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Honourable Catherine McKenna, P.C.
Minister of Environment and Climate Change
200 Sacre-Coeur, 2nd Floor
Gatineau, Quebec, K1A 0H3, Canada

**Date:** 27-October-2016

**Dear Minister McKenna,**

**cc. The Honourable Dr. Kirsty Duncan, P.C., Minister of Science**
**cc. Expert Panel, Review of Environmental Assessment Processes**
**cc. Members of the Standing Committee on the Environment and Sustainable Development**

**Re: Improving environmental assessment in Canada**

In his 2015 Mandate Letter to the Minister of Environment and Climate Change (The Minister), Prime Minister Justin Trudeau states that an immediate review of the Canadian environmental assessment process must begin in order to regain public trust, to facilitate access to markets for Canadian industry, and to increase fairness in the review process. As part of this mandate, the Prime Minister asks The Minister to: "*ensure that decisions are based on science, facts, and evidence, and serve the public's interest."* The Minister is currently seeking public input to meet this mandate (https://www.canada.ca/en/services/environment/conservation/assessments/environmental-reviews/share-your-views.html).We acknowledge that several stakeholder groups are concerned with the legal and social aspects of the Canadian Environmental Assessment Act 2012 (CEAA) reform, but note that a science-based perspective has yet to been vocalized broadly. The purpose of this letter is to provide the Minister with perspectives on environmental assessment from some of Canada's top independent scientists – the Liber Ero Fellows [see attached] – and to encourage a stronger role for science in environmental assessment.

***The science used in the development of environmental impacts assessments (EIAs) can be, and must be, stronger. Weak science puts Canada's social and ecological systems at risk***. EIAs are intended to measure and help mitigate the negative effects of industrial projects on the foundational social and ecological systems that support Canadian society. Much like a research hypothesis, an EIA is an educated prediction about how nature (and social systems) will respond to disturbance and mitigation. In most cases, EIAs integrate multiple sources of data from research and assessment studies. The manner in which these data are collected and interpreted affects the accuracy of predictions in the EIA. To measure and help mitigate the negative effects of industrial development on the environment requires stronger, if not the very best, science that Canada has to offer.

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We have identified 7 broad objectives where stronger science can improve EIAs in Canada:

**Objective 1: To effectively apply the Precautionary Principle**. Currently, the burden of proof is guided by a presumption of non-significant impacts on the environment and a presumption of positive impacts on the economy. These presumptions undermine the Precautionary Principle and minimization of risk.

**Objective 2: To clarify the role of cumulative effects in assessing project impacts.** Currently, the role of cumulative effects is undefined and ineffective in decision-making.

**Objective 3: To improve how success is measured for the post-operation phases of a project (i.e., during remediation and restoration).** The currently-used indicator of successful remediation – land capability or the presence of early successional vegetation communities – is insufficient and should not be the endpoint of mitigation.

**Objective 4: To define triggers for adaptive management responses**. Adaptive management is used as a framework to respond to the unforeseen or unpredicted consequences of disturbances and mitigation. Currently, thresholds for adaptive management intervention are not defined *a priori* in follow-up and mitigation plans.

**Objective 5: To improve the determination of baseline conditions**. An assessment of impact requires knowledge of existing conditions. Currently, there are no minimum standards for the intensity or spatial extent of the environmental sampling required to identify baseline (existing) conditions.

**Objective 6: To improve the transparency and reproducibility of EIA findings.** Data used to assess environmental impacts should be transparent and freely available to the public and the scientific community.

**Objective 7: To accurately account for the long-term impact of the construction and operation phases of project development.** Currently, the overall impact of a project tends to overemphasize the importance of the post-mitigation period and underestimate the lasting impacts of the construction and operations phases of the project.

In the attachment to this letter, we expand on these issues and offer recommendations to meet these objectives. We hope that these objectives will not only receive consideration in the CEAA review process, but that the Government of Canada will support the institutional capacity to implement these recommendations.

In addition to the seven objectives described in the attachment – which seeks to improve the existing EIA process in Canada – we offer an additional concept: regulatory zoning. Conservation scientists often search for priority targets that maximize environmental protection with minimal economic cost. Similarly, the scientific community could help develop a prioritization scheme for the application of regulation. Some areas would require intensive monitoring for impacts at the highest standards available. Other areas, with a lower ecological and higher economic priority, would only require a streamlined version of the EIA process.

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There may be surprisingly few areas where priorities overlap, and if they do, a transparent, science-based process could help resolve potential controversy.

Thank you for considering our ideas regarding the role of science in Canada's EIA process. As professional and independent scientists we are grateful to share these thoughts with you, recognizing that many of our colleagues working in government or industry may be unable to do the same in spite of their best intentions. We strongly welcome any opportunity to contribute to the ongoing discussion regarding the improvement of Canada's EIA process. More broadly, we offer our capacity as scientists to the Minister to further support the resolution of Canada's most pressing environmental issues. Despite the challenges we currently face, we hope that you share in our optimism for Canada's future social, ecological, and economic sustainability.

Sincerely,

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**Encl.**

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***Who are the Liber Ero Fellows?***

The Liber Ero Fellowship is a group of postdoctoral researchers, professional biologists, and academic faculty who are enhancing Canada's capacity in conservation science. We tackle research questions across a broad range of species and regions, from the disease ecology of barren-ground caribou, to Fraser River salmon declines, to ship strikes on whales in the North Atlantic, to private-sector conservation in the prairies. We work closely with academic institutions, industry partners, and non-government agencies to create theoretical and applied advances in conservation science. There are simply no comparable groups in Canada with such a strong focus on bringing independent science to bear on decisions affecting conservation and the environment. Specifically, of the signatories to this letter, we have published over 300 peer-reviewed articles, provided public testimony to governments, and participated in environmental impact assessments. Many of us have earned our PhDs in the last 10 years, and so provide not only a voice for science today, but a voice for the future of Canada.

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***Detailed analysis of science-based improvements to Canadian environmental impact assessment.***

We briefly describe 7 related objectives, consequences, and recommendations where science can improve environmental assessment in Canada. This list is not exhaustive and we welcome further opportunity to explore additional ideas with the Minister, industry partners, First Nations, and other communities.

**Objective 1. To effectively apply the Precautionary Principle.** Currently, the burden of proof is guided by a presumption of non-significant impacts on the environment and a presumption of positive impacts on the economy. These presumptions undermine the Precautionary Principle and minimization of risk.

**Consequence:** The integration of the Precautionary Principle into the policies of the Canadian Environmental Assessment Agency [1] indicates that Canadians prefer a risk-averse approach to natural resource management. However, when it comes to decision-making, it appears as though regulators only require 'modeled' estimates of the economic benefits of a project; yet require a much greater weight of evidence to demonstrate that a project will have negative impacts on the environment. Put simply, the economic analysis is not subject to the same degree of scrutiny as the environmental analysis (Kriebel et al. 2001).

**Recommendation:** Both environmental and economic scientists must quantify the uncertainty of their predictions. As a condition of project approval, we recommend that EIAs include measures of uncertainty associated with economic benefits, and that EIAs do not overlook the risks of uncertain and potentially negative effects of a project on the environment.

**Objective 2: To clarify the role of cumulative effects in assessing project impacts.** Currently, the role of cumulative effects is undefined and ineffective in decision making.

**Consequence:** EIAs do not clearly incorporate the cumulative impact of a project on the region of interest. When a new project is proposed in a region that is highly disturbed (e.g., in NE Alberta), then proponents will argue in an EIA that the proposed project will only contribute an incremental/nominal amount of disturbance to the landscape. These contributions are often expressed in percentages of the total existing or planned development, and will typically be ~1% of total disturbance. As such, the project appears to not be the primary cause for exceeding cumulative amounts of disturbance. Conversely, if a new project is proposed for a relatively pristine area, its impact will often be much less than the regional thresholds for disturbance. These thresholds will be expressed as an impact of disturbance to the area, e.g., "the project will

[1] https://www.ceaa-acee.gc.ca/default.asp?lang=En&n=B82352FF-1&printfullpage=true

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disturb 0.01% of the region." In both cases – whether a project is being proposed for a highly-disturbed or minimally-disturbed landscape – proponents can (and apparently always) avoid concluding that any one project will have an important role in exceeding cumulative impact thresholds. Moreover, we note that most species do not have regional cumulative effects thresholds and that the absence of this knowledge is being used by proponents to avoid addressing cumulative impacts in their EIAs. This approach is in contrast to the precautionary intent of EIAs (see Objective 1). One exception is woodland caribou, where thresholds of cumulative disturbance have actually been defined (e.g., Environment Canada identifies a threshold of <35% disturbance needed to recover boreal caribou populations [2]). However, the exceedance of this threshold in many caribou ranges supports the claim that cumulative effects assessments are ineffective in decision making.

**Recommendation:** Revise the interpretation of cumulative effects to more clearly identify when, where, and how projects should proceed in order to minimize the cumulative effect of disturbance on valued ecosystem components. As a condition of project approval, proponents must identify how they will mitigate the exceedance of regional disturbance thresholds. Such thresholds need to be determined for a greater number of valued ecosystem components (i.e., species).

**Objective 3: To improve how success is measured for the post-operation phases of a project (i.e., during remediation and restoration).** The currently-used indicator of successful remediation – land capability[3] or the presence of early successional vegetation communities – is insufficient and should not be the endpoint of mitigation.

**Consequence:** In many EIAs, the negative effects of the project are minimized through mitigation and reclamation efforts that occur during the operations and post-operations phase. Many EIAs include a follow-up program, which is designed to track and manage the trajectory of the disturbance caused by the project along a pathway towards 'recovery'. Here, recovery is described as having the capability of returning the land to a state comparable in species composition and abundance as occurred prior to project construction. Three major problems arise in the current design of follow-up programs:

**(1)** They are too short in duration. For example, follow-up programs <50 years are insufficient to provide evidence for recovery. The successional process may take much longer than 50 years before land capability is restored.

[2] Environment Canada. 2012. Recovery Strategy for the Woodland Caribou (*Rangifer tarandus*), Boreal population, in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. Xi + 138pp.
[3] The National Energy Board's "Remediation Process Guide" indicates a that a recovery plan "…address reclamation of the site, which is the site restoration such that it is returned to as close a state to original, or an equivalent, capability." [https://www.neb-one.gc.ca/sftnvrnmnt/nvrnmnt/rmdtnprcssgd/index-eng.html#s1 last access 15-Aug-2016].

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**(2)** The presence of primary successional species is not evidence for a trajectory towards ecosystem recovery. For example, decades after their construction, vegetation in many seismic lines and hydrocarbon well-sites in the boreal forest have not recovered to pre-disturbance cover (i.e., forest) (Bayne et al. 2011, van Rensen et al. 2015). These same disturbances are implicated in the decline of woodland caribou.
**(3)** Recovery goals often focus on vegetation only, forgoing the presence of other species or their interactions. For example, the presence of wolves and deer/moose in disturbed areas of the boreal forest are thought to be driving declines of woodland caribou (Hervieux et al. 2014). We could not find a follow up program that has accounted for heightened presence of wolves or deer/moose, nor implemented management actions if such a change was detected.

**Recommendation:** We recommend that monitoring the abundance of all valued ecosystem components [not just indicators of plant succession] needs to be part of follow-up programs, with stakeholders, First Nations, and project proponents tasked with deciding which species constitute a valued ecosystem component. Recovery of vegetation and animal communities should be judged relative to pre-disturbance conditions and nearby reference areas. Recovery criteria should be based on the responses of valued ecosystem components, not on assumptions of a positive trajectory in vegetation or other proxies of ecosystem recovery. We recommend that monitoring studies are adequately funded by the proponent for the duration of the follow up program prior to project approval. The EIA process should define and mandate specific targets of recovery that are then measured and evaluated. If recovery is deemed impossible, conservation offsets could be used to achieve a net-neutral (or net-positive) environmental condition over a pre-determined spatial scale.

**Objective 4: To define triggers for adaptive management responses**. Adaptive management is used as a framework to respond to the unforeseen or unpredicted consequences of disturbances and mitigation(Walters 1986). Currently, thresholds for adaptive management intervention are not defined *a priori* in follow-up and mitigation plans.

**Consequence:** Follow up programs will often state in qualitative or aspirational terms that if mitigation is determined to be unsuccessful, interventions will occur to correct the issue. However, it is often unstated in EIAs: (1) how much change is permitted before management interventions are triggered; (2) how this change will be quantified; (3) what the specific interventions would be; and (4) how success of these subsequent interventions is determined. The absence of these prescriptions from an EIA is a significant loop-hole for proponents in the regulation of environmental impacts.

**Recommendation:** As a condition of project approval, define *a priori* the acceptable limits of change from pre-disturbance conditions – including the magnitude (in effect size or percent change) and duration. Species or species-group targets should be developed by a scientific

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advisory panel to set monitoring and threshold standards for all EIAs.

**Objective 5: To improve the determination of baseline conditions.** An assessment of impact requires knowledge of existing conditions. Currently, there are no minimum standards for the intensity or spatial extent of the environmental sampling required to identify baseline (existing) conditions.

**Consequence:** To evaluate whether the predictions about the efficacy of mitigation are accurate (or if further management actions are required), it is important to quantify environmental conditions of a reference state/area prior to disturbance. In many cases, project proponents will perform desktop-based assessments of local conditions in the project area. For example, they may review the scientific literature on plants and animals found in the local project area and how those species might respond to disturbance based on species-habitat relationships described elsewhere. While such reviews are sometimes helpful, they cannot replace field-based surveys that assess local conditions, or statistically powerful approaches such as replicated Before-After-Control-Impact (BACI) studies (Underwood 1992). In the absence of field surveys or BACI studies, there is no way to determine the magnitude of the project's impact or the effectiveness of mitigation. In addition, even field-based surveys can vary widely in their rigour, leading to biased results. For example, many EIAs claim that if an active nest or animal burrow (i.e., for a species identified as valued ecosystem components) is discovered during the construction phase of the project, then construction will be deferred until the nesting/rearing period is over. EIAs typically do no report the sampling effort or study design to detect these nests, nor how long the deferral period should be.

**Recommendation:** Define the minimum standards required for surveys to quantify baseline/current conditions and monitoring effort. Encourage the use of BACI studies to evaluate the magnitude of effects relative to pre-project conditions. As a condition of project approval, create a plan in the EIA that describes the sampling effort and locations to detect the presence and abundance of valued ecosystem components.

**Objective 6: To improve the transparency and reproducibility of EIA findings.** Data used to assess environmental impacts should be transparent and freely available to the public and the scientific community.

**Consequence:** In an EIA, the data collected to describe current conditions and to determine the effectiveness of mitigation measures are unavailable to the public and scientific community. This approach is in contrast to the globally-integrated system of peer-review, transparency, and replicability that characterizes contemporary science. The world's top peer-reviewed scientific journals have recently shifted to an open-access model for archived data. The Tri-Council of

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science funders in Canada, including the National Sciences and Engineering Research Council, have mandated that funded principal investigators make their peer-reviewed publications open access. These moves are motivated by the importance of being able to validate results by independent scientists. It is impossible to verify the scientific validity of the claims made by project proponents. Given the conflict of interest that exists for proponents to present favourable findings, the credibility of the EIA process should rely on open-access to data and a transparent decision-making process that can be verified independently. Moreover, providing access to empirical data for other project proponents could help provide more efficient and rigorous EIAs in the future and reduce duplication of effort. Indeed, there is economic efficiency in the creation of 're-usable' data. We recognize that there are reasons why some data should not be made available (i.e., the precise GPS coordinates of an endangered species' nest), but there are ways of providing safeguards in these cases (e.g., scaling the data to a coarser resolution).

**Recommendation:** As a condition of project approval, all empirical data, model parameters, and methods used in the development of EIAs should be made freely available for download and hosted on a third party web site (e.g., Government of Canada). Data curation should follow established metadata standards as a requirement of the EIA process. For sensitive information, data could be reported at a coarser degree of resolution or randomly shifted in space (according to a specified mean distance); with precise locations submitted to the Minister, who can provide access when appropriate.

**Objective 7: To accurately account for the long-term impact of the construction and operation phases of project development.** Currently, the overall impact of a project tends to overemphasize the importance of the post-mitigation period and underestimate the lasting impacts of the construction and operations phases of the project.

**Consequence:** The combined construction and operations phases of some projects may be 50-100 years (and much longer if recovery is considered). During this time, the footprint of the project is unavailable for use as habitat by many species. However, in EIAs, the overall significance and impact of projects are focused on highly-optimistic predictions of post-mitigation success. This focus overlooks the extent to which the impacts of construction and operations may have lasting effects on biodiversity well into the post-mitigation phase of the project. For example, proponents may argue that larger species will temporarily move away from construction and operations, while smaller species can recolonize from other areas. However, these arguments assume that there are areas on the landscape suitable for wildlife displaced by the project. If habitat adjacent to a project is suitable for wildlife, competition with organisms already present there may prevent successful movement from the affected site.

Moreover, even if there is habitat available for displaced wildlife at the start of the construction phase of the project, this habitat is often not secured or protected from future development. Thus, future projects could be constructed in an area that was used to offset the

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impacts of an earlier project.

Project lifespans of 50-100 years can be equivalent to several generations for some plant and animal species. As such, it may take several generations to re-establish viable populations, even if mitigation efforts resulted in a perfect replacement of pre-disturbance conditions. The multi-generational effects of a project arising from the construction and operational phases are not accounted for in EIA significance ratings.

Lastly, it is often impossible to determine in an EIA how long the construction and operations phases of the project will remain active. For example, it is common to report on a project lifespan of ">50-80 years". This literally means that projects with a lifespan of 300 years or 51 years, which have vastly different potential for impacts on the environment, are treated similarly.

**Recommendation:** There needs to be clear guidance on how to assess the long-term or lag effects of construction and operation phases of a project. In addition, EIAs for new projects need to identify if they are going to impact areas previously used to offset the impacts of an earlier project. There should be polices in place to avoid 'double counting' offsets used in cumulative effects assessments. One way to help implement these recommendations is a centralized, spatially-explicit database of project impact areas that includes local and regional study areas.

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