section lists the literature reviewed. In parallel with the literature review, these themes were explored via interviews with experts and stakeholders from the public sector, private sector, civil society, and Indigenous Peoples. Appendix A provides a list of interviewees.

3. RESEARCH AND INTERVIEW RESULTS

The results of the literature review and interviews with experts and stakeholders are provided below.

3.1 THE NEED FOR A CLIMATE TEST

In addition to the need for a climate test, this section explores the guiding principles for a climate test and existing examples of a climate test for large-scale energy projects.

The need for a climate test

The literature review identified several authors who have explored the need for a climate test, as well as some who have explored the design of such a test (e.g., Jaccard et al., Donner, Bošković and Leach). In examining the need for a test, these analyses have addressed some key concerns including: the risk of Canada not being able to meet its climate change commitments; the potential for overbuilding energy infrastructure due to inaccurate oil supply and demand scenarios: and the possibility of being left with stranded assets.

In a January 2017 article, Thomas Gunton, Director of the Resource and Environmental Planning program at Simon Fraser University, pointed to the need for the federal government and NEB "to evaluate all proposed projects from a social, economic and environmental perspective to determine which mix of projects are required and best meet Canada's public interest."[2] Gunton explores pipeline needs and potential overcapacity, and recommends that the strategy Canada should purse is to define "the level of Canadian oil production consistent with Canada's climate change objectives." He then recommends assessing what group or mix of projects best meet Canada's public interest.

A clearly defined climate test may help address the lack of predictability for industry and investors in the current system. This was addressed, in part, in the Canadian Energy Pipeline Association submission to the Expert Panel Review of Environmental Assessment (EA) which stated: "Predictability with respect to whether potential adverse environmental effects are likely to be found significant is needed for potential investors to measure and weigh risk before entering into the environmental assessment (EA) process. Project proponents do not want to put forward projects that, under known and predictable rules, are not likely approvable. With adequate understanding of the information required and the test to be met, proponents will be in a better position to assess what project to pursue, or not pursue".[3] Although these comments are regarding EA, unpredictability about whether a project is in line with climate science and national commitments would be reduced by a climate test.

The North American environmental community, as represented through several leading non-governmental organisations (NGOs), has strongly endorsed the need for a climate test to ensure energy policy and project approval processes aligned with climate science.[4] Climate test.org lists four broad principles a climate test must align with to ensure energy policy supports a shift to a low-carbon economy in line with the Paris Agreement:

1. Energy decisions must be guided by climate science
2. Decision-makers must develop and consider models that are consistent with a global economic transition away from fossil fuels
3. Environmental review processes must assess the need for projects and policies in the context of global energy supply and demand scenarios consistent with international climate goals
4. Environmental review processes must assess a project or policy's greenhouse gas emissions

The Canadian Environmental Network (CEN) submission to the Expert Review of Federal Environmental Assessment Processes specifically calls for a project level climate test in EAs.[5] They called for four key questions to be addressed in the test:

1. Does the project fit within the carbon budget of the sector?
2. Does the project keep us on identified pathways to GHG reduction targets and ultimate decarbonization?
3. What are the social costs associated with climate impacts and how will they be mitigated or compensated, and traded-off in the broader sustainability test?
4. Is the project economically viable if the social cost of its life cycle GHG emissions is internalized?

One of the main consequences of not evaluating or testing the climate implications of energy policies and projects is the inability to gauge a project's effect on Canada's ability to meet international and national climate change commitments and targets. A recent study by David Hughes for the Canadian Centre for Policy Alternatives noted that "projected growth in oil and gas production under several scenarios means that non-oil and gas sectors of the economy would need to reduce their emissions by between 47 per cent and 59 per cent below 2014 levels by 2030 to meet the Paris Agreement commitment."[6] Considering this analysis, a climate test is also necessary to ensure we understand the implications of large-scale energy projects on other sectors of the economy and vice versa. To evaluate these interactions, we need to translate Canada's national target into an agreed upon carbon budget that can be allocated to GHG emitting sectors. The different sectors of the economy can then evaluate the implications of large-scale projects on their share of the budget and plan accordingly.

The expert interviews confirmed the pressing need for a climate test for large-scale energy projects. As one interviewee noted, the development and application of a climate test is long overdue as "government is saying climate is an existential threat; but it is not considering climate implications for long lived infrastructure projects". All interviewees indicated the need for a test, with some specifying the type of test they wanted to see (for example, an economic viability test and/or a carbon budget approach based on climate science) and some indicating that a climate test needs to be applied beyond projects under the NEB's jurisdiction (e.g., to all energy projects, major land use planning and infrastructure projects). One interviewee noted that the test should address both mitigation and adaptation and that a pass/fail type test is less preferable to a test that drives innovation and "carbon competitiveness". Further context provided by the interviewees on the need for a climate test included:

- The current regulatory review practice only assesses the need for a project according to an economic rationale that fails to account for market impacts of policies aimed at restricting GHG emissions. A more legitimate economic needs analysis would include forecasts that assess demand under climate policy scenarios in line with domestic and international commitments

- There is a lot of focus on demand and consumer choice, but most decisions about carbon are at the infrastructure level—for example public transit, expansion of transport infrastructure, and energy systems (e.g. pipelines). Consumers for the most part do not have a choice in these decisions
- We need to be clear about what kind of test we are talking about – we talk about primarily an economic test and do not want to talk about an incremental review of each project
- It is important to consider where the test is taking place: NEB versus within an EA process or a broader policy arena
- There is a need for NEB decisions to take place within a larger policy framework that would address climate change. The absence of integrated climate and energy policy as a guiding framework is problematic for any energy regulator. Similar issues occur with respect to Indigenous consultations. We need an energy strategy that is integrated with the pan-Canadian climate strategy
- The climate test should not just be applied to NEB projects. All areas of federal decision making—plans, programs and policies—should have a climate test

Existing examples of climate tests for large projects or groups of projects

There have been relatively few projects that have been subject to a climate test. As one interviewee noted this type of test "is still in its infancy." Where examples were cited, it was noted that the assessments fell short in evaluating upstream and downstream impacts. Examples noted by interviewees included: the U.S. State Department's GHG emissions assessment of the proposed Keystone XL pipeline; the Trans Mountain Expansion pipeline project which was required to offset GHG emissions; and the Petronas Pacific North West LNG project. Unsurprisingly, the projects deemed to have been subject to some form of test overlap with the projects identified in section 3.2 below as having conducted a climate impact assessment. It is important to note that these "tests" are generally insufficient. For example, one interviewee noted that the Trans Mountain expansion assessment "did not have enough data to measure upstream and downstream impacts. For example, land use change impact data was not sufficient and there were a lot of information gaps especially on externalities."

Some further context provided by the interviewees on examples of a climate test included:

- Existing climate studies do not adequately capture the actual cost of the social and environmental impacts – up and down stream
- Consider the need for an institution to house data and information needed to apply a test. See the work of the Canadian Energy Research Institute (CERI) on an Energy Information Organization for Canada (CEIO) as an example[7]
- Part of the reason we have so few examples of a climate test is due to the way we assess projects. We look at incremental impacts and do not weigh a project against the cumulative impacts of all projects and policies. Assessing how a project helps or hinders climate objectives is where we come up short
- One approach would be to determine Canada's own carbon budget and then use that budget to set the level of GHG emissions to allocate to each sector of the economy based on policies. The burden would be on the project proponent to show consistency with the sector carbon budget
- Tests need to consider direct, indirect and cumulative emissions

Guiding principles for a climate test on proposed major energy infrastructure projects

Using guiding principles is a way to both inform the design of a climate test, as well as a means for determining if the design is robust. By comparing the test to the principles, gaps can be exposed and the test can be improved. The climatetest.org principles can be used in this way and several interviewees cited those principles or similar ones as a way to evaluate a climate test. The above referenced CEN project level questions are designed to be used in a similar way. Some other possible principles or thoughts on principles provided by the interviewees included:

- Alignment with international, national, and provincial climate commitments
- Needs to incorporate the social cost of carbon, which is currently grossly underestimated and missing impacts like forced migration, wars, land use changes, etc.
- Needs to look at impacts but also the distribution of impacts, such as social and environmental justice impacts, in particular on vulnerable communities and Indigenous Peoples
- Needs to include context based measurement, reporting, and assessment relative to climate change impacts, and consider other environmental, economic, and social dimensions
- Assess performance (of projects) on vital capital resources, including natural capital, and consider ecological thresholds
- Looking at impacts is not working – recommend we use amount of emissions contributed to GHG targets and goals as a proxy for impacts. We need to ask if the project will help or hinder the pathway to decarbonization and by how much
- When conducting assessments, identify the scale of the problems we are trying to solve and make appropriate policy commitments. For example, governments have set interim GHG targets that are not adequate to solve the problem of climate change
- Be simple. For example: "Would this project be economically justified in the world that global leaders are trying to achieve when they set climate targets, such as a 2 C limit on temperature increase?"
- Canada needs a long term national carbon budget (e.g., up to 2050) and decisions must be consistent with the budget. To do this, we need to atomize the budget at sector level and no project can be evaluated in a vacuum
- Should be on an economic basis – viability of markets – considering the cost of carbon and climate impacts. Does a project make sense in a 2 C world?
- Whether or not the proponent can make the case that a project is in the long-term interest of Canada
- Needs to look at project effect on carbon sinks e.g., forests, wetlands
- Needs to monitor life cycle emissions on an ongoing basis, rather than a one-time deal
- There needs to be respect, recognition and consideration for Indigenous Peoples and alignment with reconciliation efforts
- Participation of First Nations and Indigenous Peoples as environmental monitors
- Must integrate a scenario assessment into what the emissions implications are of the project (e.g., pipeline). For example, what is the lifetime carbon footprint of a project relative to the carbon budget?
- Needs to be based on a fair-share carbon budget with a stringent emissions reduction timeline

- Needs a trigger threshold for how big a project must be to require a climate test, but always need to do it for long lived major infrastructure projects
- Paris Accord will determine what current consumption (90 million barrels of oil per day) will turn into: flat; increasing; or decreasing. When testing Canadian decisions, the test must link to global supply and demand for the commodity
- Needs to look at the full value chain; from point of production to point of use
    - Opportunities for innovation at all points of value chain
    - If purpose of test it to incent innovation and leverage creative tension, needs to look at full life cycle

3.2 ASSESSING THE CLIMATE IMPACT/CARBON FOOTPRINT OF ENERGY PROJECTS

We found several examples of assessments of the climate impact of new major energy infrastructure projects, although it is worth noting that several people we interviewed could not name a single example. The most prominent examples named by interviewees were related to proposed new oil sands pipelines and projects evaluated under the "Interim Measures for Pipeline Reviews" announced in January 2016.[8] Assessments named by interviewees include:

- U.S. State Department Environmental Impact Assessment of the Keystone XL Pipeline
- Kinder Morgan Trans Mountain Expansion Pipeline
- Enbridge Line 3 Replacement Project
- NOVA Gas Transmission Towerbirch Expansion Project
- Petronas Pacific North West LNG Project
- TransCanada Energy East Pipeline

Table 1 summarizes the results of four studies that quantified the GHG emissions from proposed pipelines. Three of these studies quantified upstream emissions and the fourth focused on downstream emissions. There are significant differences in the scope, boundaries, methodology, assumptions, and results from the three studies on the proposed Energy East pipeline. Of note, the Institut Québecois du carbone (IQC) study estimated more than 2.5 times larger downstream emissions than the Navius/OEB study. This was mainly due to different assumptions about the feasibility of substituting oil by rail for pipelines. The IQC study included technical and political limits on oil by rail substitution for pipelines, whereas the Navius/OEB study resulted in lower downstream emissions because it assumed few barriers to the adoption of oil by rail, at least in part due to assumed higher oil prices. It is worth noting that the IQC study appears to be aligned with internationally accepted GHG project accounting standards such as ISO 14064-Part 2 and the GHG Protocol for Projects.[9]

Table 1: Examples of GHG Emissions Assessments of Pipeline Projects

Example	Upstream Emissions (million metric tonnes CO_2e)	Downstream Emissions (million metric tonnes CO_2e)	Links to Market Dynamics? (Supply/Demand)	Notes
Trans Mountain Expansion (ECCC 2016b)	13 – 15 Mt	Discussed Not quantified	Discussed via oil price scenarios (<$60/bbl., $60-$80/bbl., >$80/bbl.)	Considered incremental emissions to be minimal
Energy East (Pembina 2014)	30 – 32 Mt	Not quantified		
Energy East (IQC 2016)	Not quantified	12 – 32 Mt	Included via economic modelling	Oil by rail alternative is limited by technical and political factors
Energy East (Navius/OEB 2015)	0.7 – 4.3 Mt	4.7 – 12 Mt (Total: 5.3 – 17 Mt)	Included via economic modelling	Assumed oil by rail alternative Assumed high oil prices

What makes for a "good" climate impact assessment?

Several themes emerged from this question. Interviewees addressed both the emissions and economic dimensions of a climate assessment. From an emissions perspective, most interviewees agreed that a "good" climate impact assessment must include both "direct" and "indirect" GHG emissions associated with the project over its full value chain and expected life. In this context, "direct" means GHG emissions from inside the project boundary, and "indirect" means GHG emissions from sources either upstream or downstream from the project. There was some agreement that the indirect upstream GHG emissions should be included in the assessment, and less consensus about whether and how indirect downstream GHG emissions should be included. At least in part, this was because interviewees were not familiar with how to include indirect downstream GHG emissions.

It is important to distinguish between assessing the climate impact/carbon footprint of a project and a climate test. After the climate impact or carbon footprint of a project has been assessed, it needs to be compared against something (i.e., a "benchmark") to qualify as a climate test.

A "good" climate test needs to support collective action on climate and avoid the "tragedy of the commons". This challenge is highlighted in the Table below.[10]

Table 2: Avoiding the Tragedy of the Commons

"... if oil sands production were to not occur in Canada, investments would be made in other jurisdictions and global oil consumption would be materially unchanged in the long term in the absence of Canadian production growth." - **Environment and Climate Change Canada**, Trans Mountain Expansion Project: Review of Related Upstream Greenhouse Gas Emissions Estimates	Simon Donner described this as typical of the tragedy-of-the-commons analysis in which, if everyone in the world decides that the impact of *their* contribution is irrelevant in a global context, then everyone will continue to expand. As Donner says, "In sum, the analysis in the Environment and Climate Change Canada review is mathematically inconsistent if applied broadly." - **Simon Donner**, as reported in Report from the Ministerial Panel for the Trans Mountain Expansion Project

A "good" climate test needs to be consistent with climate science. The test must determine if a project fits within Canada's carbon budget as reflected in our international commitments under the Paris Climate Agreement and national and provincial climate policies and reduction targets. The project assessment needs to consider cumulative impacts from both the project and the rest of the economic sector.

In addition to testing if a project fits within Canada's carbon budget, an effective climate test needs to test the economic viability of a project using robust assumptions (e.g., carbon prices, oil prices) and scenarios (e.g., global supply and demand for oil) consistent with a carbon constrained world and Canadian climate policy and commitments.

Additional characteristics of a "good" climate impact assessment mentioned by interviewees include:

- Emissions evaluations need to be enshrined in law so that they form legally-binding evidence and can become the basis on which to legally reject or approve a project
- Public input, independent and trustworthy science, and a transparent and meaningful engagement process
- Can't use "significance" (e.g., amount of project emissions vs. Canada's total emissions) as a test. Instead, a sustainability approach is needed that compares a project against alternatives and assesses which options give the best outcome and moves the project closest to a low-carbon future. Proponents must move to the option that offers the best pathway to decarbonisation

How can upstream and downstream climate impacts of a project be captured in a climate test?

Upstream impacts are being incorporated via the Environment and Climate Change Canada Upstream GHG methodology.[11] Some interviewees thought this methodology was acceptable, and others pointed out gaps including that it does not include all upstream GHG emission sources such as land use change, grid electricity, and upstream burdens from fuel and diluent production and transportation.[12]

Several interviewees suggested that the downstream impacts of a project could be captured via the economic dimension of the climate test as discussed above, incorporating a price on carbon and the impacts of climate policies on global supply and demand for fossil fuels. There was some difference in opinion regarding the allocation of, and ease of, capturing downstream emissions.

A few interviewees questioned the need to assess upstream and downstream impacts, especially considering the current NEB mandate and how to use the assessment results to improve proposed projects. These comments highlighted the need to clarify the goals of a climate impact assessment, and indicated a need to distinguish between high level climate policy discussions and individual energy project assessment.

Additional comments from interviewees on how upstream and downstream climate impacts can be captured in a climate test include:

- Relates to the need for higher level strategic guidance that came out of a broader conversation that came out in the EA modernization review. The burden placed on an individual project is unfair for looking at upstream and downstream emissions if higher level policy guidance is not in place
- The need for a "wells to wheels" analysis. To be competitive, project proponents do not want to be on the high side of that analysis as it would create stranded asset risk that can have public consequences. Transparency is a good thing and can be used to drive innovation
- Take a life cycle or value chain approach. Science based targets are moving in this direction, but the tricky bit is avoiding double or triple counting. Isolating the project in question is the main challenge
- Existing ECCC method does capture upstream emissions reasonably well. Downstream emissions have been accounted for by other groups (e.g., IQC (2016)). Climate change requires project emissions significance (e.g., amount of emissions) to be evaluated relative to a fixed national carbon budget. The problem is there is no actual carbon budget
- One interviewee suggested we shouldn't care about downstream climate impacts if these occur in another country. We should just be interested in whether a given fossil fuel supply project is economically consistent with global climate commitments to which our country adheres
- Other interviewees felt both upstream and downstream need to be captured as downstream emissions generally represent 80 per cent of the total footprint. The idea of exporting emissions is important as climate change does not respect borders
- Having both upstream and downstream emissions accounted for makes sense to determine impacts of projects. Downstream is easier to account for, e.g. fossil fuel burning. How to account for this is known
- Need to assess upstream and downstream emissions to help address the conflict between the interests of producers and consumers
- Capturing downstream emissions is difficult because so many things could happen downstream. It is difficult to make it meaningful
- An economic test can help capture the downstream impacts because it internalizes downstream emissions through assessment of markets and supply and demand
- Life cycle assessment addresses both upstream and downstream impacts

Given the NEB mandate for lifecycle regulation of energy projects, how does a climate impact assessment relate to the evaluation of the economic need for projects?

Several interviewees see this as a core issue, as currently NEB economic needs assessments are not adequately factoring in climate policy and impacts. Using an economic test that factors in information on the effects of emissions reduction targets and the Paris Agreement on global oil demand and supply was seen as the way to link the economic need test and assessment of climate impacts. One interviewee noted that this will be supported by the pan-Canadian framework on clean growth and climate change, which will result in a carbon price everywhere in Canada.

Economic need for projects must look at all economic parameters, of which the price of carbon will be one. Others noted that future scenarios based on GHG reduction commitments and climate science are critical to pricing carbon, and those scenarios should look at "past trends, hard commitments made, and policies on the table." This linkage will also be supported if we can better define economic need. As one interview noted, the question "economic need compared to what?" needs to be answered. A broader perspective was that economic need has to be expanded to a sustainability test that includes a climate change test but also economic benefits and distribution of wealth and social and health risk benefits and impacts. This would require policy guidance on how government should make a decision when trade-offs occur. One interviewee cautioned that we need to be careful about discounting the price of our oil.

Some additional thoughts on how a climate impact assessment relates to the evaluation of the economic need for projects include:

- How much is done by the NEB and how much is done by the Canadian Environmental Assessment Agency? One interviewee leaned towards the NEB doing the economic test, with the NEB's mandate modified to ensure consistency with a 2 C world
- We need better guidance on scenarios for economic and market assessment: price of carbon, price of oil, and demand and supply. The NEB does its own energy market assessment as part of its advisory function, which often becomes evidence at energy project review hearings. The NEB could do a better job of incorporating carbon prices and other climate policies into these assessments
- It depends on how you define "economic need". We have an economic need for transportation, but it doesn't have to be fossil fuel based transportation
- We need to balance economic need with the climate test and be able to say, "We're open to approving the project, but the proponent has to show it won't break the carbon budget"
- Testing of economic need for projects should look at carbon competitiveness as well as value added dimension. Yes, there are carbon/climate impacts, but also economic value created that must be considered

3.3 BENCHMARKS AGAINST WHICH TO COMPARE THE CLIMATE IMPACT OF ENERGY PROJECTS

The most common benchmark response was to compare project emissions against a carbon budget for each economic sector based on climate targets and commitments. The Paris Agreement was referenced in this regard, as well as the need for climate change mitigation scenarios that are consistent with climate science. One interviewee noted that we need a context based carbon metric and, as climate science evolves and improves, we would update the metric with the latest and greatest climate change mitigation scenarios (see section 3.4). It was noted that the International Panel on Climate Change (IPCC) is working at what a 1.5 C future would look like.[14]

Some interviewees focused on the benchmark for an individual project (e.g. comparison to best in class within the same sector), but it was noted by one interviewee that carbon intensity of production is not a good benchmark for decarbonisation scenarios and the "climate doesn't care about intensity". Some interviewees pointed to a broader need for an aligned energy and climate policy – a strategic pathway to decarbonisation – to provide the benchmark. The current policy environment provides a variety of benchmarks/targets (e.g. the Alberta oil sands emissions cap, 30 per cent below 2005 levels by 2030 national target, provincial GHG reduction targets), but these are not aligned, and some provinces have targets and others do not.

Some other interviewee comments of note regarding benchmarks include:

- Individual proponents should not be held accountable for bigger decisions on tough questions if Canada has not figured out a decarbonization pathway
- The climate test might end up asking all companies to predict emissions, follow up on that prediction, and then offset those emissions. The approach could use performance of different companies to incentivize more efficient behavior and use this benchmark to leverage better projects
- Need to know how do we benchmark against best practices elsewhere. Are we leaders, laggards, or in the middle of the pack? If a company is a leader, then it has more leeway to do stuff (e.g., reduced regulatory burden, accelerated permitting). If a company is a laggard, it is encouraged to go elsewhere (e.g., outside Canada). The principles of the Canadian Oil Sands Innovation Alliance (COSIA) could be a helpful model if this approach were taken
- Not really interested in benchmarks. The key is economic consistency with our global climate commitments
- Benchmark against a set of global benchmarks by evaluating the oil system at a global scale, including looking at major production basins such as the Middle East, Bakken, North Sea, Offshore, Onshore, etc.

3.4 EXAMPLES OF CLIMATE TESTS

The research and interviews revealed some examples of climate tests. Two economic viability examples and two carbon budget examples are presented below.

3.4.1 ECONOMIC VIABILITY APPROACHES

"Economic viability" approaches to a climate test ask the question "Is the project economically viable in a carbon constrained future?" Two examples of this approach are discussed below.

Jaccard et al. (2017) developed an approach that models global oil prices and costs using a carbon price that rises so that emissions stay within the 2 C carbon budget. This rising carbon price creates higher costs for higher emission sources of oil so that their total production costs rise relative to lower emission sources. The authors' oil pricing model accounts for falling demand, costs differentiated by oil source due to different cost structures and carbon intensities, and the behavior of the Organization of the Petroleum Exporting Countries (OPEC) to maintain market share. They provide the following overview of their approach:

> *[Figure 1] summarizes the key steps of our oil price and climate test model. On the left, global EEE [energy-economy-emissions] models, with varying degrees of regional, sectoral and energy industry detail, simulate the energy-economy evolution over several decades in response to a carbon price that rises so that CO_2 emissions stay within the 2 C carbon budget. The rising carbon price triggers investments to abate CO_2 among oil sources. These investments*

increase with the rising carbon price until, at some price level, all production emissions are eliminated. The rising carbon price and / or CO_2 abatement costs are added to non-carbon production costs to become the total life-cycle production costs for each category of oil source. With the rising carbon price, higher emission sources, such as the oil sands, see their total production costs rise relative to lower emission sources.

Simultaneously, the global EEE models forecast the rate at which the demand for oil declines due to the rising carbon price which is applied by governments as a carbon tax on gasoline, diesel, and other oil products. This declining oil demand combines with the rising production costs of oil producers to determine the price of oil in future periods according to a formula that reflects: (1) the heterogeneity of production costs and multiplicity of marginal producers in the current global oil market and (2) the upward influence on oil prices caused by the long-run under-investment strategy of the lowest cost oil sources, these represented collectively by OPEC.[15]

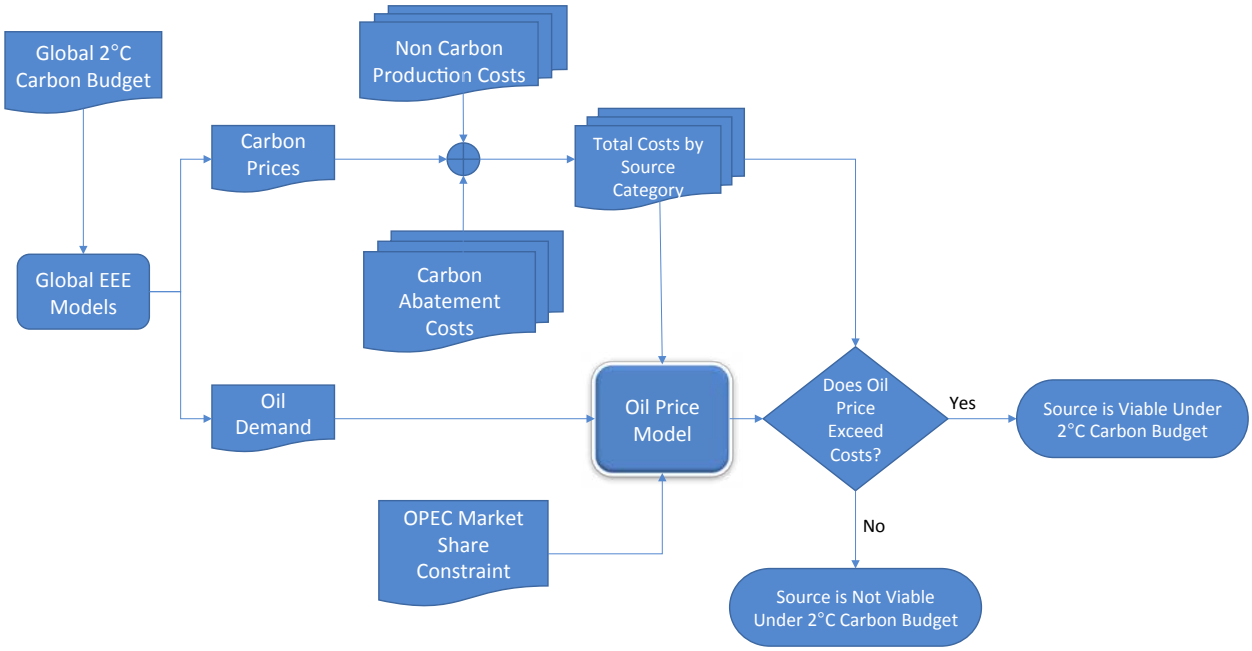

Figure 1: Summary of Oil Price and Climate Test Model (Jaccard et al. (2017)

According to the authors, applying this approach to the oil sands results in a less than 5 per cent probability that new investments to expand oil sands or oil pipeline capacity from the oil sands are economically viable:

Incorporation of key uncertainties in the model enables us to estimate the likelihood that a new investment of a given category of oil source would be economically viable under the 2 C carbon budget. In our case study application to the oil sands, we find less than a 5% probability that new investments to expand oil sands output are economically viable over the next three decades under the 2 C constraint. This also means that investments to expand oil pipeline capacity from the oil sands are also inconsistent with the 2 C carbon budget.[16]

Bošković and Leach (2017) took a different approach to answer the economic viability question. They apply the social cost of carbon to a "bottom up" cost model of oil sands projects and compare that to a range of oil price forecasts from various sources (e.g., market forward pricing curves, Alberta Energy Regulator, the U.S. Energy Information Administration (EIA), industry consultants, NEB). They conclude that, even with optimistic future price forecasts, new oil sands projects are unlikely to be economically viable if oil sands producers bear a large share of carbon costs:

We evaluate the impact of imposing the social cost of carbon on new oil sands projects. Using data from recent oil sands projects and estimates of the social cost of carbon, we estimate the minimum prices required to make these projects economically viable. Our results indicate oil sands are a marginal resource before they incur any carbon costs. The viability of oil sands then depends on the incidence of the social cost of carbon, but projects are not likely viable, even under optimistic future price forecasts, if producers bear most of the costs from life-cycle emissions.[17]

Although they come to similar conclusions, these two approaches have important differences including:

- Carbon Price Assumptions
  - Jaccard et al. assume a rising carbon price consistent with a 2 C carbon budget, derived from one of the most frequently cited EEE models (EMF 27)
  - Bošković and Leach use the social cost of carbon developed by the United States Environmental Protection Agency
- Other Cost Assumptions
  - Jaccard et al. use published cost estimates for different oil production sources from the literature (i.e., International Energy Agency (IEA), Aguilera (2014), and CERI)
  - Bošković and Leach use a "bottom up" cost model parameterized to match costs of recent mining and in-situ oil sands projects
  - Bošković and Leach include the costs of royalties and taxes for oil sands producers
- Oil Price Assumptions
  - Jaccard et al. develop an oil pricing model using aggregate oil demand from EEE models, disaggregated oil production costs by oil source category, and OPEC market share constraints
  - Bošković and Leach use published oil price forecasts from various sources (i.e., forward price curves, Alberta Energy Regulator, EIA, Industry consultant, NEB, IEA, McGlade and Ekins)
  - Bošković and Leach use more granularity on the price of bitumen obtained by producers vs. the global price of oil
- Economic Viability Test
  - Jaccard et al. compare modelled oil prices to total costs (including capital costs) and assume the oil price must exceed total costs for an oil production source to be economically viable
  - Bošković and Leach calculate a project's Internal Rate of Return (IRR) and assume it must exceed a 10 per cent threshold for the project to be economically viable

3.4.2 CARBON BUDGET APPROACHES

"Carbon budget" approaches to a climate test ask the question "Does the project fit within the carbon budget?" Two examples of this approach are discussed below.

Donner developed an approach to compare emissions from expanded oil sands production with Canada's allocated share of the global carbon budget as determined by the IPCC. He created two carbon budget scenarios for Canada, one based on our present-day share of global emissions (2 per cent), and the other based on our share of global population (0.5 per cent).

For the higher carbon budget based on our present-day share of global emissions, "… oil-sands emissions over 30 years of operation of the expanded Trans Mountain pipeline would consume 11 per cent to 13 per cent of Canada's remaining carbon allotment… The national emissions targets for the years 2030 and 2050 are roughly compatible with this "generous" share for Canada."

For the lower carbon budget based on our share of global population, "Oil-sands emissions locked in by the Trans Mountain pipeline expansion could then claim 40 per cent to 49 per cent of our much smaller allotment. The fraction increases to 49 per cent to 63 per cent with both the LNG facility and the Line 3 upgrade, requiring other economic sectors to make dramatic emissions cuts if Canada is to stay within its carbon budget."[18]

McElroy has developed a context-based carbon metric to assess if a proposed decarbonization pathway is aligned with climate science. McElroy's context-based carbon metric includes (1) a "not to exceed" threshold, or carbon budget consistent with preserving a safe climate system and (2) a "fair, just, and proportionate" approach to allocating the carbon budget amongst emitters.

The carbon budget in this approach is consistent with a science-based threshold and aligned with the Paris Agreement to limit warming to "well below 2 C". Decarbonization pathways (i.e., emission trajectories) are assessed relative to a rigorous mitigation scenario (SSP1-2.6). This mitigation scenario allocates reduction burdens unevenly throughout the world according to where emitters are located and the development status of the economies involved. A higher mitigation burden is placed on Organization for Economic Co-operation and Development (OECD) countries, such as Canada.

A choice of carbon budget allocation approaches is provided to apply the context-based carbon metric. A per capita approach is designed for human populations at any scale of interest (e.g., cities, regions, countries). A "contribution to GDP" approach uses GDP as a proxy for economic contribution and corresponding entitlements to use natural capital (e.g., to emit GHGs). The rationale for this allocation scheme is that entities "… that are making valuable contributions to society should be entitled to use corresponding shares of limited natural resources as long as they are fair, just and proportionate".[19]

The context-based carbon metric provides a rigorous and transparent assessment of a proposed decarbonization pathway or emission reduction target against the allocated sustainable carbon budget for an entity of interest (e.g., country, province, industry sector).[20]

3.4.3 ALLOCATING THE CARBON BUDGET

A key challenge for any carbon budget approach is how to allocate the carbon budget. The allocation approaches proposed by Donner and McElroy are discussed above. Boothe and Boudreault proposed three ways to allocate Canada's carbon budget amongst the provinces and territories. They include an "egalitarian" approach based on population, a "historical" approach based on current share of Canada's emissions, and an "efficiency" approach based on a national

carbon price consistent with attaining Canada's target level of emissions. The provincial and territorial carbon budgets using each of these approaches is compared against each region's 2020 GHG emission reduction target in Figure 2.

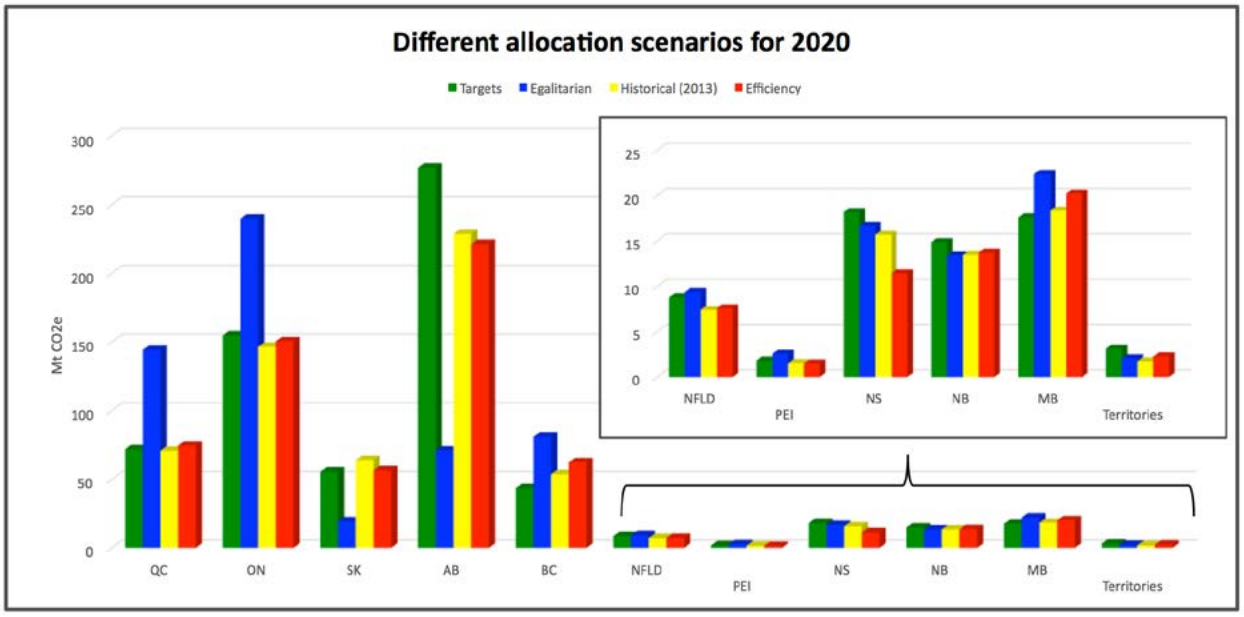

Figure 2: Example Carbon Budget Allocation Scenarios by Province (Boothe and Boudreault (2016a))

Booth and Boudreault provide the following discussion and conclusions for their analysis:

> *Focusing on the four largest-emitting provinces (British Columbia, Alberta, Ontario and Quebec) we see first that under the egalitarian approach Ontario, Quebec and British Columbia all receive allocations greater than their announced 2020 targets. In contrast, Alberta's allocation is substantially below its target. This result comes about, in part, because Alberta has both the largest emissions and smallest population of the four largest emitters, and because of the lack of ambition in the target set by the previous Alberta government.*
>
> *Looking next at the historical approach, we see a closer alignment between allocations and provinces' own targets. Interestingly, the efficiency approach shows a similar pattern, despite the fact that it is based on a very different rationale.*
>
> *What can we learn from this illustration? First, while British Columbia, Ontario and Quebec would minimize their burden by supporting the egalitarian approach, we know that they have already set targets for emissions reductions that are much more ambitious and more closely aligned with the historical and efficiency approaches. Alberta would clearly prefer the historical or efficiency approaches over the egalitarian approach. Finally, with its interest in minimizing the overall cost of burden of adjustment, the federal government is most likely to prefer the efficiency approach. This suggests that the federal government and four largest emitting provinces may have a lot in common when it comes to how to share the burden of meeting our GHG targets.*

This is not to say that there is not hard bargaining ahead. What climate change actions will be chosen and how they will be implemented will be at least as challenging as sharing the burden of transforming to a low-carbon society. However, our illustration suggests that if there is a (political) will, there is room to agree on how to reasonably share the burden of reaching Canada's 2030 target.[21]

Some interviewees speculated that it could be possible and potentially useful to develop a carbon budget allocation scheme using an auction approach like those used by cap-and-trade emission trading systems. This would have the advantage of harnessing market mechanisms and allocating carbon budgets to the highest value use.

One allocation challenge indicated by interviewees is how to preserve future claims against the carbon budget, especially as the annual carbon budget declines. For example, a future project may be proposed that is significantly more "carbon efficient" than existing infrastructure. However, if the carbon budget for a sector is already fully subscribed, there may be no room for new projects that would lower the overall carbon intensity of a sector.

3.5 OPERATIONALIZING A CLIMATE TEST

To operationalize the climate test one needs to think about the type of projects it would be applied to, when in the project approval process it should be applied, and what information and expertise is required to support the effective application of the test. Perhaps the most challenging aspect is how a federal test would align with provincial climate policy and carbon reduction commitments. Interviewee responses on each of these aspects are summarized below.

What kind of projects should be subject to a climate test?

In general, most interviewees suggested projects that exceeded an emissions threshold should have a climate test applied. This view was not unanimous, with some suggesting all NEB projects would need to have the test applied and it was also suggested that the climate test would have to be applied/expressed across the different parts of Canada's regulatory processes. One interviewee noted the threshold should be whether the project aligned, or not, with pathways to achieve climate targets. The idea of applying the test in relation to the size of the capital investment was mentioned. It was also suggested that innovative projects (e.g. lower carbon intensity than existing projects) could be fast tracked in some way (e.g., reduced regulatory burden).

Some interviewees moved beyond NEB projects to note that if Canada is serious about achieving the Paris agreement, all fossil fuel energy projects as well as large scale infrastructure, industrial projects, and regional and urban plans would need a climate test. It was also suggested that criteria based on agreed upon guiding principles need to be developed and applied to select the projects that would undergo a climate test.

When in the project approval review process should a climate test be applied?

Early in the application/project approval/permitting process was the most common response to this question. It was noted this is straightforward for a regulated monopoly (e.g. pipelines) and could be applied to "new natural gas pipelines, new LNG facilities, new coal ports or even perhaps new coastal tanker traffic in Canadian waters. But, if it is not a natural monopoly regulated by the NEB or federal port authorities or using Canadian national waters for transport, it gets a bit trickier". This would bring up federal-provincial jurisdictional issues.

It was also noted that if a "clear carbon budget framework is in place, proponents should be able to self-select away from projects that would not easily fit within it." A few interviewees expressed the view that the climate test should happen as part of the economic needs analysis. One interviewee noted this would happen "during a strategic-level EA as soon as the project proposal is received by the regulator." There were relatively strong views that a climate test should be applied outside and parallel to the NEB process and the results fed into the NEB review. This would be a two-stage review – Strategic EA level review (carbon budget test) and a project level review (expanded economic viability test).

One interviewee noted the design stage is where there is the most leverage to optimize a project. Under the current system, project constructors are rewarded for spending less capital but operators pay the price (e.g., constructing a less expensive project may result in less energy efficient and more carbon intensive operations). This can occur even internal to firms that are structured in way that often no one is trying to optimize efficiency over the full life cycle of projects. This is particularly true when engineering is delegated to outside firms. A carbon price is not enough to overcome this.

What information would be required to support a climate test?

Several different perspectives arose around this information question. There are two aspects to this that interviewees touched on. One aspect is the type of information needed and the second aspect is where the information should be created and housed.

Regarding the types of information needed, a robust economic model would be necessary for the future demand and prices for oil, coal, and gas. According to Jaccard such a model would be a long run global energy-economy-emissions models that incorporates key uncertainties such as the effect of a 2 C carbon budget on carbon prices and oil consumption demand.[22] In addition to economic information requirements, there is a need for a national carbon budget based on a fair share of the global budget in line with the Paris Agreement. The Canadian carbon budget would need to be further broken down by sector. Another key information need is guidance on what constitutes consultation with Indigenous Peoples in terms of Free, Prior, and Informed consent. As well, information on how a project will impact hunting, harvesting, and access to sacred areas and how it might infringe on aboriginal rights is required.

Other recommendations on information to include in the test and supporting models/analysis include:

- Current and future economic, environmental and social impacts
- Energy supply and demand forecasts and other market trends
- Non–conventional data such as the effect of "prosumers" on demand (prosumers are energy consumers who also produce their own energy, e.g. electric vehicles charged by home solar)
- What are the impacts of stranded assets and the consequences of overbuilding?
- Phase-out of domestic and international fossil fuel subsidies
- Consequences of not meeting demand (underbuilding)
- Information is needed on impacts on Indigenous Peoples, although this might be separate from the climate test
- GHGs by project operating at full capacity over the lifetime of a project (from proponent). Requires a fixed time for lifetime of a project and should also report emissions by year

- From government: transparent information on how the carbon budget is being developed
- Details on the carbon budget allocation

Regarding who should be collecting the information to support a climate test, a variety of perspectives were put forward. Some interviewees felt that the NEB and government departments and agencies have, or can create, the needed information, while others pointed to the need for an independent and objective energy information agency. One interviewee suggested that for the economic forecasts and modeling the Government needs to "own it," but, similar to Bank of Canada forecasts, they would develop the forecast in consultation with experts from a range of stakeholder groups (e.g., financial institutions, industry, think tanks).

What expertise would be required to support a climate test, and where is that expertise currently available?

In general, interviewees indicated that the expertise to develop and apply a climate test is available in Canada or internationally. In Canada, this expertise is housed within the NEB and various federal departments (e.g. ECCC) and agencies (CEAA) as well as in provincial regulatory bodies, consultancy firms and academia. As noted previously, some interviewees indicated the need to better coordinate existing expertise while others thought a dedicated agency or a centre of excellence would be a better way to organise the expertise. The client for this latter approach would be government and proponents, and it was noted that a dedicated group or agency would increase public confidence in the information being used by decision-makers. One interviewee noted that the existing expertise needs to be empowered in the process to ensure that the needed information is considered properly. Specific types of expertise noted included:

- Energy emissions modelling
- Real world energy market expertise
- Carbon budget expertise as well as expertise on how to handle non-CO_2 emissions
- Scientific experts on how to handle non-CO_2 emissions
- Context based carbon metrics and indicators
- Data on broader social, environmental and economic impacts and benefits
- Qualitative information held within traditional knowledge holders/keepers/elders. It was noted cooperation with these knowledge keepers is critical due to their understanding of knowledge and stewardship of the land
- First Nations legal scholars and existing environmental monitors in First Nations communities should be involved
- Ideally, Canada should have a Sustainability Agency that would comprise elements of ECCC's and CEAA's current expertise, and may also include elements of expertise from the NEB, Transportation Safety Board, Department of Fisheries and Oceans and others
- Ultimately, the underlying theory is that these projects should be aimed at assessing the impact on human well-being
    - Human well-being literature tells us that to achieve and maintain human well-being we need to maintain stocks of resources or "vital capital"
    - Analysts need to have a good working understanding of capital theory – conceptual and practical means of quantifying them

- The way they do it is to specify the carrying capacity of capital. Carrying capacity literature has a lot to say about this, and a lot to offer

How can a federal climate test be aligned with provincial climate policy and carbon reduction commitments?

This question proved the most challenging for interviewees to address. It was noted that having an agreed upon "global" economic viability test accepted by the federal government and provinces would support application of the climate test. The pan-Canadian framework on clean growth and climate change was noted as a step in the right direction in terms of convening government decision-makers to build consensus, but more work is needed to reconcile constitutional differences between federal and provincial governments. A lack of reconciliation will result in jurisdictional infighting and challenges in gaining agreement on how to divide carbon equitably amongst provinces and economic sectors. The regulatory, economic and political value of an upfront consensus on the strategy and budgets (that is not subject to changes in government) was also noted as critical for the effective application of a climate test. If this does not occur, there could be inconsistency between federal carbon budgets and provincial carbon policies. For some, the lack of an overarching integrated energy and climate change strategy is a key barrier to federal-provincial alignment as well as a challenge for the NEB. One interviewee noted the absence of a national strategy means the NEB gets "thrown under the bus" for not addressing issues that are outside their mandate. It was also noted that the jurisdictional responsibility for emissions varies. For example, some downstream emissions are within the purview of provincial regulatory bodies.

One interviewee raised the benefits of having an independent expert advisory committee with representative experts that could provide oversight on the policy aspects and targets (e.g., carbon budget) and review carbon budgets as changes in technology and science develop. One interviewee indicated a need to look to developments in international metrics and indices as well as broader reporting requirements such as reporting on progress on the United Nations Sustainable Development Goals.

3.6 OTHER THEMES

The research and interviews raised several issues that speak to the need for consultation and consensus building around the design and application of a climate test. These "process" considerations are critical for building a common vision and trustworthy information foundation to support agreement on a climate test. Some insight from the interviewees on this and other issues to consider include:

- At the end of day this is about public confidence in decision making in an era of fundamental change in technology and society.[23] The change could be bad, and it could be good. People don't get that we are in an age of a cultural and technological transition and dislocation
  - Politicians are afraid to say this
  - This is a time of adjustment – we need to get this
  - It is going to hit us hard; sooner or later
- The politics around energy projects create challenges. We also need to remember the importance of engaging with First Nations – which is mostly the responsibility of the federal government – but also has provincial elements. Governments leading on climate action are municipalities, which do not have constitutional status. The challenge and blessing is that

climate change affects us all, from infrastructure to stricter regulations on emissions, to end uses of products. We need all hands on deck

- The current approach where the federal government sets the GHG reduction standard (needs to be rigorous) and lets provinces have flexibility in meeting it is a reasonable approach in so far as the provinces are willing to participate. If provincial standards are higher that is OK
- Need to accelerate pace and scale of innovation. A focus on carbon competitiveness reframes the debate. To do this we need deeper engagement with project design folks who have opportunity to make things carbon competitive at early design stages
- Preference is for Natural Resources Canada or ECCC to develop and apply a climate test on behalf of NEB, but it is difficult to understand the burden that would create. We could ask why the burden should be on government, but that needs to be weighed against conflict of interest inherent in a proponent doing the assessment

4. CONCLUSIONS

Based on the evidence collected by this study via research and interviews, we reached the following conclusions.

- The lack of a climate test puts Canada's climate change commitments at risk and poses a major business risk for project proponents
- A climate test needs to address both the emissions and economic dimensions of assessing major energy infrastructure projects and other proposals
- The economic part of a climate test can help to capture the downstream impacts of a project by considering fossil fuel supply and demand in a carbon constrained world
- A climate test needs to be applied beyond projects that fall within the NEB's mandate to a wide range of proposed projects, programs, and policies
- There is an urgent need to separate climate policy discussion from the individual project assessment process[24]
- Achieving consensus on the final design of a climate test and how and where it should be applied requires further consultation and dialogue
- A major bottleneck in the development of a climate test is the lack of a comprehensive carbon budget allocated at the economic sector level
- The lack of an overarching integrated energy and climate change strategy is a key barrier to federal-provincial alignment on climate policies, programs, and tools (e.g., a climate test) as well as a challenge for the NEB
- Federal Provincial alignment is critical for both the development of carbon budgets and establishing procedure for the application of the climate test to the full range of policies and programs that affect Canada's current and future GHG emissions

5. RECOMMENDATIONS

Below are our primary recommendation arising from the research and interviews conducted for this study.

5.1 INCLUDE A 2-PART CLIMATE TEST IN THE EVALUATION OF MAJOR ENERGY PROJECTS

PART 1: Include a climate test based on the economic viability of projects in a carbon-constrained world

This test would determine if the project is economically viable in a carbon constrained world. For a project to be economically viable, the long-run market price for the products it produces, refines or transports (e.g., oil or other fossil fuels) needs to exceed its long-run cost of production. This part of the test would be based on best available global energy-economy-emissions models that include the future price of carbon and future supply and demand for oil and other fuels. This test "fits" within the existing NEB mandate, but it requires a broader analysis of economic viability that considers market constraints and the effects of domestic and international climate policy on the price of fossil fuels and production costs, among other factors. For example, for crude oil pipelines, the test could be applied as part of the National Energy Board Act's (NEB Act) provisions related to the existence of markets and economic feasibility assessment (section 52-2 b-c).

Basing this part of the test on future carbon prices, albeit those that incorporate a more inclusive consideration of costs, allows the test and its result to be accessible to decision-makers. It will require a strong consensus on the energy-economy-emissions model(s) and their associated assumptions and parameters. The test would require regular updating of data and assumptions to reflect new policy and/or market conditions.

Two examples of economic viability climate tests are provided above in section 3.4 of this paper. Based on those examples, some of the important dimensions of an economic viability climate test (and how they are addressed in the two example studies) include:

Carbon Price Assumptions

- As global decarbonization policies gain traction, carbon prices are expected to rise
- Jaccard et al. assume a rising carbon price consistent with a 2 C carbon budget, derived from one of the most frequently cited EEE models (EMF 27)
- Bošković and Leach use the social cost of carbon developed by the United States Environmental Protection Agency

Other Cost Assumptions

- There are a variety of approaches to estimating other costs. For specific project proposals, specific project cost estimates would be available and appropriate. For groups of projects or entire sub-sectors (e.g., oil sands), averages need to be derived. These could come from the literature per the Jaccard et al. study, or they could be derived from a "bottom up" cost model per the Bošković and Leach study
- Jaccard et al. use published cost estimates for different oil production sources from the literature (i.e., IEA, Aguilera (2014), and CERI)
- Bošković and Leach use a "bottom up" cost model parameterized to match costs of recent mining and in-situ oil sands projects
- Bošković and Leach include the costs of royalties and taxes for oil sands producers

Oil Price Assumptions

- As climate and decarbonization policies become more rigorous, demand for oil is expected to fall relative to the "business as usual" (BAU) scenario, and supply will respond depending on the options available to, and motivations of, various suppliers around the world
- Jaccard et al. develop an oil pricing model using aggregate oil demand from EEE models, disaggregated oil production costs by oil source category, and OPEC market share constraints
- Bošković and Leach use published oil price forecasts from various sources (i.e., forward price curves, AER, EIA, Industry consultant, NEB, IEA, McGlade and Ekins)
- Bošković and Leach use more granularity on the price of bitumen obtained by producers vs. the global price of oil

Economic Viability Test

- There are different ways to test the economic viability of a proposed project or group of projects
- Jaccard et al. compare modelled oil prices to total costs (including capital costs) and assume the oil price must exceed total costs for an oil production source to be economically viable
- Bošković and Leach calculate a project's Internal Rate of Return (IRR) and assume it must exceed a 10% threshold for the project to be economically viable

PART 2: Include a climate test based on carbon budgets

This test would determine if the project fits within a pre-defined carbon budget. An example is provided in Figure 3. This requires a determination of national and sector carbon budgets in line with Canada's 30 per cent GHG emissions reduction target by 2030 (from a 2005 base year), as well as the Paris commitment to limit global warming to 2 C and strive for 1.5 C. This test would be conducted outside the NEB at a strategic level, perhaps within a revised environmental assessment process or at a political level where broader stakeholder interests and sustainability impacts and benefits are evaluated.

This test helps ensure alignment with climate science and is relatively easy to explain. A key challenge will be determination of, and negotiation on, the allocation of the national carbon budget to the sectoral level. This approach requires determination of the budgets for energy projects that fall within the NEB mandate as well as those outside that mandate. It also requires allocation of a carbon budget for all non-energy sectors.

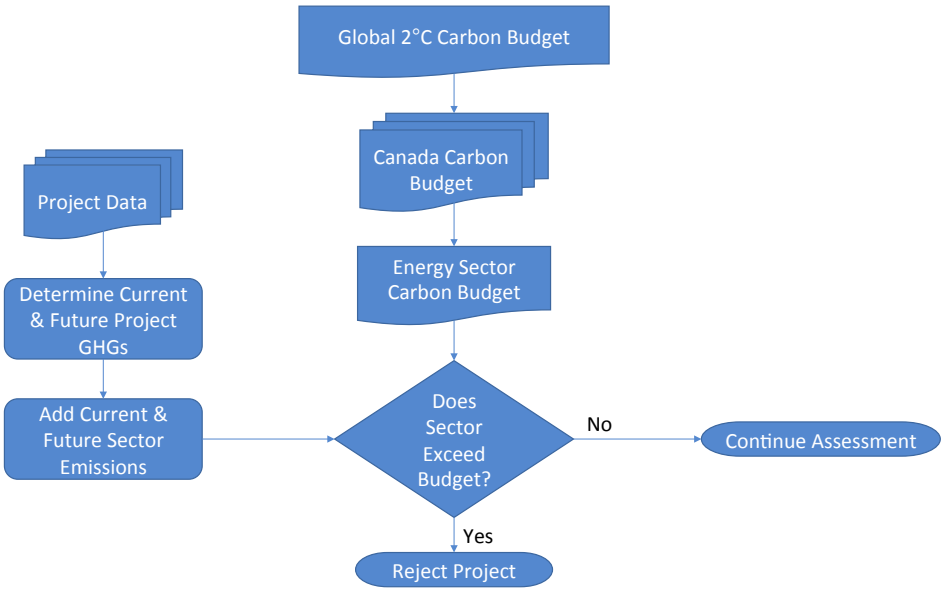

Figure 3: Example Carbon Budget Part of Climate Test

Two examples of carbon budget climate tests are provided above in section 3.4 of this paper. Based on those examples and Figure 3, some of the important components of a carbon budget climate test with examples include:

Current and Future Project GHG Emissions

- This should include direct and indirect (upstream and downstream) GHG emissions associated with a proposed project or group of projects
- Upstream GHG emissions could be estimated using the ECCC (2016b) methodology or a new version of that methodology incorporating suggestions on how to improve it (e.g., see Section 3.2 above)
- Downstream GHG emissions could be estimated using economic modelling, such as that used by Navius/OEB (2015) or IQC (2016)

Current and Future Sector GHG Emissions

- To support a carbon budget climate test, the current and future project GHG emissions need to be added to the current and future sector GHG emissions so that they can be compared against the appropriate sector carbon budget
- This would require information and assumptions about existing and planned activity and emissions for the entire sector that the proposed project is part of

National Carbon Budget

- The current and future carbon budget for Canada needs to be aligned with a global "well below 2 C" carbon budget and be consistent with Canada's commitments (e.g., 2030 GHG emission reduction target, 2050 GHG emission reduction target)
- Donner proposes two methods of deriving a carbon budget from the IPCC global carbon budget. One uses our present-day share of global emissions (2 per cent), and the other is based on our share of global population (0.5 per cent)

- McElroy's context-based carbon metric allows for developing a Canada carbon budget using either a per-capita approach or a "contribution to GDP" approach

Energy Sector Carbon Budget

- The current and future energy sector carbon budget needs to be aligned with the "all of Canada" carbon budget and the carbon budgets for all other non-energy sectors
- McElroy's context-based carbon metric derives sustainable carbon budgets for entities such as economic sectors using a "contribution to GDP" approach

Allocating the Carbon Budget

- Challenges and potential solutions for allocating Canada's carbon budget are discussed above in Section 3.4.3.
- In addition to the approaches suggested by Donner and McElroy, Boothe and Boudreault suggest three allocation alternatives based on equity, history, or efficiency

A comparison of the two parts of our proposed climate test to the Guiding Principles identified in the research is shown in Table 3.

Table 3: Comparison of Proposed Climate Test to Climatetest.org Guiding Principles

Guiding Principles	Economic Viability Test	Carbon Budget Test
Energy decisions must be guided by climate science	Reflected in Price/Cost of Carbon and future Demand for Fossil Fuels	Reflected in the carbon budget
Decision-makers must develop and consider models that are consistent with a global economic transition away from fossil fuels	Reflected in future Price and Demand for Fossil Fuels	Reflected in the overall carbon budget
Environmental review processes must assess the need for projects and policies in the context of global energy supply and demand scenarios consistent with international climate goals	Addressed	Addressed
Environmental review processes must assess a project or policy's greenhouse gas emissions	Addressed	Addressed

5.2 REFINE THE CLIMATE TEST VIA A STAKEHOLDER WORKSHOP OR FORUM AND ONGOING PROCESS

This report was prepared in a very short period of time (five weeks). However, the literature reviewed and the expert opinion gathered for this report provide a high level of confidence in the value of a climate test for projects within the NEB mandate and beyond. The design principles and main structure of the test are also reasonably clear. What is also clear is designing and applying an

effective climate test that has the buy-in of key stakeholders is a challenge that requires a variety of skills and expertise.

To build on work to date and to achieve the level of detail necessary to agree on the final design of a climate test and its application, we strongly recommend a climate test workshop be held with leading experts and key stakeholders to focus on the development, design, adoption, implementation, and application of a climate test.

Potential goals of the workshop would include:

- Validate and/or modify the test recommended in this report
- Identify any additional information required to complete the design of, or execute the application of, the test
- Determine how and by whom the test would be applied
- Bring together interested parties and establish mechanisms for ongoing dialogue
- Identify any need for further socialization and engagement with other stakeholders
- Identify points of agreement and any outstanding questions and options for resolving them

A draft workshop agenda and recommended pre-workshop activities are shown in Appendix C.

STAKEHOLDER GROUPS TO INCLUDE IN A CLIMATE TEST WORKSHOP

Content Experts

- Academics
- Consultants
- First Nations knowledge keepers

Interested Parties and Other Affected Stakeholders

- Industry
- NGOs
- First Nations

Implementers

- Governments
- Regulators

5.3 PUT IN PLACE RESOURCES TO ENSURE THE CLIMATE TEST SUCCEEDS

Effectively incorporating a climate test within and/or outside the NEB will require new and existing data to be gathered and integrated into decision making processes. This will require human and financial resources and possibly new processes and decision support tools. It will be necessary to develop a detailed implementation plan that identifies the primary outcomes, accountable organizations and managers, resources, training needs and other information required to effectively execute a climate test. We recommend that these details be addressed in conjunction with the finalization of the test.

5.4 DEVELOP AN OVERARCHING INTEGRATED ENERGY AND CLIMATE CHANGE STRATEGY

The lack of an overarching integrated energy and climate change strategy is a key barrier to federal-provincial alignment as well as a challenge for the NEB. The pan-Canadian framework on clean growth and climate change was noted by several experts as an important step toward a national climate change strategy, but more detail is needed to ensure policies and projects align with climate science, and that the commitments of the federal and provincial governments meet Canada's obligations under the Paris Agreement. Such a strategy should address the development, application, and review of the carbon budget portion of the climate test. It should also address future carbon prices and it should include necessary actions to drive innovation on energy sources and technologies that reduce the overall carbon intensity of the economy.

6. REFERENCES

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APPENDIX A: EXPERTS AND STAKEHOLDERS INTERVIEWED

The following experts and stakeholders from the public sector, private sector, civil society, and indigenous peoples were interviewed to support this work, using the questions in Appendix B to guide the interview.

Name	Organization / Affiliation	Sector
Bill Baue	Reporting 3.0	Private
Simon Donner	Associate Professor, Department of Geography, University of British Columbia	Public
Erin Flanagan	Pembina Institute	Civil Society
Mark Jaccard	Professor, School of Resource and Environmental Management, Simon Fraser University	Public
Anna Johnston	West Coast Environmental Law	Civil Society
Eugene Kung	West Coast Environmental Law	Civil Society
Gord Lambert	GRL Collaboration for Sustainability Member of the Alberta Climate Leadership Expert Panel Chair of Alberta Climate Leadership Task Force	Private
Lesley Matthews	Polaris Solutions Inc.	Private
Mark McElroy	Founder and Executive Director, Center for Sustainable Organizations	Private
Teika Newton	Transition Initiative Kenora	Civil Society
Ken Ogilvie	Independent Environmental Policy Consultant	Private
Graeme Reed	Assembly of First Nations	Indigenous Peoples
Kim Scott	Director of Research and Policy Coordination, Assembly of First Nations	Indigenous Peoples
Curtis Scurr	Assembly of First Nations	Indigenous Peoples
Keith Stewart	Greenpeace Canada	Civil Society
Tim Weis	Special Advisor to Minister of Environment, Climate Change Implementation, Government of Alberta	Public

APPENDIX B: INTERVIEW QUESTIONS

A Climate Test to Align Energy Project Assessment with Climate Policy

As part of the NEB Modernization initiative, we are exploring how a "climate test" could be incorporated into the assessment of major energy infrastructure projects to support alignment with climate policy. A climate test would check a proposed project's climate impact against Canada's climate commitments and other relevant benchmarks, such as global oil demand and supply scenarios consistent with the Paris Agreement. Our research includes interviews with experts and stakeholders like you. Thank you for agreeing to speak with us about this important subject!

Need for a climate test

1. Do you see a need for a climate test?
2. Can you provide existing examples of climate tests for large projects or groups of projects? In Canada? In other jurisdictions?
3. Can you suggest guiding principles for a climate test on proposed major energy infrastructure projects?

Assessing the climate impact of energy projects

4. What makes for a "good" climate impact assessment of major energy infrastructure projects? Can you provide examples?
5. What climate impact assessments of major energy infrastructure projects are you aware of? How would you rate their relevance, completeness, consistency, transparency, and accuracy?
6. How can upstream and downstream climate impacts of a project be captured in a climate test?
7. Given the NEB mandate for lifecycle regulation of energy projects, how does a climate impact assessment relate to the evaluation of the economic need for projects?

Benchmarks to compare against

8. What benchmarks should the climate impact of major energy infrastructure projects be compared against? Why?
9. How could these benchmarks be scaled to the project, "group of projects", or industry sector level?

Operationalizing a climate test

10. What kind of projects should be subject to a climate test?
11. When in the project approval review process should a climate test be applied?
12. What information would be required to support a climate test?
13. What expertise would be required to support a climate test, and where is that expertise currently available?
14. How can a federal climate test be aligned with provincial climate policy and carbon reduction commitments?
15. Do you have any additional comments you would like to share with us?

APPENDIX C: PROPOSED WORKSHOP AGENDA AND PREPARATION

Pre-workshop actions would be needed to ensure participants arrive at the workshop well briefed, fully engaged, and ready to contribute. This could include:

1. Seed documents (this report and others)
2. Homework for participants
3. Webinars

Proposed Agenda

1. Describe the problem
    a. What does a good solution look like?
2. Solution Options
    a. What "off the shelf" solutions are available?
    b. Presentations from experts
    c. Economic viability solutions
    d. Carbon budget solutions
    e. How could these be used as a climate test?
3. Operationalizing a Climate Test
    a. What projects are in scope?
    b. What information is required?
    c. What expertise is required?
    d. Who should conduct the climate test?
4. What else needs to happen?
    a. Who needs to be involved?
    b. Methodology/process/tool development

ENDNOTES

1. For example, Various authors (2016): www.climatetest.org; Pembina Institute (2017): Good governance in the era of low carbon; Obama's climate test
2. Gunton (2017)
3. CEPA (2016)
4. Climatetest.org
5. CEN (2016)
6. Hughes (2016)
7. CERI (2016)
8. Government of Canada (2016)
9. GHG Protocol for Projects (2005)
10. Ministerial Panel (2016)
11. Environment and Climate Change Canada (2016a)
12. Newton (2016)
13. NEB (2016)
14. International Panel on Climate Change. (2016). Global Warming of 1.5°C. Accessed at https://www.ipcc.ch/report/sr15/
15. Jaccard et al. (2017)
16. Jaccard et al. (2017)
17. Bošković and Leach (2017)
18. Donner (2016)
19. McElroy (2017)
20. The CBS approach is summarized in McElroy (2011) and explored in depth at http://www.sustainableorganizations.org
21. Boothe and Boudreault (2016a)
22. Jaccard et al. (2017)
23. This point is similar to one made by CEPA (2016) in their EA panel submission which stated. "Public confidence in EA has become impaired in part because broad public policy issues have not been addressed at the political level and cannot be addressed satisfactorily through project reviews"
24. For a detailed discussion of this point, see Cleland and Gattinger (2017)