

The Role of Science in Contemporary Canadian Environmental Decision Making: The Example of Environmental Assessment

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I. INTRODUCTION

In the fall of 2015, Canada adopted the United Nations' 2030 Agenda for Sustainable Development (the "Agenda").¹ The Agenda consists of 17 Sustainable Development Goals ("SDGs", see Figure 1) and envisions "a secure world free of poverty and hunger, with full and productive employment, access to quality education and universal health coverage, the achievement of gender equality and the empowerment of all women and girls, and an end to environmental degradation."² Shortly thereafter, Canadians elected a new political party to government whose campaign included a promise to strengthen Canada's environmental laws after nearly a decade of weakening.³ One of the government's first official acts was to sign and champion the 2015 *Paris Agreement* on climate change.⁴

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¹ See "The 2030 Agenda for Sustainable Development" (last modified 17 July 2018), online: *Government of Canada* <international.gc.ca/world-monde/issues_development-enjeux_developpement/priorities-priorites/agenda-programme.aspx?lang=eng>; *Transforming Our World: The 2030 Agenda for Sustainable Development*, A Res 70/1, UNGAOR, 70th Sess, Supp No 49 (2015).

² "The 2030 Agenda for Sustainable Development", *ibid*.

³ As further discussed in Part II, *infra*.

⁴ *Paris Agreement under the United Nations Framework Convention on Climate Change*, 22 April 2016, Can TS 2016/9 (entered into force 4 November 2016) [*Paris Agreement*].



Figure 1: The UN Sustainable Development Goals⁵

As of spring 2018, however, the status of these initiatives appears uncertain. With respect to the SDGs, the Commissioner of the Environment and Sustainable Development reported on 24 April 2018 that Canada “had not developed a formal approach to implement the 2030 Agenda and the sustainable development goals. . . . [and] despite some specific action at the departmental level, there was still no federal governance structure . . . [and] no implementation plan or system to measure, monitor, and report on the progress in achieving the goals.”⁶ Similarly, and notwithstanding over two years of study, Canada’s federal environmental-law regime appears on track to retain many of its dominant—and negative—characteristics, including excessively discretionary government powers, a failure to meaningfully tackle the challenge of cumulative environmental impacts, and a lack of a strong commitment to science that is open, rigorous, and impartial.⁷

⁵ Figure reprinted from “Sustainable Development Goals”, online: *United Nations Development Programme* <undp.org/content/undp/en/home/sustainable-development-goals.html>. For a description of the UN Sustainable Development Goals, see “Sustainable Development Goals” (*ibid*).

⁶ Auditor General of Canada, *Reports of the Commissioner of the Environment and Sustainable Development to the Parliament of Canada: Report 2; Canada’s Preparedness to Implement the United Nations’ Sustainable Development Goals* (Ottawa: Auditor General of Canada, 2018) at 7.

⁷ For early commentary on these laws, see Meinhard Doelle, “Bill C-69: The Proposed New Federal Impact Assessment Act (IAA)” (9 February 2018), online (blog): *Environmental Law News* <blogs.dal.ca/melaw/2018/02/09/bill-c-69-the-proposed-new-federal-impact-assessment-act/>; Martin Olszynski, “In Search of #BetterRules: An Overview of Federal Environmental Bills C-68 and C-69” (15 February 2018), online (pdf): *ABlawg.ca* <ablawg.ca/wp-content/uploads/2018/02/Blog_MO_Bill68_Bill69.pdf>; Martin Ignasiak, Sander Duncanson & Jessica Kennedy, “Changes to Federal Impact Assessments, Energy Regulator and Waterway Regulation (Bills C-68 and C-69)” (12 February 2018), online: *Osler* <osler.com/en/resources/regulations/2018/changes-to-federal-impact-assessments-energy-regulator-and-waterway-regulation-bills-c-68-and-c-1>.

In this article, we examine the role of science in Canada’s federal environmental assessment (EA)⁸ regime to illustrate opportunities for improvement. We do not address the application of science in EA practices (i.e., how to do good science within EA processes), which has been thoroughly reviewed by MacKinnon et al.⁹ Instead, we examine the *context* for science in EA law: we examine the components of a regulatory regime, enshrined by law, that would allow for scientifically defensible assessments and evidence-based decision making. We have four objectives: (1) to provide a recent history of the role(s) of science in Canada’s legislated EA regimes, including public support for science in EA law; (2) to propose five components necessary in an EA regime to ensure strong inclusion of science; (3) to evaluate if new proposed legislation meets scientific standards for modern EA, particularly cumulative effects and climate change; and (4) to encourage collaboration between scholars and practitioners in law and the natural and social sciences to work towards stronger scientific foundations in Canada’s EA regimes at all levels.

II. SCIENCE AND EA IN CANADA

A. The Fundamental Role of Science in EA

EA laws in Canada have changed over time and among jurisdictions, but rarely—if ever—have they been used to prevent negative environmental impacts outright. Rather, and as is the case with the western world’s first modern environmental assessment law (the United States’ *National Environmental Policy Act*¹⁰) the primary goal of EA laws has been considerably less ambitious: “to force agencies to *consider* the environmental effects of their actions and to provide a means to involve and inform the public in federal agency decision-making.”¹¹ In simpler terms, laws like the *NEPA* “merely prohibit uninformed—rather than unwise—agency action.”¹²

⁸ In this review, we use the term “environmental assessment” (as opposed to “environmental impact assessment”, “impact assessment”, or others) as this is the relevant term for most of the Canadian environmental law literature. Bill C-69 uses the term “impact assessment”, and this term may soon come into legal force. Although we recognize the important semantic differences between the terms, for the purposes of this article, we assume that “EA” encapsulates other terms. We use the term “regime” to refer to the relevant laws, regulations, and policy instruments through which EAs are carried out in Canada.

⁹ Aaron J MacKinnon, Peter N Duinker & Tony R Walker, *The Application of Science in Environmental Assessment* (London: Routledge, 2018).

¹⁰ 42 USC § 4321 (1970) [*NEPA*].

¹¹ Courtney A Schultz, “History of the Cumulative Effects Analysis Requirement Under NEPA and Its Interpretation in U.S. Forest Service Case Law” (2012) 27:1 *J Envtl L & Litig* 125 at 126 [emphasis added].

¹² *Chief of the Forest Service v Methow Valley Citizens Council*, 490 US 332 at 350–51 (9th Cir 1989) [citations omitted]:

The sweeping policy goals announced in . . . NEPA are thus realized through a set of “action-forcing” procedures that require that agencies take a “‘hard look’ at environmental consequences,” and that provide for broad dissemination of relevant environmental information. Although these procedures are almost certain to affect the agency’s substantive decision, it is now well settled that NEPA itself does not mandate particular results, but simply prescribes the necessary process. . . . Other statutes may impose substantive environmental obligations on federal

Arguably, Canada's succession of EA laws has not been vastly different. As was noted by the Supreme Court of Canada (SCC) in its landmark 1992 decision, *Friends of the Oldman River*,¹³ in which it interpreted the then-applicable *Environmental Assessment and Review Process Guidelines Order*.¹⁴

Environmental impact assessment is, in its simplest form, *a planning tool that is now generally regarded as an integral component of sound decision-making*. . . .

As a planning tool it has both an information-gathering and a decision-making component which provide the decision maker with an objective basis for granting or denying approval for a proposed development. In short, environmental impact assessment is simply descriptive of a process of decision making.¹⁵

The critical assumption underlying such EA regimes is that identifying potential environmental (and other) impacts in a transparent and rigorous manner should lead to decision making that better accounts for environmental, social, and health impacts, including through the potential for political or democratic accountability for such decisions.¹⁶ The following description by the Federal Court of Canada, which can be applied equally to all of Canada's EA regimes (past, present, and future), captures this intended dynamic well: "In short, Parliament has designed a decision-making process . . . that is, *when it functions properly*, both *evidence-based and democratically accountable*."¹⁷

Instead, Canada's EA regimes have garnered much criticism, including for weaknesses regarding the requirements for, and the quality of, science and evidence in the EA process.¹⁸ In an effort to address these and other shortcomings, the Government of Canada is currently in the midst of reforming the existing federal EA regime, the *Canadian Environmental Assessment Act, 2012*.¹⁹ The *CEAA 2012* itself is the product of widely panned reforms made just six years ago

agencies, but NEPA merely prohibits uninformed—rather than unwise—agency action.

¹³ *Friends of the Oldman River Society v Canada (Minister of Transport)*, [1992] 1 SCR 3, 88 DLR (4th) 1 [*Friends of the Oldman River* cited to SCR].

¹⁴ SOR/84-467 [*EARPGO*].

¹⁵ *Friends of the Oldman River*, *supra* note 13 at 71 [emphasis added, citations omitted].

¹⁶ See Bradley C Karkkainen, "Toward a Smarter NEPA: Monitoring and Managing Government's Environmental Performance" (2002) 102:4 Colum L Rev 903 at 904–05.

¹⁷ *Greenpeace Canada v Canada (AG)*, 2014 FC 463 at para 237, 87 CELR (3d) 173 [*Greenpeace*] [emphasis added].

¹⁸ See e.g. Doelle, "The End of EA", *supra* note 20; Robert B Gibson, "In Full Retreat: The Canadian Government's New Environmental Assessment Law Undoes Decades of Progress" (2012) 30:3 Impact Assessment & Project Appraisal 179; Lorne A Greig & Peter N Duinker, "A Proposal for Further Strengthening Science in Environmental Impact Assessment in Canada" (2011) 29:2 Impact Assessment & Project Appraisal 159; Pierre Gosselin et al, *The Royal Society of Canada Expert Panel: Environmental and Health Impacts of Canada's Oil Sands Industry* (Ottawa: The Royal Society of Canada, 2010).

¹⁹ SC 2012, c 19, s 52 [*CEAA 2012*].

by the previous Conservative government.²⁰ Within this process, there have been repeated calls from scientific, legal, environmental, and Indigenous communities to improve the scientific basis of EA.²¹

Although each EA regime in Canada is unique, all can be understood as consisting of four general phases: (1) a *planning phase* where basic information about a project and its potential impacts, as well as the assessment that will be conducted, are shared and discussed with stakeholders; (2) an *assessment phase*, where baseline social, environmental, and health conditions are measured and potential project impacts are estimated (i.e., “environmental impact statement”); (3) a *decision-making phase*, where the relevant authority considers environmental (and other) potential impacts and makes decisions (for example, to approve or reject a project or establish conditions of approval); and, ideally, (4) a *learning or adaptive management phase*, where project follow-up and monitoring occurs, and EA processes at large are evaluated and adjusted in a recursive manner.

Conventionally, the scientific method includes identifying a hypothesis to be tested, including associated predictions and assumptions, making observations, and analyzing whether the observed results match the predictions.²² In the EA context, hypothesis testing manifests through the predicted necessity or effectiveness of mitigation measures. For example, if mitigation is deemed unnecessary, it is because the proponent hypothesizes that the project will have negligible environmental impacts. If mitigation is prescribed, and the proponent deems a project to have negligible (i.e., nonsignificant) residual impacts, it is because the mitigation is hypothesized to work in the manner predicted by the proponent. Equally relevant to hypothesis testing, in both a purely scientific and EA context, are evaluations of data reliability (for example, accuracy, precision, independence, and efforts to reduce sampling biases), sample size, effect size vis-à-vis statistical significance, and statistical power. Scientific methods are also used to estimate the costs and consequences of negative environmental impacts on species, ecosystems, and communities, as well as the expected costs to humans.

Scientific evidence²³ is a critical element in each of the four EA phases. During the planning and assessment phases, much of the evidence used to determine baseline conditions,

²⁰ *CEAA 2012* was introduced as part of the Conservative government’s omnibus budget bill in 2012. See *Jobs, Growth and Long-term Prosperity Act*, SC 2012, c 19. This legislation also amended the federal *Fisheries Act*, RSC 1985, c F-14 and what was then the *Navigable Waters Protection Act*, RSC 1985, c N-22. For critical commentary of those reforms, see e.g. Meinhard Doelle “CEAA 2012: The End of Federal EA As We Know It?” (2012) 24:1 J Envtl L & Prac 1 [Doelle, “The End of EA”]; Martin ZP Olszynski, “From ‘Badly Wrong’ to Worse: An Empirical Analysis of Canada’s New Approach to Fish Habitat Protection Laws” (2015) 28:1 J Envtl L & Prac 1.

²¹ *Ibid.*

²² For a discussion of science and scientific evidence aimed at Canadian legal audiences, see Scott Findlay & Nathalie Chalifour, “Science and the Scientific Method” in *Science Manual for Canadian Judges* (Ottawa: National Judicial Institute, 2013) 39, online (pdf): <nji-inm.ca/index.cfm/publications/?langSwitch=en>.

²³ Here, we use the term “evidence” to refer to scientific evidence gathered using biophysical or social science methods. We recognize the value and importance of Indigenous and traditional knowledge in EA; however, we do not address the methods by which this is provided and subsequently integrated with EA

identify environmental sensitivities (for example, species at risk and water quality), and make potential impact estimations is derived using approaches from the natural and social sciences. Though scientific evidence is only one of many considerations (for example, economic, social, political), it is used to inform decision making regarding whether an industrial project will be approved, and under what conditions. Scientific information, evidence, and theory are also used in the recursive component of adapting and improving EA processes.

B. A Recent History of Science and EA Law in Canada

Although some form of EA has taken place in Canada since the 1930s, federal legislation was not enshrined until 1995. In this section, we briefly describe the evolution of relevant federal statutes,²⁴ each of which contained different provisions and opportunities for including science. Importantly, none of the federal EA statutes implemented to date have ever contained explicit provisions with respect to science. This stands in contrast to several other federal environmental laws. As one example, the preamble to the *Canadian Environmental Protection Act, 1999*²⁵ “recognizes the integral role of science, as well as the role of traditional aboriginal knowledge, in the process of making decisions relating to the protection of the environment and human health”.²⁶ *CEPA 1999* also imposes a duty on the federal government to “apply knowledge, including traditional aboriginal knowledge, science and technology, to identify and resolve environmental problems”.²⁷ Most concretely, section 76.1 requires the Minister of Environment, when “conducting and interpreting the results of” various toxicity assessments pursuant to Part 5, to “apply a weight of evidence approach and the precautionary principle.”²⁸ In *Goodyear Canada Inc v Canada (Minister of the Environment)*, the Federal Court described one such assessment as “a statutorily mandated scientific evaluation of . . . a chemical substance to determine whether it is toxic or capable of becoming toxic.”²⁹

As another example, the federal *Species at Risk Act* contains several references to “science” or “scientific” information.³⁰ In addition to references in the preamble,³¹ *SARA* defines

in this review. We encourage readers to look to Indigenous communities and organizations for guidance regarding the role of Indigenous knowledge in EA reviews, of which many such guides are available.

²⁴ We do not review in detail the history of EA theory, practice, or legislation in Canada. This has been done by others, including MacKinnon, Duinker & Walker, *supra* note 9; David R Boyd, *Unnatural Law: Rethinking Canadian Environmental Law and Policy* (Vancouver: UBC Press, 2003); Meinhard Doelle & Chris Tollefson, *Environmental Law: Cases and Materials*, 2nd ed (Toronto: Carswell, 2013).

²⁵ SC 1999, c 33 [*CEPA 1999*].

²⁶ *Ibid*, Preamble.

²⁷ *Ibid*, s 2(1)(i).

²⁸ *Ibid*, s 76.1

²⁹ 2017 FCA 149 at para 41, 9 CELR (4th) 1.

³⁰ SC 2002, c 29, Preamble, ss 2(1), 15(2), 38 [*SARA*].

³¹ See *ibid*, Preamble:

wildlife, in all its forms, has value in and of itself and is valued by Canadians for aesthetic, cultural, spiritual, recreational, educational, historical, economic, medical, ecological and scientific reasons, . . .

the Government of Canada is committed to conserving biological diversity and to the principle that, if there are threats of serious or

“status report[s]” as containing “a summary of the *best available information* on the status of a wildlife species, including *scientific knowledge*, community knowledge and aboriginal traditional knowledge.”³² In carrying out assessments and making recommendations with respect to the species listing, the Committee on the Status of Endangered Wildlife in Canada “must carry out its functions on the basis of the *best available information* on the biological status of a species, including *scientific knowledge*”.³³ Finally, section 38 of *SARA* imposes a duty on the Minister, “[i]n preparing a recovery strategy, action plan or management plan, . . . [to] consider the commitment of the Government of Canada to conserving biological diversity and to the principle that, . . . cost-effective measures . . . should not be postponed for a lack of full scientific certainty.”³⁴ While *SARA* is widely criticized for its inefficacy at fostering the actual biological recovery of species at risk,³⁵ there is little doubt that it is at least strengthened by the explicit science-based provisions.³⁶ Indeed, the “transparent separation of science and policy” in *SARA*’s listing process has been described as its “primary strength”.³⁷

With regard to the history of EA in Canada, the first generally applicable federal EA regime was the *Environmental Assessment and Review Process Guidelines Order*. The *EARPGO* was established and approved in 1984 as a regulation enacted pursuant to section 6 of the *Department of the Environment Act*.³⁸ In its 1992 *Friends of the Oldman River* decision, the SCC described the regime as follows:

In general terms, these guidelines require all federal departments and agencies that have a decision-making authority for any proposal, i.e., any initiative, undertaking or activity that may have an environmental effect on an area of federal responsibility, to initially screen such proposal to determine whether it may give rise to any potentially adverse environmental effects. If a proposal could have a significant adverse effect on the environment, provision is made for public review by an

irreversible damage to a wildlife species, cost-effective measures to prevent the reduction or loss of the species should not be postponed for a lack of full scientific certainty

³² *Ibid*, s 2(1) [emphasis added].

³³ *Ibid*, s 15(2) [emphasis added].

³⁴ *Ibid*, s 38.

³⁵ See e.g. Brett Favaro et al, “Trends in Extinction Risk for Imperiled Species in Canada” (2014) 9:11 PLoS One; Katherine Dorey & Tony R Walker, “Limitations of Threatened Species Lists in Canada: A Federal and Provincial Perspective” (2018) 217 Biological Conservation 259.

³⁶ See e.g. *Alberta Wilderness Association v Canada (Minister of Environment)*, 2009 FC 710, [2009] FCJ No 876 at para 25 [emphasis added]:

The agreed upon interpretation, which I endorse to the extent that it is relevant to this application, is as follows. There is no discretion vested in the Minister in identifying critical habitat under the *SARA*. Subsection 41(1)(c) requires that the Minister identify in a recovery strategy document as much critical habitat as it is possible to identify at that time, even if all of it cannot be identified, *and to do so based on the best information then available*. . . .

³⁷ Arne O Mooers et al, “Science, Policy, and Species at Risk in Canada” (2010) 60:10 BioScience 843 at 845.

³⁸ RSC 1985, c E-10, s 6.

environmental assessment panel whose members must be unbiased, free of political influence and possessed of special knowledge and experience relevant to the technical, environmental and social effects of the proposal.³⁹

Although science was obviously an implicit part of this regime,⁴⁰ the *EARPGO* contained no explicit references to the term “science” or “scientific information”. Indeed, the entire regime was—and still is—built around the concept of *significant adverse environmental effects*,⁴¹ which has long been criticized as lacking in scientific precision.⁴² Notwithstanding the SCC’s previous description of EA as providing “an *objective* basis” for decision making,⁴³ the Federal Court of Appeal, in an early but still authoritative case on federal EA in Canada, endorsed a relatively subjective interpretation of this term, stating that significance “is *not a fixed or wholly objective standard* and contains a large measure of opinion and judgment. Reasonable people can and do disagree about the adequacy and completeness of evidence which forecasts future results and about the significance of such results”.⁴⁴ The only other term that came close to creating something of an objective benchmark was the reference to “known technology” in the context of mitigating adverse environmental effects.⁴⁵ However, it received relatively little judicial treatment.⁴⁶

The *EARPGO* was superseded in 1995 by the *Canadian Environmental Assessment Act*.⁴⁷ This regime was fundamentally different from both its predecessor and its successor (*CEAA 2012*) in that it was triggered, not by specific proposals or projects, but rather by federal decision making generally. Under the *CEAA*, an environmental assessment was required whenever the federal government was a proponent of a project, provided funding for a project, or when a

³⁹ *Friends of the Oldman River*, *supra* note 15 at 17–18.

⁴⁰ See e.g. Federal Environmental Assessment Review Office, *The Federal Environmental Assessment and Review Process* (Ottawa: Minister of Supply and Services Canada, 1987) at 4, online (pdf): [Government of Canada <publications.gc.ca/collections/collection_2017/acee-ceaa/En106-4-1987-eng.pdf>](http://publications.gc.ca/collections/collection_2017/acee-ceaa/En106-4-1987-eng.pdf). With respect to review panels, it is noted that “[p]articipation in the hearings, not only by the specialists hired by the panel but by the public as well, is vital to the review. A panel obviously *needs technical and scientific analyses from experts* but it also needs to hear from people who could be affected by the proposal, particularly those who live near the proposed site”: *ibid* [emphasis added].

⁴¹ It should be noted that the term “significant environmental effects” is different than the accepted scientific definition of “significance”, whereby a hypothesis has been proven statistically to be false in 95% of cases. For a discussion of the interpretations of “significance” in law, see Findlay & Chalifour, *supra* note 22 at 85.

⁴² See Alan Ehrlich & William Ross, “The significance spectrum and EIA significance determinations” (2015) 33:2 *Impact Assessment & Project Appraisal* 87 for a review of criticism of the lack of precision around “significance” in environmental assessment.

⁴³ *Friends of the Oldman River*, *supra* note 15 at 71 [emphasis added].

⁴⁴ *Alberta Wilderness Association v Express Pipelines Ltd* (1996), 137 DLR (4th) 177 at 181, 42 Admin LR (2d) 296 (FCA) [emphasis added].

⁴⁵ *EARPGO*, *supra* note 14, s 12(c).

⁴⁶ See the text accompanying notes 53–54 for the limited jurisprudence on the term “known technology” and its successor, which refers to mitigation measures that are “technically and economically feasible”: *Canadian Environmental Assessment Act*, SC 1992, c 37, s 16(1)(d) as it appeared on 23 June 1992 [CEAA].

⁴⁷ *Ibid*.

project took place on federal lands or required a federal permit or authorization.⁴⁸ Like the *EARPGO*, the original *CEAA* also contained no explicit references to science or scientific information. However, the *CEAA* did contain more science-related terms, such as an undefined reference to “adaptive management” in the context of describing follow-up programs.⁴⁹ Through a series of decisions,⁵⁰ Canada’s Federal Court eventually came to misconceive adaptive management as “permit[ting] projects with uncertain, yet potentially adverse environmental impacts to proceed based on flexible management strategies capable of adjusting to new information regarding adverse environmental impacts where sufficient information regarding those impacts and potential mitigation measures already exists.”⁵¹ This approach has been widely criticized as failing to appreciate the limits of adaptive management on the one hand (for example, it cannot be applied to all environmental problems, nor does it guarantee positive environmental outcomes), and the persistent problems with its implementation on the other (for example, the absence of clear goals, enforceable and objective triggers for adaptation, and adequate monitoring).⁵² The *EARPGO*’s reference to “known technologies” was also replaced in the *CEAA* by mitigation measures that were “technically and economically feasible and that would mitigate any significant adverse environmental effects of the project”.⁵³ As noted by Nathalie Chalifour, there is limited jurisprudence as to what this term means, and what jurisprudence does exist has not prevented proponents, the Canadian Environmental Assessment Agency, and review panels from relying on little more than “vague hopes for future technology.”⁵⁴

The *CEAA* was repealed and replaced by the *CEAA 2012*, the most dramatic difference being that, while the former was triggered by federal decision making generally, the latter only applies to designated major projects, which reduced the number of federal EAs carried out

⁴⁸ See *ibid*, s 5(1).

⁴⁹ *Ibid*, s 38(5), as amended by SC 2003, c 9, s 18 (“The results of follow-up programs may be used for implementing adaptive management measures or for improving the quality of future environmental assessments”).

⁵⁰ See *Pembina Institute for Appropriate Development v Canada (AG)*, 2008 FC 302 at para 32, 80 Admin LR (4th) 74, citing *Canadian Parks and Wilderness Society v Canada (Minister of Canadian Heritage)*, 2003 FCA 197 at para 24, 1 Admin LR (4th) 103.

⁵¹ *Pembina, ibid*. The one exception may be the Federal Court’s recent decision in *Taseko Mines Limited v Canada (Minister of the Environment)*, 2017 FC 1099 at para 124, 2017 CarswellNat 6943, wherein the Court recognized that “acceptance of vague adaptive management schemes . . . would, in my view, tend to call into question the value of the entire review panel process—if all such decisions could be left to a later stage, then the review panel process would simply be for the sake of appearances.”

⁵² See e.g. Arlene J Kwasniak, “Use and Abuse of Adaptive Management in Environmental Assessment Law and Practice: A Canadian Example and General Lessons” (2010) 12:4 J Environmental Assessment Policy & Management 425; Nathalie J Chalifour “Case Comment: A (Pre)Cautionary Tale about the Kearl Oil Sands Decision; The Significance of *Pembina Institute for Appropriate Development et al. v. Canada (Attorney-General) for the Future of Environmental Assessment*” (2009) 5:2 JSDLP 251; Martin ZP Olszynski, “Failed Experiments: An Empirical Assessment of Adaptive Management in Alberta’s Energy Resources Sector” (2017) 50:3 UBC L Rev 697 [Olszynski, “Failed Experiments”].

⁵³ *CEAA, supra* note 46, s 16(1)(d).

⁵⁴ Chalifour, *supra* note 52 at 269, citing *Canadian Wildlife Federation Inc v Canada (Minister of the Environment)* (1989), 31 FTR 1, 4 CELR (NS) 201 (FCTD).

annually from several thousand to less than 100.⁵⁵ While the original *CEAA* was criticized for lacking provisions for robust science, the *CEAA 2012* stepped even further away from science-based EA. The *CEAA 2012* and the assessments conducted under it were criticized by many experts (including scientists, legal scholars, and former politicians) for diminished scientific rigour and independence in decision making, inadequate consideration of cumulative effects, and hampering public and Indigenous participation.⁵⁶ Like the original *CEAA*, the *CEAA 2012* contains no explicit reference to science or scientific information. The *CEAA*'s singular reference to adaptive management was also removed, although it continues to be invoked by proponents in the context of their project descriptions and environmental impact statements.⁵⁷ Finally, a 2017 study by Roach and Walker of the impacts of the regime change on monitoring and follow-up

⁵⁵ Arlene Kwasniak, "Federal Environmental Assessment Re-Envisioned to Regain Public Trust: The Expert Panel Report" (12 April 2017), online (pdf): [ablawg.ca <ablawg.ca/wp-content/uploads/2017/04/Blog_AK_CEEA_Panel_Report.pdf>](http://ablawg.ca/wp-content/uploads/2017/04/Blog_AK_CEEA_Panel_Report.pdf) (noting that "[a]lthough numbers varied, several thousand federal EAs were triggered annually under CEAA 1992" whereas "in 2014 there were only 23 EAs.") See also Canadian Environmental Assessment Agency, "Browse Projects" (last modified 17 August 2018), online: Government of Canada <ceaa-acee.gc.ca/050/evaluations/exploration?culture=en-CA>. As of 30 December 2018, there were 78 federal EAs in progress: *ibid.*

⁵⁶ See e.g. John D Reynolds, Isabelle M Côté & Brett Favaro, "A Bleak Day for the Environment" (2012) 487 *Nature* 171; Letter from Jonathan W Moore et al, Liber Ero Chair of Coastal Science and Management, Associate Professor, Simon Fraser University to Catherine McKenna, Minister of Environment and Climate Change (9 March 2016), online (pdf): ceaa-acee.gc.ca/050/documents/p80032/108936E.pdf ("open letter signed by 135 scientists . . . voicing extreme concern about the serious scientific flaws in the draft assessment of environmental risks from the proposed Pacific North West Liquid Natural Gas facility at Lelu Island/Flora Bank, Skeena River estuary, British Columbia"); David Schindler, "Statement of Concern: Statement of Concerned Scholars on the Site C Dam Project, Peace River, British Columbia", online: Site C: Statement by Concerned Scholars <sitecstatement.org/home/> (371 cosignatories); Letter from Aerin Jacob, Liber Ero Fellow, University of Victoria to Prime Minister Justin Trudeau (15 November 2016), online: youngresearchersopenletter.org (open letter with more than 1700 original cosignatories); Letter from Maryse Lassonde, President of the Royal Society of Canada to Prime Minister Justin Trudeau (19 May 2016), online (pdf): sitecstatement.files.wordpress.com/2016/02/rsc-letter-to-pm_trudeau_19-05-2016.pdf (open letter); Letter from Kai MA Chan, Associate Professor, University of British Columbia to Prime Minister Stephen Harper (26 May 2014), online (pdf): awsassets.wwf.ca/downloads/scientists_reject_northern_gateway_jrp_report_may_26_2014.pdf ("[o]pen Letter on the Joint Review Panel report regarding the Northern Gateway Project" with more than 300 cosignatories); Letter from DW Schindler, Professor of Ecology, Department of Biological Sciences, University of Alberta to Prime Minister Stephen Harper (22 March 2012), online (pdf): sfu.ca/~amooers/scientists4species/FA_letter_2012.pdf (open letter "re. Potential amendments to section 35 of the Fisheries Act" with more than 500 cosignatories); Chris Turner, *The War on Science: Muzzled Scientists and Wilful Blindness in Stephen Harper's Canada* (Vancouver: Greystone Books, 2013).

⁵⁷ See Olszynski, "Failed Experiments", *supra* note 52 ("[a] recent [August 2015] survey of the Canadian Environmental Assessment Registry revealed that 91% of the projects listed there . . . contained at least one reference—and usually several—to adaptive management" at 700).

programs found that the number and type of parameters reported changed; post-CEAA 2012 projects had fewer follow-up commitments.⁵⁸

In 2015, the Liberal Party of Canada campaign included a promise of “robust oversight and thorough environmental assessments”, including “decisions . . . based on science, facts, and evidence, and serv[ing] the public’s interest”.⁵⁹ After winning the election, Prime Minister Trudeau gave the Minister of Environment and Climate Change a public mandate letter with specific direction on EAs, stating:

Supported by the Ministers of Fisheries, Oceans and the Canadian Coast Guard, and Natural Resources, immediately review Canada’s environmental assessment processes to regain public trust and help get resources to market and introduce new, fair processes that will:

- restore robust oversight and thorough environmental assessments of areas under federal jurisdiction, while also working with provinces and territories to avoid duplication;
- ensure that decisions are based on science, facts, and evidence, and serve the public’s interest;
- provide ways for Canadians to express their views and opportunities for experts to meaningfully participate; and
- require project advocates to choose the best technologies available to reduce environmental impacts.⁶⁰

In August 2016, the government appointed a four-person Expert Panel for the Review of Environmental Assessment Processes (the “Expert Panel”) to review federal EA processes through nationwide consultations with experts, Indigenous groups, and the public, including invitations for written submissions and in-person presentations.⁶¹ The Expert Panel was advised by a Multi-Interest Advisory Committee (MIAC), including representatives from industry associations, Indigenous organizations, environmental groups, and federal departments and agencies.

On 5 April 2017, the Minister of Environment and Climate Change released a report by the Expert Panel, *Building Common Ground: A New Vision for Impact Assessment in Canada*.⁶² This report, informed by a year of public engagement as well as the input of MIAC,

⁵⁸ Brynn Roach & Tony R Walker, “Aquatic Monitoring Programs Conducted During Environmental Impact Assessments in Canada: Preliminary Assessment *Before* and *After* Weakened Environmental Regulation” (2017) 189:3 *Environmental Monitoring & Assessment* 109 at 109.

⁵⁹ See Liberal Party of Canada, “Environmental Assessments” (2018), online: *Liberal* <liberal.ca/realchange/environmental-assessments/>.

⁶⁰ Letter from Justin Trudeau to Catherine McKenna (12 November 2015), online: *Justin Trudeau, Prime Minister of Canada* <pm.gc.ca/eng/minister-environment-and-climate-change-mandate-letter>.

⁶¹ See “Review of Environmental Assessment Processes: Expert Panel Terms of Reference” (last modified 28 June 2017), online: *Government of Canada* <canada.ca/en/services/environment/conservation/assessments/environmental-reviews/environmental-assessment-processes/final-terms-reference-ea.html>.

⁶² Canadian Environmental Assessment Agency, *Building Common Ground: A New Vision for Impact Assessment in Canada*, by Expert Panel (Ottawa: CEAA, 2017) [CEAA, *Building Common Ground*].

recommended a major overhaul of *CEAA 2012*, including the need to ensure stronger evidence-based decision making. The Expert Panel called for the creation of a new, independent, and quasi-judicial commission to conduct impact assessment in Canada.⁶³ With respect to science, the following findings and recommendations are particularly relevant:

*Current legislation does not include requirements for how science is incorporated into IAs [or EAs], nor does it provide for timelines that would allow for credible scientific methods to be implemented. Accordingly, stronger guidelines and standards are needed to ensure that IA processes include rigorous scientific methods.*⁶⁴

*Baseline and monitoring data should be standardized and made publicly available. This should include standard methods for data collection or metadata so that data are comparable and studies are replicable. Accessibility to this information should strengthen future IA practices by building a shared body of knowledge across environmental, economic, health, cultural and social conditions, including cumulative effects.*⁶⁵

To ensure that IA studies use robust scientific methods, *the IA authority must have a statutory mandate to verify the adequacy of IA studies, including the Impact Statement. . . . This new legislative requirement is needed to ensure that the scientific evidence produced in IA processes is based on robust methods and can therefore be relied upon and trusted by participants in the IA process.*⁶⁶

The development of the Impact Statement would be led by the Commission using a team of consultants and experts (the “assessment team”) *retained by the Commission that is free of any conflict of interest and chosen through a collaborative process involving the project committee and government expert committee. . . . It would include consultants and other independent experts (including Indigenous knowledge-holders) with expertise related to the factors of the study . . . and any other special expertise relevant to preparing the Impact Statement.*⁶⁷

Broadly speaking, the Expert Panel’s report was favourably received by independent experts.⁶⁸

⁶³ See CEAA, *Building Common Ground*, *supra* note 62 (“the best way to achieve efficient, consistent and accountable governance is to incorporate the [impact assessment] function into a single authority, A structure such as a quasi-judicial tribunal would empower the single authority to fulfil this mandate” at 51).

⁶⁴ *Ibid* at 42 [emphasis added].

⁶⁵ *Ibid* at 43 [emphasis added].

⁶⁶ *Ibid* at 44 [emphasis added].

⁶⁷ *Ibid* at 62 [emphasis added].

⁶⁸ See e.g. Meinhard Doelle & John Sinclair, “EA Expert Panel Report: Reflections on Canada’s Proposed Next Generation Assessment Process” (27 April 2017), online (pdf): <papers.ssrn.com/sol3/papers.cfm?abstract_id=2959453>, DOI <dx.doi.org/10.2139/ssrn.2959453>; Martin Olszynski et al, “Strengthening Canada’s Environmental Assessment and Regulatory Processes: Recommendations and Model Legislation for Sustainability”, Response to the Government of Canada’s

The federal government released its response to the report in June 2017.⁶⁹ The *Environmental and Regulatory Reviews: Discussion Paper* (the *Discussion Paper*) signalled the government's intent for environmental legislative reform, including its preliminary themes and intent to incorporate opportunities for public review. Though the *Discussion Paper* included some of the Expert Panel's recommendations in areas such as early planning, Indigenous engagement, and public participation,⁷⁰ it incorporated few of the Expert Panel's recommendations regarding science or evidence-based decision making. The government did, however, signal interest in "[m]oving toward an open science and data platform" and "[r]einforcing rigour through peer reviews of science and evidence in the assessment phase".⁷¹ Numerous responses to the *Discussion Paper* were made, including recommendations by scientists and policy experts to strengthen provisions for science.⁷²

On 8 February 2018, the government introduced Bill C-69, which will introduce a new *Impact Assessment Act (IAA)* and repeal the *CEAA 2012*.⁷³ Termed a "once-in-a-generation opportunity",⁷⁴ Bill C-69 is currently under significant scrutiny from all sectors as it makes its way through the Senate in the fall of 2018. We discuss the proposed *IAA* in Part IV of this article.

The foregoing discussion shows that the incorporation of explicit scientific language in Canadian EA law has been virtually nonexistent. Further, science-related terms such as "adaptive management" or "significant adverse environmental effects" have never been explicitly defined, rendering them vulnerable to judicial misunderstanding and misinterpretation. The potential for such misunderstanding is particularly high in environmental law because so many of its disputes are resolved in the context of judicial review applications (that is, challenges to government decision making), where the default judicial posture is deference to assumed departmental expertise.⁷⁵ Departments, for their part, tend to prefer statutory interpretations that preserve their

Discussion Paper on Environmental and Regulatory Reform (18 August 2017) online (pdf): <s3.ca-central-1.amazonaws.com/ehq-production-canada/file_answers/files/28b387fc534e5697ef3120eb00dfc1288a80262a/004/713/091/original/Strengthening_EnviroLaw_Response_Paper_%2818Aug2017%29.pdf>.

⁶⁹ Natural Resources Canada, *Environmental and Regulatory Reviews: Discussion Paper* (Ottawa: Natural Resources Canada, 2017), online (pdf):

<www.canada.ca/content/dam/themes/environent/conservation/environmental-reviews/share-your-views/proposed-approach/discussion-paper-june-2017-eng.pdf>.

⁷⁰ See *ibid* at 10–11, 15–16,

⁷¹ *Ibid* at 12.

⁷² See e.g. Alana R Westwood et al, "Strong Foundations: Recap and Recommendations from Scientists Regarding the Federal Environmental and Regulatory Reviews" (2017) at 12–14, online (pdf): <y2y.net/publications/0914-westwood-jacob-et-al-strong-foundations-full-paper-infographics-fisheries.pdf> [Westwood et al, "Strong Foundations"]; see also Olszynski et al, *supra* note 68.

⁷³ See 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*, 1st Sess, 42nd Parl, 2018 (as passed by the House of Commons 20 June 2018) [*IAA*].

⁷⁴ Jason MacLean, Meinhard Doelle & Chris Tollefson, "Polyjural and Polycentric Sustainability Assessment: A Once-in-a-Generation Law Reform Opportunity" (2016) 30:1 *J Env'tl L & Prac* 35 at 38.

⁷⁵ See e.g. Martin Olszynski & Meinhard Doelle, "Ontario Power Generation Inc. v Greenpeace Canada: Form over Substance Leads to a 'Low Threshold' for Federal Environmental Assessment", Case

flexibility and discretion.⁷⁶ Moreover, in the EA context specifically, courts have declared that they will also not assess the substance of the science relied upon by government departments for fear of becoming “academ[ies] of science”.⁷⁷

C. A Public Mandate for Strengthening the Scientific Basis of EA Law

Although experts and stakeholders have long criticized the inadequate role of science in Canadian federal EA regimes, in recent years these concerns are increasingly being echoed by the broader Canadian public. A series of public polls and engagements have shown EA to be a priority and demonstrated that there are significant concerns about the process of environment-related decision making and the underlying science that is used to support these decisions. A 2017 nationally representative poll conducted by Nanos Research found that half of Canadians felt that the federal government was doing “a poor or very poor job of building public confidence in energy decision-making”;⁷⁸ only 17% felt it was doing a good or very good job. Managing cumulative effects was also top of mind, as 80% of Canadians agreed or somewhat agreed that there needed to be better management of the cumulative effects generated by multiple projects.⁷⁹ Another study found that “only 33% felt that the consideration of science was working well” in the federal environmental assessment process under *CEAA 2012*.⁸⁰ The same study found that the most common choices about improving the federal EA process emphasized basing decisions on science, facts, and evidence (31%, $n = 189$), and the importance of public participation and consultation (27%, $n = 167$) and credibility, independence, and lack of bias and influence (19%, $n = 113$).⁸¹

A January 2018 NRG Research Group poll also revealed that some Canadians are concerned with how EA processes are balancing the different sectors of Canadian society. This nationally-representative poll⁸³ of 1,000 participants asked about public perceptions of EA

Comment, (22 September 2015), online (pdf): *ABlawg.ca* <ablawg.ca/wp-content/uploads/2015/09/Blog_MOandMD_Ontario-Power-Generation-Inc-_FCA_20Sept2015.pdf>.

⁷⁶ See e.g. *Georgia Straight Alliance v Canada (Minister of Fisheries and Oceans)*, 2010 FC 1233 at para 287, [2012] 3 FCR 136. In the context of a dispute over the correct interpretation of the *SARA*, the Court observed that “[i]t is apparent throughout the [Ministers’] submissions that the Ministers much prefer the discretions and flexibility of the *Fisheries Act* to the mandatory obligations of *SARA*”: *ibid*.

⁷⁷ *Vancouver Island Peace Society v Canada*, [1992] 3 FC 42 at 51, 53 FTR 300. See also Jason MacLean & Chris Tollefson, “Climate-Proofing Judicial Review After Paris: Judicial Competence, Capacity, and Courage” (2018) 31:3 *J Envtl L & Prac* 245 at 252–65.

⁷⁸ Nanos Research, “Canadians More Negative than Positive about Energy Decision-Making” (2017) at 2, online (pdf): *University of Ottawa* <www.uottawa.ca/positive-energy/sites/www.uottawa.ca/positive-energy/files/systemunderstres_cleland_gattingerfnl_march2017.pdf>.

⁷⁹ See Nanos Research, *supra* note 78 at 3.

⁸⁰ Aerin L Jacob et al, “Cross-Sectoral Input for the Potential Role of Science in Canada’s Environmental Assessment” (2018) 3:1 *FACETS* 512 at 523.

⁸¹ *Ibid*.

⁸³ NRG Research Group, “January 2018 National Omni Poll Y2Y Results” (26 January 2018), online (pdf): *Yellowstone to Yukon Conservation Initiative* <y2y.net/publications/nrg-research-group-2018-poll.pdf>. The poll methodology proceeded as follows (described at 3): “[a] total of 1000 interviews were conducted from a randomly generated list of residential landline and wireless phone numbers for Canadian residents. Data collection was conducted from NRG Research Group’s call centre in Winnipeg,

processes. When presented with a list of options of which social sector *currently had* the most influence in EA decisions, 32% felt the government was most influential, followed by 22% for industry lobby groups. Few participants considered the most influential sectors to be environmental lobby groups (10%), Indigenous Peoples (9%), or the public (5%); 18% thought that influence was distributed evenly.⁸⁴ However, when asked which social sector *should have* the most influence over EA decisions, 46% replied that influence should be equal between groups, followed by the public having the most influence (26%).⁸⁵ Only 2% felt industry lobby groups should have the most influence.⁸⁶ Furthermore, when participants were asked whether EA decisions should be based primarily on fairness (defined as “[e]veryone who is involved gets a say, especially those most directly impacted”), thoroughness (defined as “[a] detailed, patient process of gathering all information and weighing the decision”), or efficiency (defined as “[d]ecision-making happens quickly, with deadlines to provide investor confidence”), 45% chose fairness, 37% chose thoroughness, and only 14% chose efficiency.⁸⁷ Selection of efficiency was particularly low among people in British Columbia (9%) and Atlantic Canada (7%),⁸⁸ regions which have both been recently affected by controversial reviews of large energy-related projects conducted under *CEAA 2012*. Thus, this poll showed that many Canadians believe that fairness and thoroughness are more important than efficiency and are concerned that industry is exerting undue influence on EA processes.

Many Canadians participated in the Expert Panel’s consultation processes through a variety of means, including in-person appearances, written submissions, and posts to an online portal.⁸⁹ Jacob et al. evaluated 421 unique written submissions to the Expert Panel and found that the vast majority (87%) mentioned one or more of the five components for strong science in EA law (see Part III).⁹⁰ Of the contributors to the consultation who mentioned 1 or more of the 5 components, over 90% were in favour of strengthening the component(s).⁹¹ When split by sector, support for stronger science was highest among Indigenous groups, non-governmental organizations, and individuals/academics.⁹² Industry groups and government bodies and agencies also supported stronger science, but they showed greater support for open science, cumulative

Manitoba from January 10 to the 17th, 2018. The results of this study are accurate +/- 3.2%, 19 times out of 20. The survey questions were developed by Y2Y staff with some assistance from NRG research professionals. The questions were translated as the survey was fielded in both official languages.” Regional quotas were set including Atlantic; Quebec; Ontario; Manitoba/Saskatchewan; Alberta and British Columbia; and the northern territories. Final data were “weighted to accurately reflect the age-gender population distribution of Canada based on the 2016 Census data.”

⁸⁴ *Ibid* at 6.

⁸⁵ *Ibid* at 7.

⁸⁶ *Ibid*.

⁸⁷ *Ibid* at 8.

⁸⁸ *Ibid*.

⁸⁹ See Jacob et al, *supra* note 80 at 514.

⁹⁰ See *ibid* at 517.

⁹¹ See *ibid*.

⁹² Support was higher as compared to the other two sectors (government bodies/agencies and industry/industry associations) examined in the study. The study evaluated all written submission to the Expert Panel Review of Environmental Assessment Processes, interpreting and categorizing them according to explicitly expressed support for or against five components of stronger science in impact assessment. See *ibid* at 520.

effects, and transparent decision making, with much less support for greater scientific rigour or independence. Thus, most written submissions to the Expert Panel expressed a need to strengthen the scientific basis of EA reform, with the exception of industry groups, which expressed hesitation to strengthen the scientific rigour or independence of EA.⁹³

The Expert Panel consultations were accompanied by a voluntary, government-led (nonrepresentative) questionnaire called Choicebook,⁹⁴ which received 2,673 responses. This questionnaire asked people to rank the top three elements to consider (of eight) when making environmental regulatory decisions. The top-ranked element was “[s]cience, facts and evidence have been used to support decisions” (74%), and the second and third-ranked elements were “[e]nvironmental benefits/impacts have been considered” (66%) and “[e]xpert knowledge/input has been gathered and considered” (42%).⁹⁵ Only 25% of respondents selected “[e]conomic benefits/impacts have been considered” as one of their three top-ranked concerns.⁹⁶ Furthermore, nearly half of Choicebook respondents felt EA processes should “completely” address Canada’s climate change commitments.

EA practitioners themselves (generally, consultants hired to conduct scientific studies associated with EA requirements) have been surveyed about science in global EA processes. In a survey of 344 members of the International Association for Impact Assessment, 99% of respondents “indicated that an effective IA process must include a scientifically credible report”,⁹⁷ but were generally displeased with the amount of emphasis placed on science throughout the EA process. An international survey of both EA scholars and practitioners found that many EA scholars were dissatisfied with the quality of science in EA, particularly as it relates to approaches in impact prediction.⁹⁸

Based on these results, there seems to be a broad public mandate to update the EA law to include the components necessary to ensure that evidence is appropriately gathered and considered. Thus, there is broad public support of the government’s own stated intentions to improve the scientific and evidentiary basis of the federal EA regime.

III. COMPONENTS OF SCIENCE-BASED EA LAW

⁹³ See *ibid* at 522.

⁹⁴ Nielsen, Delaney + Associates & Publivate, "Review of Canada’s environmental and regulatory processes: Questionnaire report (Final Draft)" (Prepared for the Government of Canada, 23 December 2016).

⁹⁵ *Ibid* at 36.

⁹⁶ *Ibid*.

⁹⁷ Angus Morrison-Saunders & Barry Sadler, “The Art and Science of Impact Assessment: Results of a Survey of IAIA Members” (2010) 28:1 *Impact Assessment & Project Appraisal* 77 at 79.

⁹⁸ Jie Ma, Peter Duinker & Tony Walker, “Scholar and Practitioner Views on the Quality of Science in Environmental Assessment” (Poster delivered at the International Association for Impact Assessment conference, Montreal, April 2017), online (pdf): <researchgate.net/publication/315677812_Scholar_and_Practitioner_Views_on_the_Quality_of_Science_in_Environmental_Assessment>.

Canada has long been considered in the forefront of both criticism of science in EA and for pushing technical advancement.⁹⁹ Scientific guidelines for EA practice have been established in Canada for decades, first cemented by the landmark investigation of Beanlands and Duinker¹⁰⁰ and continuing until the present. However, the majority of the principles set forth by the academic and scientific communities have not been enshrined in EA law or practice.¹⁰¹ In this section, we do not discuss the technical applications of science in EA, but rather the regulatory conditions of an EA regime under which science and evidence can flourish or be discarded. We use five discrete components necessary for strong science to be included in EA, as defined by Jacob et al. and discussed further by Westwood et al.¹⁰² These components are not direction for the scientific undertakings associated with EA, but rather elements that need to be included in a regime to ensure that any scientific works or evidence-based decision making made under that regime meet the standards associated with scientific inquiry.¹⁰³

1. Open information

Open access to information is increasingly the standard of modern scientific publishing, including government-funded publishers. Canada's Tri-Agency, which represents the three federal granting agencies that advance research, training, and innovation, recognizes the social importance of open information:

Societal advancement is made possible through widespread and barrier-free access to cutting-edge research and knowledge, enabling researchers, scholars, clinicians, policymakers, private sector and not-for-profit organizations and the public to use and build on this knowledge.¹⁰⁴

⁹⁹ See Federal Environmental Assessment Review Office, *Environmental Impact Assessment in Canada*, by WJ Couch, JF Herity & RE Munn, Occasional Paper No 6 (Toulouse: Federal Environmental Assessment Review Office, 1981) at 24.

¹⁰⁰ Gordon E Beanlands & Peter N Duinker, *An Ecological Framework for Environmental Impact Assessment in Canada* (Halifax: Institute for Resource and Environmental Studies, Dalhousie University & Federal Environmental Assessment Review Office, 1983).

¹⁰¹ For a current overview of the state of biophysical science in EA, see MacKinnon, Duinker & Walker, *supra* note 9. The textbook describes in detail modern areas of study and methods of application for rigorous biophysical science in EA, including ecosystem resilience, ecosystem complexity, thresholds, accounting for biodiversity, landscape ecology, climate change, and ecosystem services.

¹⁰² Jacob et al, *supra* note 80 at 515–16; Westwood et al, *supra* note 72 at 12.

¹⁰³ For a discussion of standards associated with scientific inquiry, see “Principles”, online: *Science Integrity Project* <scienceintegrity.ca/>. The Science Integrity Project engaged the multisectoral wisdom of 75 Canadian leaders to define aspects of integrity in scientific theory and practice. See “Home”, online: *Science Integrity Project* <scienceintegrity.ca/>.

¹⁰⁴ Government of Canada, “Tri-Agency Open Access Policy on Publications” (last modified 21 December 2016), online: *Science.gc.ca* <science.gc.ca/eic/site/063.nsf/eng/h_F6765465.html?OpenDocument>.

Data that meet standards of transferability and generalizability¹⁰⁵ as well as reproducibility¹⁰⁶ are necessary to ensure research can be independently verified.¹⁰⁷ To be truly open, information used in assessment, including raw data, needs to be free, described (for example, accompanying metadata), curated (for example, hosted and maintained), and publicly available (for example, accessible, usually via website). An EA regime that meets open-access standards would freely publish all data and reports associated with the planning, assessment, and learning/adaptive management phases of projects, as well as publish reports that describe EA decisions and how scientific information was incorporated or considered in the decision-making phase. This database would be available in perpetuity. Consideration for private individual, community-held, or other sensitive knowledge including scientific information (for example, locations of species targeted for illegal trade) can be accommodated within an open-information framework.

2. Cumulative effects

Cumulative effects assessment involves considering the impacts of a project at the broad spatial and temporal scales encompassing past, present, and future infrastructure development or land-use change.¹⁰⁸ In principle, the assessment of cumulative effects should allow for insight into how proposed projects contribute towards exceeding large-scale thresholds (for example, total greenhouse gas emissions, amount of habitat fragmentation, and concentrations of chemicals in water flows). Woodland caribou, for example, suffer substantial negative impacts when a disturbance affects more than 65% of their habitat.¹⁰⁹ Thus, cumulative effects assessment could help provide a broader context for the evaluation of proposed projects.

¹⁰⁵ We adopt a definition given in Michael Drummond et al, “Transferability of Economic Evaluations Across Jurisdictions: ISPOR Good Research Practices Task Force Report” (2009) 12:4 Value Health 409 who state that their data “were generalizable if they applied, without adjustment, to other settings. On the other hand, data were transferable if they could be adapted to apply to other settings” at 410.

¹⁰⁶ As reviewed in Steven N Goodman et al, in “What does research reproducibility mean?” (2016) 8:341 www.ScienceTranslationalMedicine.org, reproducibility does not have one single definition. We adopt the definition “[r]eproducibility refers to the ability of a researcher to duplicate the results of a prior study using the same materials and procedures as were used by the original investigator” given in Kenneth Bollen et al, “Social, Behavioral, and Economic Sciences Perspectives on Robust and Reliable Science: Report of the Subcommittee on Replicability in Science Advisory Committee to the National Science Foundation Directorate for Social, Behavioral, and Economic Sciences” online (pdf): *National Science Foundation* <www.nsf.gov/sbe/AC_Materials/SBE_Robust_and_Reliable_Research_Report.pdf> at 3.

¹⁰⁷ Marcus R Munafò et al, “A Manifesto for Reproducible Science” (2017) 1:1 *Nature Human Behaviour* 1; Marcia McNutt, “Journals Unite for Reproducibility” (2014) 346:6210 *Science* 679. For discussion on procedures to ensure data meet these standards, see Ethan P White et al, “Nine Simple Ways to Make It Easier to (Re)use Your Data” (2013) 6:2 *Ideas in Ecology & Evolution* 1.

¹⁰⁸ See A John Sinclair, Meinhard Doelle & Peter N Duinker, “Looking Up, Down, and Sideways: Reconceiving Cumulative Effects Assessment as a Mindset” (2017) 62 *Environmental Impact Assessment Rev* 183 at 184.

¹⁰⁹ See Environment Canada, *Scientific Assessment to Inform the Identification of Critical Habitat for Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada: 2011 Update* (Ottawa: Environment Canada, 2011) at 14.

Cumulative effects assessment in Canada has been deemed impotent in practice for several reasons.¹¹⁰ Often, proponents sidestep a detailed cumulative effects assessment by arguing that their projects will not have significant residual effects.¹¹¹ Alternatively, in some cases, proponents argue that landscapes are so greatly disturbed that an additional project (for example, with a disturbance footprint of <1% of the regional study area) should have a negligible effect on wildlife.¹¹² In addition, for most wildlife species, and many other environmental components of EA, such thresholds have not been established,¹¹³ resulting in cumulative effects assessments that are at best incomplete and, more often, avoided completely. Such quantitative thresholds are rarely used in environmental impact assessments and, when they are, the negative impacts are often argued to be nonsignificant.¹¹⁴

Cumulative effects assessments, when included, are also often narrowly scoped.¹¹⁵ Cumulative effects theoretically encompass the often-compounding upstream and downstream consequences of resource production and use.¹¹⁶ For energy projects in particular, the research on cumulative effects completed as part of a project EA has been found inadequate to address the challenges of climate change, which requires an honest and full accounting of not just project emissions, but also those generated by predictable upstream and downstream processes (for example, additional extraction or combustion by end users).¹¹⁷ As is being increasingly recognized, appropriately addressing climate change and other cumulative effects will require

¹¹⁰ See Peter N Duinker & Lorne A Greig, “The Impotence of Cumulative Effects Assessment in Canada: Ailments and Ideas for Redeployment” (2006) 37:2 *Environmental Management* 153 [Duinker & Greig, “Ailments and Ideas”].

¹¹¹ See *ibid* at 155–56.

¹¹² See Cathryn Clarke Murray et al, “The Insignificance of Thresholds in Environmental Impact Assessment: An Illustrative Case Study in Canada” (2018) 61:6 *Environmental Management* 1062 at 1067.

¹¹³ See Malcolm L Hunter Jr et al, “Thresholds and the Mismatch between Environmental Laws and Ecosystems” (2009) 23:4 *Conservation Biology* 1053 at 1053–54. See generally Andrew J Huggett, “The Concept and Utility of ‘Ecological Thresholds’ in Biodiversity Conservation” (2005) 124:3 *Biological Conservation* 301.

¹¹⁴ See Murray et al, *supra* note 112 at 1063, 1067.

¹¹⁵ See Duinker & Greig, “Ailments and Ideas”, *supra* note 110 at 158.

¹¹⁶ See Nancy Shackelford et al, “Threats to Biodiversity from Cumulative Human Impacts in One of North America’s Last Wildlife Frontiers” (2017) 32:3 *Conservation Biology* 672.

¹¹⁷ See e.g. Robert B Gibson, Meinhard Doelle & A John Sinclair, “Fulfilling the Promise: Basic Components of Next Generation Environmental Assessment” (2016) 29 *J Envtl L & Prac* 257. See also Stephanie J Green et al, “Oil Sands and the Marine Environment: Current Knowledge and Future Challenges” (2017) 15:2 *Frontiers in Ecology & Environment* 74 at 79–80, Elizabeth M Brown, “The Rights to Public Participation and Access to Information: The Keystone XL Oil Sands Pipeline and Global Climate Change under the National Environmental Policy Act” (2012) 27:2 *J Envtl L & Litig* 499 at 517–518; Michael Burger & Jessica Wentz, “Downstream and Upstream Greenhouse Gas Emissions: The Proper Scope of NEPA Review” (2017) 41:1 *Harv Envtl L Rev* 109 at 175; Wendy J Palen et al, “Consider the Global Impacts of Oil Pipelines” (2014) 510 *Nature* 465 at 466. For a detailed discussion on the state of climate science in environmental assessment, see MacKinnon, Duinker & Walker, *supra* note 9 at 51–54.

provisions for individual project EAs to be nested within regional and strategic efforts that can evaluate a project against values and effects thresholds at larger scales.¹¹⁸

Frameworks for cumulative effects assessment have been developed for certain systems, such as watersheds.¹¹⁹ Although cumulative effects assessment has been required under federal law since 1995,¹²⁰ it has largely been confined to the context of individual projects and unevenly applied.¹²¹ In the context of Canada's oil sands region, EAs for individual projects have often repeated scientific work already completed for other projects. Although some independent studies have examined regional cumulative effects impacts,¹²² few studies as part of EAs have addressed the outcomes of previous developments, or provided information on regional ecological capacities that could indicate how a project contributes to regional, national, or global limits.¹²³

3. Scientific rigour

Scientific evidence is a key part of public policy decisions,¹²⁴ but not all information is produced according to the same standards. A great deal of scientific data are collected during the information-gathering as well as recursive phases of EA. These data are collected and analyzed using a variety of methods including field studies, mathematical predictions of impacts, and meta-analyses. The methods used should be the best available.¹²⁶ However, past practices have been criticized as incomplete for including inferences and assumptions without validation or testing, for example.¹²⁷ In addition, when scientific information essential to evaluating environmental risk is lacking, this absence is often underemphasized in EA.¹²⁸ It is a truism that

¹¹⁸ See Carissa Schively Slotterback, "Addressing Climate Change in State and Local Environmental Impact Analysis" (2011) 54:6 *J Environmental Planning & Management* 749 at 762; Vong Sok, Bryan J Boruff & Angus Morrison-Saunders, "Addressing Climate Change Through Environmental Impact Assessment: International Perspectives from a Survey of IAIA Members" (2011) 29:4 *Impact Assessment & Project Appraisal* 317 at 324; Takafumi Ohsawa & Peter Duinker, "Climate-Change Mitigation in Canadian Environmental Impact Assessments" (2014) 32:3 *Impact Assessment & Project Appraisal* 222 at 230; Green et al, *supra* note 117 at 80; Shackelford et al, *supra* note 116.

¹¹⁹ See MacKinnon, Duinker & Walker, *supra* note 9 at 89–90.

¹²⁰ See *CEAA 1992*, *supra* note 46, ss 16(1)(a), 19(5).

¹²¹ See Duinker & Greig, "Ailments and Ideas", *supra* note 110 at 158.

¹²² See e.g. Shackelford et al, *supra* note 116; Mary Toews, Francis Juanes & A Cole Burton, "Mammal Responses to the Human Footprint Vary across Species and Stressors" (2018) 217 *J Environmental Management* 690.

¹²³ See Robert (Bob) Connelly, "Canadian and International EIA Frameworks as They Apply to Cumulative Effects" (2011) 31:5 *Environmental Impact Assessment Rev* 453 at 545; Green et al, *supra* note 117.

¹²⁴ See Gosselin et al, *supra* note 21 at 16–17.

¹²⁶ See "Principles", *supra* note 103. However, it should be noted that, of the many calls for environmental decision making to be based on the "best available science", few definitions of what this may entail have been offered. But see Darren S Ryder et al, "Defining and Using 'Best Available Science': A Policy Conundrum for the Management of Aquatic Ecosystems" (2010) 61:7 *Marine & Freshwater Research* 821.

¹²⁷ See J Treweek, "Ecology and Environmental Impact Assessment" (1996) 33:2 *J Applied Ecology* 191 at 193.

¹²⁸ Murray et al, *supra* note 112 at 1066.

the absence of information should not be equated to an absence of risk. In the context of Alberta's oil sands development, for example, an expert review commissioned by the Royal Society of Canada found that the rigour and content of economic analyses associated with EA reviews were inconsistent and systemically underestimated the costs associated with proposed projects.¹²⁹

Project proponents have also been found to consistently undermeasure environmental impacts, including pollution,¹³⁰ habitat loss,¹³¹ and emission of toxic compounds.¹³² They have also undermeasured benefits of ecosystem services,¹³³ such as the productivity of watersheds. For example, the proponents of the Pacific NorthWest Liquefied Natural Gas terminal project concluded that the proposed development site had "low habitat productivity and value".¹³⁴ However, this directly contradicted field studies performed in the 1970s by government and private science¹³⁵ as well as recent independent science programs,¹³⁶ which consistently identified the proposed development site as having the most productive salmon habitat in the estuary.

In theory, evidence of all kinds collected during the information-gathering phase should be used in decision making. Clarke Murray et al. suggested that governments require "clear and defensible significance determinations,"¹³⁷ including using quantitative thresholds and making them legally enforceable and accountable. In the next iteration of Canada's EA regime, significance testing appears destined to take a back seat to decision making based on whether a project meets a test of sustainability and is in the public interest (see Part IV). In their review of environmental impact assessments, the Royal Society of Canada found that socioeconomic and

¹²⁹ See Gosselin et al, *supra* note 18 at 250.

¹³⁰ See Erin N Kelly et al, "Oil Sands Development Contributes Polycyclic Aromatic Compounds to the Athabasca River and its Tributaries" (2009) 106:52 *Proceedings National Academy Sciences United States of America* 22346.

¹³¹ See Rebecca C Rooney, Suzanne E Bayley & David W Schindler, "Oil Sands Mining and Reclamation Cause Massive Loss of Peatland and Stored Carbon" (2012) 109:13 *Proceedings National Academy Sciences United States of America* 4933.

¹³² See Shao-Meng Li et al, "Differences between Measured and Reported Volatile Organic Compound Emissions from Oil Sands Facilities in Alberta, Canada" (2017) 114:19 *Proceedings National Academy Sciences United States of America* E3756.

¹³³ Ecosystem services are the tangible and intangible benefits that people receive from nature, including food, fibre, wood, climate regulation, crop pollination, aesthetic values, and more.

¹³⁴ Stantec Consulting Ltd, "Report on Fish and Fish Habitats: Baseline Characterization of the Fish and Fish Habitats on Flora Bank and Adjacent Habitats" (4 May 2015) at v.

¹³⁵ See Wright Engineers Limited, "Port Development Prince Rupert B.C." (report commissioned by the National Harbours Board, August 1972); Canada, Fisheries and Marine Service, *A Biological Assessment of Fish Utilization of the Skeena River Estuary, with Special Reference to Port Development in Prince Rupert*, by RJ Higgins & WJ Schouwenburg (Vancouver: Department of the Environment, 1973) at 60; Northcoast Environmental Analysis Team, "Prince Rupert Bulk Loading Facility Phase 2: Environmental Assessment of Alternatives" (report commissioned by the Federal-Provincial Joint Committee on Tsimpsean Peninsula Port Development, 1975), volume 1.

¹³⁶ See Charmaine Carr-Harris, Allen S Gottesfeld & Jonathan W Moore, "Juvenile Salmon Usage of the Skeena River Estuary" (2015) 10:3 *PLoS One* 1 at 13–14; Moore et al, *supra* note 56 at 1.

¹³⁷ See Murray et al, *supra* note 112 at 1062.

biophysical measurements were inadequate to support the determination that a project is in the public interest.¹³⁸ As such, standards for collection and inclusion of evidence must be set to ensure that evidence is sufficient for decision making.

4. *Transparent Decision Making*

Multiple sources and types of information are used in the decision-making phase of EA; scientific evidence is just one component, and is used in conjunction with economic, social, and political considerations. In past EA regimes, the lack of transparency in decision making was highly criticized for obscuring the public's ability to understand if and how scientific evidence was considered and for eliminating the opportunity for government accountability.¹³⁹

The erosion of public trust undermines current and past EA regimes.¹⁴⁰ In concert with concerns over project approval, this situation of low confidence can lead to rising social unrest and political interventions.¹⁴¹ In particular, developments related to Alberta's oil sands, though formally approved by federal EA processes, have received widespread criticism for failing to appropriately consider large gaps in scientific information, for lack of Indigenous consent, and for propagating opaque decision making.¹⁴² As such, decision making must be made more transparent, including providing stakeholders and the public with the rationale for project decisions and detailed explanations regarding how scientific evidence was considered.¹⁴³

5. *Independence*

In the context of EA, "independence" refers to the relationship between project proponents and the parties collecting, synthesizing, or presenting evidence under the expectation that such information is unbiased, as well as to the varied relationships between proponents, regulators, and decision makers. Under the current EA regime in Canada, project proponents often directly hire individuals or companies to collect and present social and environmental information regarding potential project impacts (a model often referred to as professional reliance). Subsequently, these assessments are reviewed by government bodies, some independent (for example, the National Energy Board [NEB]) and some not (for example, the Canadian Environmental Assessment Agency), who then make nonbinding recommendations regarding project approval. This system, used in both federal and provincial regimes, has come under substantial scrutiny, and the lack of independence between these individuals and companies has been identified as a serious weakness of the current EA system, including by the Expert Panel (as noted above).¹⁴⁴

¹³⁸ See Gosselin et al, *supra* note 21 at 257.

¹³⁹ See *ibid* at 7–8; Expert Panel on the Modernization of the National Energy Board, *supra* note 21 at 13.

¹⁴⁰ See CEEA, *Building Common Ground*, *supra* note 62 at 1; Expert Panel on the Modernization of the National Energy Board, *supra* note 21 at 32.

¹⁴¹ See Mark Winfield, "Decision-Making, Governance and Sustainability: Beyond the Age of 'Responsible Resource Development'" (2016) 29 J Envtl L & Prac 129 at 145–46.

¹⁴² See e.g. Green et al, *supra* note 117; Palen, *supra* note 117.

¹⁴³ See Expert Panel on the Modernization of the National Energy Board, *supra* note 21 at 13; CEEA, *Building Common Ground*, *supra* note 62 at 100.

¹⁴⁴ See *ibid*.

The current system means that project proponents may exert direct (for example, contractual) or indirect influence on the groups they hire to collect and present EA materials. In some cases, this professional reliance may compromise the scientific integrity of EAs—previous investigations have found that private consultants hired to create EA reports were pressured by proponents to minimize environmental risks of projects.¹⁴⁵ At the provincial level, in British Columbia, the system of professional reliance has come under intense scrutiny for causing an inappropriate delegation of decision-making authority to organizations and individuals with no public accountability.¹⁴⁶ A government-ordered review of this system made numerous recommendations, including the authority for agencies to obtain and question information provided by professionals or proponents, promoting professional independence, improving public access to and transparency of professional documentation and rationale, and improving baseline data.¹⁴⁷

Independence between proponents and decision makers is also relevant to the integrity of EA. In one prominent example of the need to preserve independence, NEB board members recused themselves from review of the TransCanada Energy East pipeline project following revelations that NEB board members and senior officials had engaged in a private meeting with a company representative (and former provincial premier).¹⁴⁸ In another example, public servants were instructed “to give cabinet a legally-sound basis to say ‘yes’” to the proposed Trans Mountain Expansion Project, while government was ostensibly consulting in good faith with First Nations and had not yet reached a final decision.¹⁴⁹

¹⁴⁵ See e.g. Tonya Smith et al, “Oversight At Risk: The State of Government Science in British Columbia; An Assessment of Research Capacity, Communication and Independence in British Columbia Provincial Ministries and Departments” (April 2017) at 19–20, online (pdf): *Evidence for Democracy* <evidencefordemocracy.ca/sites/default/files/reports/oversightatrisk.pdf>; Michael Cleland & Monica Gattinger, “System Under Stress: Energy Decision-Making in Canada and the Need for Informed Reform” (March 2017) at 27, online (pdf): <www.uottawa.ca/positive-energy/sites/www.uottawa.ca.positive-energy/files/systemunderstres_cleland_gattingerfnl_march2017.pdf>; Mark Haddock, *Professional Reliance and Environmental Regulation in British Columbia* (Victoria: Environmental Law Centre, 2015) at 48–54; Beanlands & Duinker, *supra* note 100; Expert Panel on the Modernization of the National Energy Board, *supra* note 21 at 35; Anne Casselman, “Who is Watching B.C.’s Environmental Watch Dogs?”, *BC Business* (14 July 2015), online: <www.bcbusiness.ca/who-is-watching-bcs-environmental-watch-dogs>.

¹⁴⁶ See Haddock, *ibid* at 31, 52; Smith et al, *ibid* at 7.

¹⁴⁷ See British Columbia, *Professional Reliance Review: The Final Report of the Review of Professional Reliance in Natural Resource Decision-Making*, by Mark Haddock (Victoria: Ministry of Environment and Climate Change Strategy, 18 May 2018) at 61–77.

¹⁴⁸ See Mike De Souza, “Pipeline Regulator Gets Pounded with Complaints for Being Secretive”, *National Observer* (21 February 2018), online: <www.nationalobserver.com>; Mike De Souza, “Pipeline Panel Recuses Itself, Chairman Reassigned from Energy East Duties”, *National Observer* (9 September 2016), online: <www.nationalobserver.com>.

¹⁴⁹ Mike De Souza, “Government Insiders Say Trans Mountain Pipeline Approval Was Rigged”, *National Observer* (24 April 2018), online: <www.nationalobserver.com/2018/04/24/kinder-morgan-opponents-suspected-trudeau-government-rigged-its-review-pipeline-federal>.

IV. THE *IMPACT ASSESSMENT ACT* AND SCIENCE: MAJOR OVERHAUL OR LIGHT RENOVATION?

As one of us has described elsewhere, the *IAA* is largely a “bulked-up version” of the *CEAA 2012*.¹⁵⁰ Most obviously, the *IAA* is still primarily designed around a designated project list, with peripheral provisions for projects on federal lands, as well as regional and strategic assessments. The main differences between the *IAA* and the *CEAA 2012* include a legislated planning phase¹⁵¹ and an expansion of the scope of assessments, including a project’s social, economic, and health effects.¹⁵² In addition, as noted above, rather than focusing exclusively on a project’s “significant adverse environmental effects”¹⁵³ the federal government will also have to consider its contribution to “sustainability”¹⁵⁴ and whether it contributes to or hinders Canada’s ability to meet its climate change commitments.¹⁵⁵ All three of these factors (i.e., the adverseness of any effects, sustainability, and climate change) will be mandatory considerations as part of the government’s “public interest” determination with respect to a given project, which must be accompanied by a set of reasons that demonstrates their consideration in the decision-making process.¹⁵⁶

With respect to science, upon the introduction of the *IAA* in February 2018, it could safely be said that the *IAA* generally failed to address the science-based shortcomings identified in the course of the past two years of study and consultations. Although the legislation contains five new references to science or scientific information, these do not reflect the clearly defined recommendations made by the government-appointed Expert Panel; these references do not even confer the concrete roles for science found in both *CEPA 1999* or *SARA*.¹⁵⁷ The preamble of the *IAA* refers to the integration of “scientific information and the traditional knowledge of the Indigenous peoples of Canada”,¹⁵⁸ while the “purposes” clause refers to “ensur[ing] that an impact assessment takes into account scientific information”.¹⁵⁹ Scientific information is also referred to twice in the context of the internet registry¹⁶⁰ and once in relation to the mandatory expert advisory panel.¹⁶¹ While these references certainly bolster the case for more rigour in the scientific aspects of impact assessment (as part of a purposive and contextual interpretation of the legislation),¹⁶² in and of themselves they are of relatively limited use. As further discussed

¹⁵⁰ Martin Z Olszynski, “A(nother) New Federal Regime for Assessing Interprovincial Pipeline Projects: The Proposed *Impact Assessment Act*” (2018) 6:2 Energy Regulation Q 11 at 11 [Olszynski, “A(nother) New Federal Regime”].

¹⁵¹ See *IAA*, *supra* note 73, cls 10–20.

¹⁵² See *ibid*, cl 2 (“effects”).

¹⁵³ *CEAA 2012*, *supra* note 19, s 4(1)(a).

¹⁵⁴ *IAA*, *supra* note 73, cls 22(h), 63(a). Sustainability is defined in clause 2 as “the ability to protect the environment, contribute to the social and economic well-being of the people of Canada and preserve their health in a manner that benefits present and future generations”.

¹⁵⁵ See *ibid*, cls 22(i), 63(e).

¹⁵⁶ See *ibid*, cl 63(a)–(b), (e).

¹⁵⁷ See *CEPA, 1999*, *supra* note 25 and *SARA*, *supra* note 30.

¹⁵⁸ *IAA*, *supra* note 73, Preamble.

¹⁵⁹ *Ibid*, cl 6(1)(j).

¹⁶⁰ See *ibid*, cl 105(2)(d).

¹⁶¹ See *ibid*, cl 157(1).

¹⁶² “Today there is only one principle or approach, namely, the words of an Act are to be read in their entire context and in their grammatical and ordinary sense harmoniously with the scheme of the Act, the

below, the *IAA* contains no provisions with respect to open science (i.e., a centrally managed public repository of all impact assessment data), standardized methodologies, or peer review.

Shortly prior to Bill C-69's release, Westwood et al. convened 25 national experts on EA. In their report, "Strong Foundations: Recap and Recommendations from Scientists Regarding the Federal Environmental and Regulatory Reviews" ("Strong Foundations"),¹⁶³ they recommended 15 scientific priorities and outstanding gaps to be addressed in the new Act (see Table 1). After Bill C-69 was introduced, the experts graded whether these criteria were included. They found that seven criteria were not included in the proposed *IAA* at all, seven were partially met, and no criteria were fully realized (see Table 1).¹⁶⁴ Another report card by a coalition of leading Canadian environmental organizations also found the proposed *IAA* lacking on meeting many expert recommendations, including some relating to science.¹⁶⁵

Following the *IAA*'s review by the Standing Committee on Environment and Sustainable Development (the "Committee"), however, there is now one provision that has the potential to address a considerable part of the current regime's science deficit. Introduced by Member of Parliament and Leader of the Green Party of Canada, Elizabeth May, and unanimously passed by the Committee, a new subsection 6(3) will require the government to adhere to the principle of scientific integrity:

The Government of Canada, the Minister, the Agency and federal authorities must, in the administration of this Act, exercise their powers in a manner that adheres to the principles of *scientific integrity, honesty, objectivity, thoroughness and accuracy*.¹⁶⁶

Although a full discussion of this provision's potential implications is beyond the scope of this article, we offer the following preliminary observations.¹⁶⁷ First, and perhaps obviously, this clause is directly aimed at government actors only; it will not apply to proponents and consultants (whether as individuals or companies). As such, it is arguably a half measure only. On the other hand, bearing in mind that, under the proposed *IAA* (as under the current *CEAA 2012*), government scientists and analysts will be tasked with reviewing all privately generated data and impact statements, subsection 6(3) can be expected to have at least an indirect upward

object of the Act, and the intention of Parliament": Elmer A Driedger, *Construction of Statutes*, 2nd ed (Toronto: Butterworths, 1983) at 87, cited with approval by the SCC in *Re Rizzo & Rizzo Shoes Ltd*, [1998] 1 SCR 27 at para 21, 154 DLR (4th) 193.

¹⁶³ See *supra* note 77.

¹⁶⁴ See "How Does the Impact Assessment Act, Bill C-69, Stack Up on Science?", online (pdf): *Yellowstone to Yukon Conservation Initiative* <y2y.net/publications/2018-reportcard-v2.pdf> ["How Does the Impact Assessment Act Stack Up?"].

¹⁶⁵ See West Coast Environmental Law Association et al, "Making The Mid-Term Grade: A Report Card on Canada's Proposed New Impact Assessment Act" (March 2018), online (pdf): *West Coast Environmental Law* <www.wcel.org/sites/default/files/publications/2018-03-29-midtermreportcard-iaact-final.pdf>.

¹⁶⁶ *IAA*, *supra* note 73, cl 6(3) [emphasis added].

¹⁶⁷ In the interests of full disclosure, several of the authors of this article recommended that "scientific integrity" be included in the *IAA* in briefs and appearances before the Standing Committee on Environment and Sustainable Development.

(in terms of quality) effect on nongovernment actors participating in the impact assessment process. Second, “scientific integrity” is a common term in this context. Having been operationalized in the United States for some time,¹⁶⁸ American law professor Holly Doremus lists “intellectual honesty, rigorous reasoning, and unclouded judgment” as the core tenets of scientific integrity.¹⁶⁹ Each of these tenets is reflected in subsection 6(3) (honesty, thoroughness, and objectivity, respectively).¹⁷⁰ This material is bound to inform this provision’s interpretation; indeed most of it was cited by Ms. May as she introduced the amendment in Committee.¹⁷¹ Third, and finally, the explicit reference to “objectivity” should give future courts cause for pause before re-embracing their current subjective approach to *CEAA 2012*. The entire provision should also lay to rest any remaining judicial reluctance to engage in the substantive review of the science of impact assessments (for example, in the context of future litigation). Setting aside this provision, the remainder of this article summarizes the key findings of the analyses based on the 14 recommendations in “Strong Foundations” with regards to the degree to which the proposed *IAA* aligns with key scientific principles of effective EA.¹⁷²

The proposed *IAA* does not fulfill standards for **open information**. Although it requires that project notices and files be published on a central website (the “Registry”), it provides for only summaries and there are no requirements for fully open data.¹⁷³ The Registry provisions are essentially unchanged from the *CEAA 2012*¹⁷⁴ and are full of problematic qualifiers, for example, the Registry shall contain “(d) any scientific information that the Agency receives from a proponent or federal authority, *or a summary of the scientific information and an indication of*

¹⁶⁸ See e.g. US, Department of the Interior & US Geological Survey, “Scientific Integrity” (23 July 2015), online: *USGS* <www2.usgs.gov/usgs-manual/500/500-25.html>, which requires US Geological Survey employees to “communicate the results of scientific activities clearly, honestly, objectively, thoroughly, accurately, and in a timely manner.” See also 40 CFR § 1502.24 (2012) [emphasis added]:

“Agencies shall insure the professional integrity, *including scientific integrity*, of the discussions and analyses in environmental impact statements. *They shall identify any methodologies used and shall make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement.* An agency may place discussion of methodology in an appendix.”

See *Idaho Sporting Congress v. Thomas* (1997) 137 F.3d 1146, USCA 9th Cir., wherein the Court of Appeals interpreted these regulations as requiring “that the public receive the underlying environmental data from which a Forest Service expert derived her opinion” (at para 10).

¹⁶⁹ Holly Doremus, “Scientific and Political Integrity in Environmental Policy” (2008) 86:7 *Tex L Rev* 1601 at 1623.

¹⁷⁰ See *IAA*, *supra* note 73, cl 6(3).

¹⁷¹ See House of Commons, Standing Committee on Environment and Sustainable Development, *Evidence*, 42-1, No 112 (9 May 2018) at 9–10 (Hon Elizabeth May).

¹⁷² For detailed discussion of science and the text of the proposed law prior to the amendments made in Committee, see Alana Westwood & Aerin Jacob, “Evaluating the Role of Science in the Proposed *Impact Assessment Act*” (2 May 2018), online (pdf): *Yellowstone to Yukon Conservation Initiative* <y2y.net/publications/science-in-the-iaa-tech-report-report-card.pdf/>; Aerin Jacob & Alana Westwood, “Better Rules Need Better Science: Submission to the Standing Committee on Environment and Sustainable Development Regarding the Role of Science in Impact Assessment” (6 April 2018), online (pdf): *Yellowstone to Yukon Conservation Initiative* <y2y.net/publications/jacob-and-westwood-2018-science-and-iaa.pdf>.

¹⁷³ See *IAA*, *supra* note 73, cl 105(1)–(4).

¹⁷⁴ See *supra* note 19, ss 79(1)–(4).

how that information may be obtained”.¹⁷⁵ To deliver on open information, the Registry files should match the Agency’s internal project files as set out in subsection 106(3), which must contain “any report relating to the impact assessment; . . . any records relating to the design or implementation of any follow-up programs; and . . . any records relating to the implementation of any mitigation measures.”¹⁷⁶ In addition, the text seems to indicate that project records will be impermanent, as it only requires a project file be maintained on the database until either the assessment is included, or follow-up activities are completed.¹⁷⁷ Simply put, the need for a central and public registry with all project-related information, including raw data in a transferable format to be held in perpetuity, has not been recognized.

Cumulative effects assessment may be improved in the *IAA*. Whereas the *CEAA 2012* made only passing reference to “[r]egional [s]tudies”,¹⁷⁸ the *IAA* contains considerably more detailed provisions with respect to both regional and strategic assessments, including the ability for anyone to request such assessments and a duty on the Minister to respond, with reasons, within a prescribed time period.¹⁷⁹ The current government has already committed to carrying out a strategic assessment with respect to climate change, releasing a discussion paper in June 2018.¹⁸⁰ That being said, the decision as to whether to carry out regional and strategic assessments remains discretionary, which undoubtedly diminishes the prospects for such assessments.

It is also possible that the shift in legislation from a “significance test”, which requires establishing a challenging threshold that is difficult to justify, towards a “sustainability test” may improve consideration of cumulative effects, including climate impacts in particular. As noted above, climate change is now a factor that must be considered when determining if a project is in the public interest. However, as noted above, the proposed *IAA* maintains a focus on project-level assessments, which may not be effective in ensuring that new projects help rather than hinder Canada’s efforts to meet agreed-upon climate thresholds.¹⁸¹

With regards to **scientific rigour**, the proposed *IAA* does not include explicit provisions for the peer review of science gathered during the EA process, although, as noted above, a governmental adherence to scientific integrity can be expected to have a positive effect on rigour (and further provisions may be borne out in subsequent regulations to the *IAA*). Generally speaking, monitoring activities appear to have been left to proponents. The proposed *IAA* includes gender-based analysis and community effects,¹⁸² indicating progression on methods in social impact assessment. However, provisions supporting rigorous science for natural ecosystems, species, or environmental quality generally do not appear in the text of Bill C-69

¹⁷⁵ *IAA*, *supra* note 73, cl 105(2)(d) [emphasis added].

¹⁷⁶ *Ibid*, cl 106(3)(b), (d)–(e).

¹⁷⁷ *Ibid*, cl 106(1).

¹⁷⁸ See *supra* note 19, ss 73–77.

¹⁷⁹ See *supra* note 73, cls 92–93, 95, 97(1).

¹⁸⁰ See Government of Canada, “Discussion Paper: Developing a Strategic Assessment of Climate Change” (last modified 1 June 2018), online: *Strategic Assessment of Climate Change* <www.strategicassessmentclimatechange.ca>.

¹⁸¹ See MacKinnon, Duinker & Walker, *supra* note 9 at 52–53; Connelly, *supra* note 123 at 454.

¹⁸² See *IAA*, *supra* note 73, cl 22(1)(s).

itself. The one exception here may be the reintroduction, also following Committee review, of “adaptive management” with the important addition of the word “plan” (i.e., “adaptive management plan[s]”).¹⁸³ Such plans are now referred to as potential contents of Decision Statements under the *IAA*, with several positive implications. First, while a clear definition of adaptive management would be preferable, the addition of “plan” at least conveys the idea that adaptive management is not an *ad hoc* process, or a matter of adapting “on-the-fly”,¹⁸⁴ rather, it is a deliberate and structured process that requires some thought and planning. Second, as a part of Decision Statements, such plans will be both enforceable and reviewable in court rather than left to the whim of proponents. Coupled with a duty to adhere to principles of scientific integrity, future applications of adaptive management can be expected to be more rigorous.

Transparency has been improved in the proposed *IAA*. There will be requirements to publish reasons for decision making, including how factors prescribed in decision making were considered.¹⁸⁵ However, there is no guidance in the proposed *IAA* itself for how trade-offs between different factors are to be evaluated.

Under the previous regime, which used “significant adverse effects” as the test for determining project approval, quantitative thresholds of significance were rarely employed. To prevent the problems that plagued the significance test¹⁸⁶ from similarly affecting the new tests of sustainability and public interest, there will need to be guidance for quantitative thresholds or limits, or at least indication of a set of coherent national values on science and the environment. No such guidance exists within the proposed *IAA* at this time.

Table 1: Scientific criteria recommended by Westwood et al.¹⁸⁷ for inclusion in the proposed *IAA* and assessment by experts of whether the criteria were met in Bill C-69.

Criteria	Category of component(s)	Applicable phase of EA				Met in proposed <i>IAA</i> ?
		Planning	Information gathering	Decision making	Adaptive management	
Assessments account for project impact on climate change	Cumulative effects		X	X	X	Partially
Assessments are “evidence-based, adaptive, and regional” ¹⁸⁸	Cumulative effects; scientific rigour	X	X	X	X	Partially
“Funding . . . provided for intervenor and stakeholder-led science” ¹⁸⁹	Scientific rigour; independence		X		X	No

¹⁸³ See *ibid*, cl 64(4)(b).

¹⁸⁴ JB Ruhl & Robert L Fischman, “Adaptive Management in the Courts” (2010) 95:2 *Minn L Rev* 424 at 441.

¹⁸⁵ See *IAA*, *supra* note 73, cls 63–65.

¹⁸⁶ See Murray et al, *supra* note 112 at 1067–69.

¹⁸⁷ *Supra* note 72 at 1–2.

¹⁸⁸ *Ibid*.

¹⁸⁹ *Ibid*.

Provisions for open science and data	Open information	X	X		X	Partially
Indigenous knowledge is included in “the framework of a nation-to-nation relationship” ¹⁹⁰	Independence; transparency		X	X	X	Partially
Provisions for “rigorous, independent peer review” ¹⁹¹	Scientific rigour		X	X		No
Assessments are “more comprehensive, efficient, and complete” ¹⁹²	Cumulative effects		X			Partially
Spatial and temporal scope of assessment is expanded	Cumulative effects	X	X			No
Clear triggers for assessment and impact thresholds that should not be exceeded	Scientific rigour; transparency			X		No
Established clear national values and objectives for decision making, requiring communication of rationale behind decision making	Transparency; independence	X		X	X	Partially
Precautionary principle “guide[s] the assessment process from the beginning” ¹⁹³	Independence	X		X		Partially
“[B]udgetary commitments to support federal science agencies” ¹⁹⁴	Scientific rigour		X			No (not expected in legislation)

¹⁹⁰ *Ibid.*

¹⁹¹ *Ibid.*

¹⁹² *Ibid.*

¹⁹³ *Ibid.*

¹⁹⁴ *Ibid.*

Assessments “contain commitments to scientific integrity” ¹⁹⁵	Scientific rigour	X	X	X	No
“[A]ddress[es] issues of professional reliance” ¹⁹⁶	Independence		X	X	No

Independence has been in some ways improved in the proposed *IAA*, and in other ways remains unchanged. Life cycle project regulators, such as the NEB and the Canadian Nuclear Safety Commission, will have a reduced role in assessment in the proposed *IAA*, carrying out their duties as joint review panels rather than exclusively, as under the *CEAA 2012*.¹⁹⁷ However, the proponent-funded science model is being retained, which does not address concerns about conflicts of interest or shielding organizations from public accountability. Thus, the scientific basis of EA will remain funded by industry proponents and largely hidden from public accountability.

In summary, although the proposed *IAA* addresses some of the scientific shortcomings of EA in Canada, especially in its post-Committee form, it lacks a strong commitment to science that would enable robust, credible decision making in the public interest.

V. CONCLUSIONS AND RECOMMENDATIONS

There is a long history of independent scientists and experts raising concerns about the role of science in Canadian environmental decision making and in the EA context, particularly. In recent years, this dissatisfaction has spread to the public at large, which has voiced its desire for a stronger scientific foundation for Canada’s federal EA regime.

In this article, we focused on the components of a legal framework that should be in place for science to be adequately considered in EA processes and decision making. As is clear from the discussion in Part II, the current *CEAA 2012* regime, like its predecessors, suffers from a significant science deficit: information with respect to project effects, including monitoring data, is not readily available; proponents routinely rely on mitigation measures with little or no established effectiveness; cumulative effects analysis is project focused and done poorly—if at all—while regional assessment provisions remain unused. With respect to the proposed *IAA*, although considerably improved at the Committee stage, it falls well short of the science-related recommendations made by the Expert Panel on EA. Importantly, environmental decision making is governed not just by federal EA, but also by provincial EA or other regulatory processes. There is a need for a strong scientific basis in these different regimes as well. This was

¹⁹⁵ *Ibid.*

¹⁹⁶ *Ibid.*

¹⁹⁷ See *CEAA 2012*, *supra* note 19, s 15; *IAA*, *supra* note 73, cl x. See also Olszynski, “A(nother) New Federal Regime”, *supra* note 150. Bill C-69 also proposes to replace the NEB with a new Canadian Energy Regulator, although its enabling legislation appears largely unchanged from the NEB’s. See *IAA*, *supra* note 73 cl x; Nigel Bankes, “Some Things Have Changed but Much Remains the Same: The New Canadian Energy Regulator” (15 February 2018), online (pdf): *ABlawg.ca* <ablawg.ca/wp-content/uploads/2018/02/Blog_NB_Much_Remains_The_Same.pdf>.

recognized by British Columbia in the context of its review of the professional reliance model currently in place in the province.

In this article, we did not discuss Indigenous knowledge, which has an essential role, not only in informing EA processes and decisions, but also in improving the relationship between Indigenous peoples and the rest of Canada. We encourage readers to consult Indigenous-led efforts on this issue, such as the 2018 summary, “Impact Assessment in the Arctic: Emerging Practices of Indigenous-Led Review”,¹⁹⁸ the Stk’emlúpsenc te Secwépemc Nation’s Indigenous-grounded project assessment panel review for the Ajax mine project,¹⁹⁹ and written and in-person submissions to the Expert Panel from Indigenous groups.²⁰⁰

We recognize also that it is not merely legislative drafting that will determine the sustainability of future resource development but also how the law is implemented and operationalized. Along these lines, there will be further opportunities for legal scholars and scientists to work together to strengthen the scientific basis of environmental decision making in Canada. In this article, as well as in other recent efforts,²⁰¹ legal scholars and empirical scientists have recognized the need to coordinate and collaborate to advance mutual goals of a clear EA regime that supports evidence-based decision making. The coming months—during which Bill C-69 will make its way through the Senate—will make clear whether the federal government took advantage of the great deal of expert advice available to it, as well as whether it fulfilled the broad public mandate to rectify decades of failed opportunities to improve the role of science in federal EA law.

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¹⁹⁸ Ginger Gibson et al, “Impact Assessment in the Arctic: Emerging Practices of Indigenous-Led Review” (April 2018), online (pdf): *Gwich’in Council International* <gwichincouncil.com/sites/default/files/Firelight%20Gwich%27in%20Indigenous%20led%20review_FI_NAL_web_0.pdf>.

¹⁹⁹ See Stk’emlúpsenc te Secwépemc Nation, “Honouring Our Sacred Connection to Pípsell”, online (pdf): <stkemlups.ca/files/2013/11/2017-03-ssnajaxdecisionsummary_0.pdf>.

²⁰⁰ For a database of all submissions to the Expert Panel, see Expert Panel: Review of Environmental Assessment Processes, “What We’ve Heard”, online: <eareview-examenee.ca/what-weve-heard/>.

²⁰¹ See e.g. Robert B Gibson, Meinhard Doelle & A John Sinclair, “Fulfilling the Promise: Basic Components of Next Generation Environmental Assessment” (2016) 29 *J Envtl L & Prac* 257; Doelle & Sinclair, *supra* note 68; Westwood et al, *supra* note 72.

²⁰² See “How Does the Impact Assessment Act Stack Up?”, *supra* note 164.