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Acronyms

Act	Impact Assessment Act
ALCES	A Landscape Cumulative Effects Simulator
ALIB	Adams Lake Indian Band
IA	Impact Assessment
IAAC	Impact Assessment Agency of Canada
IK	Indigenous Knowledge
IQ	Inuit Qaujimajatuqangit or Inuit Traditional Knowledge
MVEIRB	Mackenzie Valley Environmental Impact Review Board
NIRB	Nunavut Impact Review Board
QIA	Qikiqtani Inuit Association
Science	Western science
TK	Traditional Knowledge
TWC	Two Worlds Consulting

ACKNOWLEDGEMENTS AND LIMITATIONS

This work was prepared for the Impact Assessment Agency (the 'Agency') of the Government of Canada. Two Worlds Consulting (TWC) and its research team gratefully acknowledge the input and direction of the following members of Agency staff: Carolyn Dunn, Alana Green, Robyn Whittaker, and Miriam Padolsky. TWC would also like to acknowledge the individuals who agreed to be interviewed and share their vast experience. The individuals wishing to be named in the acknowledgements are Louis Belzile[1], Jessica Perritt, Barry Wilson[2], Mike Setterington[3], Scott Findlay[4], Heather Rasmussen[5], Mark Cliffe-Phillips[6], Brett Wheler[7], and Deborah McGregor[8]. Some interviewees declined being named.

TWC would also like to recognize the research team for their contributions and collaboration, namely, Jennifer Campbell, Sarah Ravensbergen, Holly Marsh, Hillary Ashley, and Heidi Klein (Sanammanga Solutions Inc.).

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EXECUTIVE SUMMARY

In 2019, the Government of Canada passed the *Impact Assessment Act* where in which expanded requirements and processes for considering Indigenous Knowledge (IK) are outlined. As part of the implementation, the Impact Assessment Agency ("Agency") is working with its Indigenous Advisory Committee and the Technical Advisory Committee on Science and Knowledge on how to effectively weave together IK and Western science (science). This report presents the experience and wisdom of IK and science practitioners, including, through case studies, examples of approaches to interweaving both knowledge systems and worldviews.

The inclusion of IK in decision-making became a requirement following court cases such as Delgamuukw *v.* British Columbia[9] (1997) and Tsleil-Waututh Nation *v.* Canada[10] (2018) which concluded that Indigenous oral history and traditions were to be placed on an equal footing as other evidence and that their knowledge was to be included in federal environmental assessments. During the past few decades, the practice of including IK in environmental assessments and decision-making has been evolving along with the practice of bringing science and IK together. The practice began with the addition of IK chapters to impact assessments (IAs) that included select ecological knowledge in the evaluation of environmental effects. IK was used primarily to determine the baseline conditions.

More recent approaches to bringing IK and science together focus on areas where the knowledge systems and community interests converge and diverge. Among the "solutions" are joint research and process efforts where IK holders and science practitioners work together to understand potential impacts. IK holders are also part of shaping the significant determinations where their epistemology can be better reflected (see case studies – Tłı̨chǫ All-season Road and Hope Bay Ltd. mining). Other approaches include Indigenous groups preparing their own evaluations and groups doing their own knowledge research. The latter two are hampered because they still rely on another party doing the knowledge weaving, and there can be a lack of full project knowledge. There are also strategic approaches such as when an Indigenous group desires to demonstrate a distinction from science but works with science knowledge holders (see case study – Baffin Bay and Davis Strait). There is an early body of work based on interviewees where built-in consensus procedures at critical points may be the most successful. Overall, there is no consistency across Canada. Geography, proponent relationships, legislation, community politics or governance, and the status of claims and treaties are all influencing factors.

Based on the review of literature and the interviews completed, TWC identified several actionable tasks that could be undertaken by the Agency. These include:

- Developing an IK and Science Guideline;
- Hiring an in-house IK facilitator or interpreter,

[9] Delgamuukw *v*. British Columbia, [1997] 3 S.C.R. 1010, Case Number 23799.
[10] Tsleil-Waututh Nation et al. *v.* Attorney General of Canada et al., 2018 FCA 153

- Ensuring that all individuals working on an IA, including panel members, receive training in different worldviews;
- Developing an IA toolkit with standards and methods to correspond with the intentions of the new legislation;
- Issuing policy direction on cumulative effects assessment and decision making; and
- Establishing Rules of Procedure which summarizes the Agency's roles and responsibility and adds transparency to the overall process.

1 INTRODUCTION

1.1 Purpose and Scope

As part of the implementation of the new *Impact Assessment Act* (the 'Act') (IAA 2019), the Impact Assessment Agency of Canada (the 'Agency') created two advisory committees of external experts: the Indigenous Advisory Committee and the Technical Advisory Committee on Science and Knowledge (the 'Committees'). The Indigenous Advisory Committee is to "provide the Agency with non-political advice reflecting the interests and concerns of the Indigenous peoples of Canada for the development of key policy and guidance"[11]. The Technical Advisory Committee on Science and Knowledge is to provide "information and expert advice on matters related to environmental assessments, impact assessments (IA) and regional and strategic assessments. Topics that may be examined by the Committee include scientific, environmental, health, social, economic and gender issues as well as Indigenous knowledge"[12]. To support both Committees and to assist the Agency in their efforts to weave together Indigenous Knowledge (IK) and Western science (science) in IAs more broadly, the Agency contracted Two Worlds Consulting (TWC) to compile a report with case studies, supported by literature and information from practitioners and knowledge holders. Various studies and compendiums on this topic already exist, but many tend to be largely theoretical and may not necessarily serve the purpose of supporting a discussion that can result in practical guidance for the Agency. The goal of this project is to compile case studies of how organizations have worked with IK and science, and how these examples could be used to develop successful approaches in the context of the new federal IA process. The case studies presented in this document are drawn from a cross-section of industries, including linear infrastructure, mining, oil and gas, and regional planning. Each case study was chosen with the aim of identifying key aspects of applying IK and science.

Section 2 outlines TWC's methodology and approach to the project. Section 3 features the summary of interviews while Section 4 presents the case studies. The results of the analysis are discussed in Section 5.

1.2 Impact Assessment Act and Indigenous Knowledge

The Act creates a five-phase process (Phase 1: Planning, Phase 2: Impact Statement, Phase 3: Impact Assessment, Phase 4: Decision Making, and Phase 5: Post Decision) intended to provide federal assessments with increased clarity and consistency, and allow for effective and efficient decision-making to occur (Agency 2019). The Agency is responsible for providing guidance to project proponents on what is expected regarding IK and science inclusion to allow for effects evaluation and evaluating what the proponent has submitted in response to those instructions. This starts with the Agency ensuring that the

[11] https://www.canada.ca/en/impact-assessment-agency/advisory/advisory-groups/indigenous-advisory-committee/terms-of-reference.html

[12] https://www.canada.ca/en/impact-assessment-agency/advisory/advisory-groups/technical-advisory-committee-science-knowledge/interim-terms-reference-sept-2019.html

evaluation considers IK, impacts on Indigenous groups regarding their Section 35 rights, cultural considerations, and any effects, studies, or plans conducted by Indigenous governing bodies (IAA 2019).

The Agency recognizes a spectrum of approaches for meaningful engagement (i.e., participation, collaboration, partnership) that exists throughout the five phases of the assessment process (Agency 2019). During the IA process, the Agency is responsible for generating several documents where IK and science may form a part of the results, including:

- Summary of Issues;
- Tailored Impact Statement Guidelines;
- IA Cooperation Plan; and
- Indigenous Engagement and Partnership Plan.

The proponent is responsible for consulting and engaging with Indigenous groups and incorporating IK and science so that it is possible to evaluate the potential environmental, social, health, and economic impacts of the project. Throughout consultation, the Agency may act as a liaison. Actions that Indigenous groups may undertake during the IA process include:

- Activities within their communities to consider the project;
- Their own assessments under Indigenous laws;
- Lead their own studies; and/or
- Compile their own information and provide input to the proponent's submissions (Agency 2019).

Finally, the Agency, proponent, and Indigenous groups can equally participate in follow-up, monitoring, and compliance.

This report will take into consideration the multiple roles of the Agency and the consideration of IK and science during the different phases of the IA process.

1.3 Impact Assessment: Process versus Practice

The Act is meant to serve as a planning tool for federal assessments. Within this process, the Act states, “the impact assessment must consider Indigenous knowledge provided with respect to the designated project [para. 22(1) (g)]”. The Act does not specify how the consideration of IK will be done. There is a general understanding across many fields that there is room for immense improvement in the ways that IK holders and science practitioners collaborate in IA processes (Abu et al. 2019). This report focuses on the practices around knowledge sharing with a focus on tangible actions that can improve input at each phase of the IA as it pertains to the Agency.

2 METHODOLOGY AND APPROACH

TWC recognizes the importance of exploring how IK and science can be mutually respected and incorporated into the federal impact assessment process, in ways that respect and reflect IK and Agency requirements. As such, TWC has focused, wherever possible, on conducting research focused on IK and science in IA that is directly relevant to policy and implementation for the Agency and the Committees.

2.1 Literature Review

TWC began by reviewing reference materials on IK and science provided by the Agency, in addition to comments from the Technical Advisory Committee and Indigenous Advisory Committee on the project's Statement of Work. From these, a list of key words was developed, which was then used to widen the literature search; other literature was found by searching Google Scholar and Web of Science. The key words considered the requirements to find practices that included recognition of reconciliation, Section 35 Aboriginal Rights and emerging practices. Included in the literature search were academic, peer-reviewed publications, policy papers, federal and provincial IA documents, IK documents and grey literature. The focus was on literature with practical applications.

Four themes were identified from these documents and factored into interview participant (Section 2.2) and case study (Section 2.3) selection. Two of the themes, *Ways of Knowing* and *Methods and Approaches* relate to the Agency's role of providing instruction on the expectation for the presentation of IK and science in Impact Statements or supporting the collection of IK by Indigenous groups. The other two themes, *Application and Documentation* and *Evaluation and Outcomes* relate to the Agency's role of evaluating or supporting the evaluation of Impact Statements and the use of IK and science in the Impact Statements.

A list of all literature considered is included in **Appendix A**.

2.2 Interviews

In April 2020, TWC conducted 10 telephone interviews[13] with practitioners familiar with IK and science in the IA process. A cross-section of individuals were selected including academics, regulators in other IA processes, Indigenous practitioners familiar with working with science, and science practitioners chosen for their experience with IK (***Table 1***). Each had a unique perspective on requirements. The purpose of the telephone interviews was to gather practitioners' reflections and practical experience on weaving together IK and science IAs, and to identify examples of projects that could be included as case studies in the report. A semi-structured, open-ended questionnaire (Appendix B) was developed in collaboration with the Agency that focused on the four themes identified during the literature review phase. This allowed participants to explore issues and topics important to them, while providing information to support the development of policy and guidance.

Potential interview participants were identified in collaboration with the Agency. Priority was given to interviews with individuals with practical experience in IK, science, and IAs. Efforts were made to ensure

[13] Fifteen individuals were contacted. Three declined because of Covid-19. No response was received from the others.

that individuals with expertise in at least one of the four themes were included. TWC contacted potential participants by email first, with a letter of introduction provided by the Agency (Appendix C). One follow-up telephone call was conducted if no email response was received.

Participants were informed that all information (including personal) provided would remain confidential; permission was received to include the information and quotes provided in this report. Verbatim notes were taken during the interviews (interviews were not recorded), and a summary of the notes was provided to participants following the interview for their review and validation. If participants did not have enough time to cover all topics or wished to share more information, they were given an additional opportunity to provide a written submission. Interview summaries are provided in Section 3.

Table 1: Summary of Interview Participants

Number of Participants	Role
2	Academic
2	Indigenous practitioner
3	Regulatory
3	Science practitioner

2.3 Case Studies

Case studies are valuable to highlight specific lines of evidence, and examine the vastly different meanings, interpretations, and explanations that different social and cultural groups hold (Yin 2009). Eckert et al. (2020) stated that in the Canadian context, case study research at one jurisdictional level can have implications at another:

> *…insights gained from assessing the contribution of IK to federal EA policy have relevance for EA processes across other scales, as federal EAs are likely to impact large-scale environmental issues (such as those that effect Canadian oceans and global climate). Notably, Indigenous peoples in Canada have expressed concerns about EA across jurisdictions for similar reasons (Booth and Skelton 2011a). (Eckert et al. 2020 p.68)*

For the purposes of this research, TWC had to identify potential case studies. The potential case studies were identified through a combination of searching online registries, input from interview participants, Agency recommendations, and TWC experience. Case studies that provided specific or innovative insights were chosen for inclusion in the report. Specific attention was given to find southern projects and four[14] were identified but the federal and/or provincial public registry record was insufficient to develop a case study.

[14] i.e., nuclear waste management, windfarm, hydro dam and oil sands

2.4 Analysis

An inductive approach was used to analyze the data collected during the literature review and interview phase. Specific focus was on current practice, emerging practice, and recommendations for practice.

2.5 Research Limitations

The following list outlines research challenges encountered during this project that may affect the results of the study:

- Desktop research that uses terminology to identify and filter results may result in missed information if different terms are used (i.e., the wide range of terms to describe Indigenous communities (Aboriginal, Indigenous, First Nation, Inuit, and Métis, and the use of IA terms). Wherever possible or deemed necessary, duplicate searches employing various versions of terminology were employed;
- Relevant information on IK and IAs may not always be available online or may not be in English;
- The number of interviews conducted was limited because of the COVID-19 pandemic in spring 2020. This put a strain on potential interview participants' time and availability;
- Inadequate publicly available information on the specifics of potential case study projects limited the number of cases that could be developed and the conclusions that could be drawn;
- TWC recognizes that this research is situated in a colonial context and acknowledges that many issues brought up by interview participants require large and small-scale changes across multiple jurisdictions to address. While every attempt was made to fairly represent information shared by interview participants, TWC acknowledges that this report cannot address all epistemological/colonial issues related to environmental management and governance in Canada; and
- In addition, as an IA is a western tool, this inevitably influences how IK research is collected on this subject; there will be many other ways to include knowledge holder's information that will not fit within this framework.

3 SUMMARY OF INTERVIEWS

The interviews resulted in insightful reflections on the practice of IA and highlighted points where the process of weaving in IK and science can be improved in this context. Below are the most frequently emphasized key points from interview participants, organized by theme.

3.1 Ways of Knowing

Respectful understanding and consideration of different worldviews is crucial for relationship building: Interview participants frequently emphasized that beginning with an understanding of, and respect for, the difference between IK and science and the contexts in which they are embedded is essential. Participants stressed that as the IA process is one embedded in science, IA process must start with, and include at every step, consideration, and respect for the cultural context. IK cannot be seen as a separate, standalone piece:

> *Western science is one way of knowing, it's not "the" way of knowing. You have to be open and create space to understand different ways of knowing.*
> *— Jessica Perritt*

> *Treat [Indigenous peoples] with respect, not as a stakeholder but as a shareholder.*
> *— Interview Participant*

Acknowledging the diversity of knowledge, and knowledge systems, even within IK itself, is also important. Participants emphasized the constantly changing and evolving nature of IK, and the ways in which it differs from science:

> *It's not just about what has happened over millennia, that's important for understanding trends, but it's also understanding that things have been evolving and there is new knowledge. Blending these knowledge sets and understanding this is part of the worldview is just as important as the lens of 'Traditional Knowledge'.*
> *— Interview Participant*

> *… the key thing about Inuit Qaujimajatuqangit is not just the knowledge that's produced at the end. That's sort of just one piece. It's much bigger. It involves sharing, communication, the approach, how things are done — even greater than that. It's the way of being and the way of knowing for Inuit. … knowledge holders have been part of the process since the very beginning. What we heard, how we've used it, asking where we go from here – doing these things each time. Knowledge and input came from multiple places. … Indigenous Knowledge is often defined differently by pretty much everybody — different communities, different Nations, different organizations. Even in different documents in the same organization, there might be different definitions. So, we should be very clear on, "This is what it means in this context and this is what it means in that context."*
> *— Interview Participant*

> *Indigenous Knowledge and science are two different things, although in both cases it is a way of seeing and understanding the world and nature. Indigenous Knowledge is not just*

> *a collection of knowledge from a group of individuals; it is a very encompassing notion that refers to a perception or vision of life and nature.*
> *— Louis Belzile*

Several participants noted that capacity building at the individual and institutional level to assist non-Indigenous staff and organizations to understand is fundamental. Participants also noted that the levels of understanding on the part of the practitioner could influence how well information is integrated. Capacity-building to create a higher level of understanding within organizations is therefore an important step:

> *Our biggest challenge but biggest success at the organization is putting time into creating those opportunities for people [staff] to have access to that knowledge, but also experience the knowledge. To understand it, you have to be exposed to it, and experience it and be immersed in it. It's different than western science where you can read a textbook or a paper and get an understanding – Indigenous Knowledge is different. As an organization, putting time and effort to help bridge the knowledge gap with western scientists has been our biggest success.*
> *— Jessica Perritt*

> *… one of the issues around bringing together Indigenous Knowledge in an impact assessment is that it's highly dependent on the person who's applying it; their skills and knowledge and what information they've been given. I've learned from many experiences of having Indigenous Knowledge shared with me by elders or knowledge holders in communities in Canada that the knowledge is delivered by the Knowledge Holder at a level that the holder deems the recipient is going to be able to work with. … that means that different people who are applying the knowledge that's given to them can make a big difference in how it gets used. I've observed that; how valuable Indigenous Knowledge is in an impact assessment is highly dependent on the person that's applying it.*
> *— Barry Wilson*

> *If you create space at the very beginning you have to speak to the power dynamic – if we want to successfully do this, we have to have a vulnerability to everything, have to let ourselves be open to learning a different way of knowing or seeing. … this has to be a part of the baseline foundation and learning for staff in organizations; people have to understand how to put this into practice. ... Once they have related to you personally and have a foundational relationship, that is key–and then it's so much easier for people to hear each other and learn and not impose one way over another.*
> *— Jessica Perritt*

> *… there needs to be the capacity level around Indigenous Knowledge in the organization. Past practice to include Indigenous Knowledge in projects is to introduce the western science application to Indigenous knowledge holders, present and share their knowledge. But it's actually the reverse; build IK capacity in western scientists so that they can appreciate and respect it so it can be integrated effectively in Impact Assessments.*
> *— Jessica Perritt*

In addition, one participant emphasized that while understanding the cultural context of Indigenous groups involved is key to showing respect, understanding "the historical context is very important because it can explain a lot of attitudes of the Indigenous peoples towards a new project in their territory." It is also helpful for Agency staff to have an understanding of the challenges and differences between collecting IK (vs. collecting 'science'). A practical understanding of IK can assist reviewers and decision-makers in understanding the context and making decisions that represent the data fairly.

Many participants noted that relationship-building and building trust takes time, and that this necessarily varies by individual, community, jurisdiction, context, and many other factors. In such situations where communities do not want to engage with proponents, the Agency must do due diligence by nations; they have a responsibility to respectfully facilitate.

While participants noted the need to acknowledge the differences between the systems, one participant also noted that considering the two as completely separate could also be harmful:

> *... we tend to try to separate science from Indigenous Knowledge and then, from a logic perspective, that infers that Indigenous Knowledge is not science — which, it surely is. … it somehow isolates Indigenous Knowledge as being wildly different and yet I think they are both cumulative sets of experience based on observation, just maybe the techniques and way it's captured – written or orally — is different. We need to be careful not to draw that line too deeply between the two.*
> *— Barry Wilson*

Inclusion of Indigenous perspectives on design process/practice is fundamental: Building strong, respectful relationships with leadership, community members and knowledge holders early on is key to support and strengthen relationships between proponents, Indigenous groups, scientists, and the Agency. This can improve the effectiveness and efficiency of the process. For example, it can ensure that questions asked to inform baseline data collection are informed by both IK and science. Doing so can help ensure that the 'right' questions are being asked. Such processes might begin to address the dynamic of knowledge holders feeling that their information is simply being extracted for use in a scientific system. Having knowledge holders and community members involved in the framing of questions (e.g. especially around what information is collected and monitored) is vitally important to enable more equal partnerships and collaboration between knowledge holders and scientists:

> *… we've been fortunate to work closely with a community that shares the importance of working within the 'spirit of inclusion', as they call it. If we ask them to learn about our projects from a technical view, then we have to be open to their understanding of how a project impacts the community, their people or land; they have been open to allowing us to be part of how we co-create that work. They've said, the only way you're going to learn from us is to come out and be a part of it.*
> *— Jessica Perritt*

> *Science sits in a system; it's how people are educated, processes for who is considered an expert, for how to do peer review, etc., and what's not understood is that IK also operates*

> *in a system of Indigenous society that also has processes for how we decide who experts are, how IK changes through time, and that's not considered.*
> *— Interview Participant*

> *[It's important] to recognize that Indigenous people are actual societies and Nations. When you approach things this way, it becomes less about extracting data in vulnerable societies, it becomes about actual Nations and people.*
> *— Interview Participant*

Support for Indigenous governance is key: The Agency has an important role to play in providing funding and capacity building to Indigenous communities in an early and ongoing fashion. Several participants spoke about the need for communities to control their own data, and for community protocols to take precedence. Participants highlighted the tension felt in many communities over what information should be shared and how to share it:

> *When we work with the co-creation aspect, it feeds into the success of how things are implemented. If communities don't see their knowledge as part of the how decisions are being made then it's just a tick box. There has to be that element of meaning behind it that is bringing something to the table, where they can see their voice and knowledge in how the project is being shaped.*
> *— Jessica Perritt*

> *Part of it is that for communities to have control, have sovereignty over their own process and knowledge, they must decide [what is] appropriate for an environmental assessment and when. And they might choose to only share data or management pieces or only choose to share high level philosophical pieces; that's up to them, what they share.*
> *— Interview Participant*

> *The most effective examples of incorporating Indigenous Knowledge are where there is the capacity of Indigenous governments to compile the relevant knowledge, interpret it in context of the project, and to do the quality control, to apply that lens of the cultural values, and have that work, that capacity in the community. This, rather than the approach of having scientists come in and say, share your knowledge so we can use it, is better.*
> *— Interview Participant*

Finally, several participants emphasized that a critical practical component to the process is to seek guidance from community members when there is uncertainty about what the appropriate way to move forward is.

3.2 Methods and Approaches

Collaboration and co-creation are critical for appropriate and respectful interweaving of IK and science: Participants strongly emphasized the importance of methods and approaches grounded in respectful collaboration and co-creation. One participant described this as the need to come together to build

bridges with strong foundations, where the foundations consider not only economic values but also society, environment, and culture, placing culture at the forefront:

> *That's what we're trying to do at [organization]–creating space for co-creation. Not imposing western science as way of evaluation or doing research or collecting knowledge. We're not asking Indigenous knowledge holders to impose their way of doing that with our technical staff, but rather creating a space to have the organization be able to jointly develop those things so that both knowledge systems are feeding into it; how things are evaluated or what work plans look like or scheduling so that one knowledge system isn't imposed over the other. Or that interpretation of how knowledge is being integrated isn't one sided-either. We don't want to have Indigenous Knowledge feeding into environmental characterization, so that then all of that knowledge gets fed into processes and is interpreted only by western science. We want to make sure there's a dual lens approach to how various aspects of the work are being done. … The opportunity to create space to do things together is important.*
> *— Jessica Perritt*

Many suggestions were offered about how collaboration and co-creation can occur. All suggestions begin with the information in the above section: that making space for in-person meetings, workshops, and conversations where the focus is on listening and understanding the particular, unique Indigenous context is fundamental. The Agency and proponents should consider spaces that allow for different perspectives to be heard, such as separate workshops for youth and women.

> *… there's a big push for cultural competency training but that is just step one. To successfully interweave Indigenous Knowledge or work in a good way with Indigenous Knowledge, that has to continually evolve. It's really important for an organization to successfully do this, and it's uncharted territory for a lot of people. You have to create these safe spaces for bringing people together to work together. We do that in many ways; we just had a second annual western science and Indigenous Knowledge holders event, bringing together different communities, universities, researchers on copper, clay and rock, how all that relates to water. We tried to create avenues to bring people together, to get people to learn from each other in a safe space, where they have an ability to talk about things they struggle with or don't understand, to build capacity at both levels, and talk through how can we do this together in a different way. We want to create opportunities of co-creation.*
> *— Jessica Perritt*

Collaboration and co-creation throughout the process can strengthen decision-making and community support for projects, improving the overall effectives of the process for many different actors.

> *Companies that have moved to this collaborative side of the spectrum have a much smoother impact assessment process–partnership and collaborative approaches are what communities are looking for.*
> *— Interview Participant*

Several participants spoke about their experiences using collaborative methods to gather data; such approaches strengthened the efficiency and effectiveness of the process. For example, using IK to guide the research questions, and then having Indigenous peoples serve as key members of field survey teams, can be very beneficial:

> *The first thing to do before doing biological surveys, I think it's important to make contact with the Indigenous people who have a great knowledge of their territory. At least their perception of their territory–we can relate it to our survey. An example: sturgeon is a very important species to Cree communities of James Bay. One of the most important things to do in the context of impact assessment on fish of the Rupert River diversion project was to locate spawning grounds of this species and describe them and the impact of the project on those spawning grounds. But it's not easy to find them when the river is almost 600 km long! So, we[15] asked some Elders and they told us where were the main spawning grounds of «namew» (sturgeon) in the river. So, we went to these areas there and yes, we found a lot of sturgeons gathering and spawning in those areas. So, IK can be complimentary to science. It can give us additional information to orient our surveys on the ground.*
> *— Louis Belvile*

Updated methodologies and increased guidance for proponents are needed to improve the effectiveness and efficiency of each IA phase: Many participants emphasized the need for the Agency to improve instructions given to proponents about the collection and representation of IK. For example, the Agency could recommend the use of methodologies that increase transparency in the use of both IK and science. The objective would be to enable better examination of where the knowledge systems are consistent and complementary, as well as cases where knowledge conflicts. Some concrete examples, such as mapping and drawing information rather than focusing on reports and graphs, include:

> *We found a system that will allow people to draw, to transmit their knowledge in the form of drawings … people drew the representation of their knowledge. Then we took those representations and looked for commonalities and differences … Indigenous Knowledge holders drew expansive pictures, and many things that didn't come up in the scientific drawings [were found in Knowledge Holder's drawings]–they saw many different factors. It was fascinating to see, and the implications were profound. … You need to understand what people in communities think is important.*
> *— Scott Findlay*

> *I believe having a methodology that allows for fair, accurate, equitable representation — a common representation — of knowledge is critical. That's a methodology issue, not only a philosophical issue, but mainly an issue of representation. If you have multiple knowledge systems and holders, and you can agree on a common way to represent, not the best representation, but a representation that is satisfactory, that allows for the knowledge to be represented in the same manner, that's the starting point … This is a*

[15] 'We' in this case means the consultants and regulators

> *critical and necessary, but not a sufficient, condition for any sort of consideration for information provided by any knowledge system. [for the purposes of impact assessment]*
> *— Scott Findlay*

> *For community members we summarized information from multiple different reports: Two that were solely influenced by Inuit Qaujimajatuqangit from knowledge holders and two reports from the … consultants … the reports from consultants relied on previously documented Indigenous Knowledge as well as western science knowledge, also bringing in community knowledge that was shared in engagement sessions. We brought all of these into a summary document and really wove the information together. I guess what you don't want to see is the Indigenous Knowledge and science knowledge completely separated or having so much space assigned to just one knowledge (usually science) and then a small blurb, if any, to Inuit Qaujimajatuqangit. In this report, we took it and wove it together by theme. Made it very clear — 'here's the sources, they all said this'. And identified the divergences, and usually it was from what community and Indigenous Knowledge holders said, interweaving. Having it all there — where there was agreement and where there were differences. All put together. No line saying, 'Okay, these are two different things', everything was just considered as knowledge and information.*
> *— Interview Participant*

Many participants noted that methods that emphasize face-to-face interaction are better. While interviews can be important for gathering specific information, workshops can allow for community consensus to be built, strengthening the understanding, allowing the context of the information to be understood, and assisting with relationship-building:

> *… for me, a workshop is probably the most interesting way or approach to collect Indigenous Knowledge … This is more expensive, more complex, more effort–but it gives good results. It's important for me to have a great number of people because each people have their own perception or knowledge of the nature on the subject you want to document. I think we cannot base Indigenous Knowledge on one individual. When we did the workshop in Waskaganish, sometimes Cree people were talking together — in Cree — we didn't understand what they said, but after a moment there was consensus, and somebody told us what was the conclusion of their discussion. It shows that many people can have their opinions of the environment, of the nature, but they have to put together their opinion and then there's a larger opinion that comes out of that.*
> *— Louis Belvile*

The timing of workshops and an approach that respects community members' governance structures, processes, and practices is key. One participant emphasized the role that preparation plays in effective collaboration. This holds true across all methods of engagement. Effective engagement also must go through the channels of a Nations' representatives:

> *We sent a lot of communication into the community through writing [before going there]. We prepared the workshop two to three months before the workshop. … The preparation phase is very important. You cannot just arrive and say, "Hey guys, let's have a workshop*

> *on cisco." … You have to deal with the representatives of the community to do that. We give them the information, the goal of the workshop, and disseminate this information throughout the community. And after, we waited for a date and they proposed a date — it was in August because it is the quiet time for Cree people. Not the hunting season or the fishing season. Most of the people are in the village, so it was really the proper time to do that. And we respected the conditions of the representatives.*
> *— Louis Belvile*

Holistic approaches focusing on pathways and connections: Many participants highlighted the need to focus on the interconnections and relationships between valued environmental components and valued socio-economic components, and not on the valued component itself. A focus on interactions brings in the Indigenous use and interrelationships with the environment. It is not reductionist.

Risk assessment approaches (rather than examination of single components) also allow for a more holistic understanding and the inclusion of different perspectives of impacts. One participant described how a focus on risk (rather than significance) resulted in consensus around mitigation measures to be developed and allowed for Indigenous epistemology to be brought into decision-making:

> *... as soon as I saw that that significance discussion with [the proponent] killed the project, I didn't want to do that again. So instead, we did risk assessments to look at what is meaningful, what's too risky and how much risk can you accept. So I used a hunting trip example, I said, I think you live a very risky life, you could go through the ice, or die in a blizzard, but you know how to manage risk, your life is risky. Building a mine is risky too so let's learn about how we assess and manage it. ... we ended up going through each risk talking through ... The whole IA approach was a risk assessment approach. And it was in their words-we didn't put it into IA speak. … we did a card holding process at the end of each day, with summary statements like, is there agreement that with that protection in place, this would cause high risk to caribou? We'd make statements, so if you agree, show a green card, if you disagree, show a red card, if you want to make a change, yellow card. You get people to give their opinion and then we agreed upon consensus statements. Workshop members then agreed that with mitigation, caribou will be protected with certain measures. Yes, we had yellow and red cards, but this process had a lot of power at the hearing, it showed.*
> *— Mike Setterington*

> *Continuing to tinker with a broken system isn't the answer. We need a new toolbox and that is to start from a systems level and then assess projects within the context of that. I agree that mining companies shouldn't bear the full responsibility for planning for 15 watersheds, but if they're the first one in there, maybe that's the price of doing business. When you're the first in a subdivision in a community, you have to put in the sidewalks and streetlamps — that's just the way it goes. So, this is no different.*
> *— Barry Wilson*

Agreement is needed on how to approach cumulative effects assessment: There was no consensus on the use of IK and science in cumulative effects assessment. Many participants spoke about the need to

account for future considerations and conditions, ensuring that conditions match with the desired future of those potentially impacted by major projects. The feeling was that project level effects assessments do not align with Indigenous ways of seeing the world:

> *I think with cumulative effects, the cumulative effects assessment generally isn't separated from the Impact Assessment. What I see way too much is that the cumulative effects assessment is just based on whether there's a potential effect, but if there's no potential effect identified, you'll never have a cumulative effects assessment. That's where you see the biggest divergence of Indigenous Knowledge and western scientific knowledge. … maybe not the biggest, but a huge divergence. In the western methodology, they say 'There's no cumulative effect.'*
> *— Interview Participant*

There was general acknowledgement that cumulative effects assessment is inadequate in terms of consideration of impacts, mitigation measures, follow-up, and monitoring from both the IK and scientific perspectives. One major point of disagreement between IK and science is the point in time from which baseline conditions should be described. For example, from the perspective

of IK, baseline conditions should account for changes since European contact, whereas science generally considers baseline conditions from the present-day.

> *... cumulative effects is just difficult, and almost impossible to be done properly at the proponent level. … thinking more about that area of disagreement between the two knowledge systems, because at end of the day there won't always be agreement. You can't just automatically default to one or the other. That might be a point where it's just validating that there is a difference and noting that 'Okay, this is where we need extra mitigation'; that might be a marker for it. Also, a place to go back to your knowledge holders, scientists or community or Indigenous peoples etc. and ask, 'What act would need to take place for this to be acceptable to you?' I think it's sometimes just that question that's missing. I don't think people are automatically against development, they just want to have space to have a say and know that their thoughts, concerns, worries, etc., mean something and aren't going to just be pushed aside to get the project through.*
> *— Interview Participant*

> *I think right now there's sort of a lack of really getting the sense when you read baselines. It sort of seems static in a way. To know really what is your baseline, how are things changing? That comes a lot into when you're talking about cumulative effects.*
> *— Interview Participant*

Increased transparency and accountability are needed to improve the IA process: Many participants spoke about the need for more transparency throughout the process. This is particularly important when it comes to the use of information and how it influences decision-making.

Transparency extends to recognizing that IK changes over time. For example, where a project is being expanded another IK study may need to be undertaken, and new permissions sought. The original IK study

may not be sufficient according to communities. Project proponents will need to confirm with communities the continuing use of earlier IK studies and the need to develop new studies.

Collaboration in knowledge collection: Several participants commented on the variability in IK collection standards for the purposes of IA when the IK report is submitted separately into the IA process. This often creates a tension where scientists mis-interpret IK studies without understanding the proper context. It was recognized that the reverse could also be true. The collection of IK without understanding the full context of the project could result in speculation about potential impacts. This creates misunderstandings. There was broad agreement that the best way to avoid misunderstandings is to adopt methodologies that involve the collaboration of IK holders and scientists.

> *Both in science and in Indigenous Knowledge, we're looking for knowledge versus opinion.*
> *— Mike Setterington*

> *... if you have an interview to collect knowledge and then people who are disconnected are trying to interpret and use it, it's a totally disconnected, linear approach and it is ineffective. What needs to happen is the Knowledge Holder needs to be involved, and able to contribute the appropriate kind of knowledge at the right time, and has the same benefit of letting things soak in. The same assessor needs to go back to the Knowledge Holder and say, "Okay, here's what I heard you say, and this is the context where we want to use it. Am I reflecting the use of this knowledge correctly?" Give them that second glance. … And I try to go back a third time with my final conclusions. … the Knowledge Holder benefits from this, too; they're not just giving, but they're receiving as well. That is how you address that frustration; don't disconnect the knowledge holders.*
> *— Barry Wilson*

Appropriate compensation for Indigenous peoples is critical: In the same way that scientists are compensated, appropriate and adequate compensation should be provided for IK holders and environmental monitors participating in all phases of the IA. Several participants noted that it is important to understand the time that it takes to appropriately gather IK, and that Indigenous groups may not always have the resources or capacity to study or collect IK to the extent that they/the Agency would like. Financial and human resources are essential to ensure IK is collected in a way that reflects the knowledge of many individuals and is representative of the community's perspectives.

> *Indigenous Knowledge is not found in databases. It's not like taking a book out of a library. It is rather necessary to speak, to exchange with people, and not only with one or two people, but with several people to get a fair idea of the Indigenous Knowledge. It first requires establishing a relationship of trust with First Nations representatives. Each person has their own life experience and knowledge of the environment. The Indigenous Knowledge is the sum of individual knowledge. Consequently, it is necessary to interview Elders, young people, fishers, hunters, women, etc., in order to obtain a valid portrait of Traditional Knowledge. It is like an opinion poll: the greater is the sample, the better is the result.*
> *— Louis Belzile*

Inclusion of Indigenous peoples in leadership and decision-making roles, and the inclusion of practices and protocols, is needed to improve Indigenous peoples' experiences in IA and strengthen the overall process: For Indigenous peoples to feel that their knowledge is valued and respected, it is important to include Indigenous cultural practices, protocols and governance systems throughout the process and in final decisions. Some participants emphasized the role that ceremony can play, and the success their organizations have had with incorporating ceremony into the methodology where both Indigenous and non-Indigenous participants are involved.

> *We have to open minds to different ways of doing things and different ways of giving validity to different knowledge systems. It's a process point of view. The best example is using ceremony within different studies. So, the obstacle is if people don't understand how ceremony is used in Indigenous ceremonies and the responsibilities associated with implementing advice from ceremonies, then it's really hard to understand and validate the use of ceremony and how that feeds into how knowledge is being interpreted. Ceremony is one of the biggest hurdles; people think ceremony is just a nice thing to do. But it's breaking down the understanding of the role of ceremony in Indigenous Knowledge, and the responsibility and accountability associated with ceremony and decision-making in communities. The only way to break this down is for people to experience and be a part of ceremony in communities.*
> *— Jessica Perritt*

> *… if you're going to successfully interweave Indigenous Knowledge in the work, you need space for ceremony and need space for how advice is received through ceremony and how decisions are being made in an organization. When we have those meetings of co-creation, ceremony is always at the forefront of doing that.*
> *— Jessica Perritt*

Flexible approaches are needed: While participants noted the need for more clarity in guidance to proponents around the collection, documentation, and representation of IK, they also noted that flexibility and adaptive research and management are key. Methods must adapt to each context, given the diversity of Indigenous groups and processes:

> *… we have to use methods that are appropriate for the knowledge system we're working in … Whether researcher, or peer reviewed, or methodology, observation, whatever methods we have to use, those methodologies exist in Indigenous Knowledge but it is different than in western knowledge/science. We have to do what is appropriate for the Indigenous Knowledge systems we're working in. There are obstacles, it is seen as a barrier to including Indigenous Knowledge because from a western scientific way of including knowledge, this is through citations, peer review, etc. but just because that's the way they do it doesn't mean that's the only way it's done.*
> *— Jessica Perritt*

> *Time has to be considered … the organization has been guilty of imposing own time frame on communities, and not asking the community, does this make sense for you in how your knowledge systems feed into workplan? There is a power dynamic around time and we*

> *have to say, for Indigenous Knowledge holders/communities to meaningfully put thought into how knowledge systems are contributing to multi-billion dollar projects — they don't have that at their fingertips. We've put lots of time into the project and we have to give the same respect to communities.*
> *— Jessica Perritt*

There should be a process for dealing with knowledge conflicts: Participants noted that while IK and science often align, knowledge conflicts can also occur. When this occurs, there needs to be a process in place that considers both systems in a respectful and fair manner. One participant noted:

> *You make a decision on the basis of triangulated evidence, on complementarity, and then what you say is, I'll delve into the knowledge conflict. … what do you do? Park those issues, make a decision, then feed those issues back into follow-up and monitoring. Use follow-up and monitoring in part to try to resolve those knowledge conflicts.*
> *— Scott Findlay*

3.3 Application and Documentation

The creation of ethical space is fundamental for interweaving knowledge systems: Participants emphasized the need to incorporate and value IK not only through traditional use studies or as input, but through making space for IK throughout the impact statement or assessment reports. This includes considering all aspects of IK, not making IK an "add-on", but involving Knowledge holders in the writing, attributing their contribution, and confirming that the knowledge was interpreted in the appropriate context. Some participants stated practices and protocols that can assist with this:

> *... in impact assessments in last few decades: typically, there is this real overwhelming approach where practitioners use science to try to drill down a specific cause and effect relationship based on some localized action. Something that's happening within a project. Indigenous Knowledge is brought in afterwards and I feel like often it's called "further input," but really, it's there to validate the [science] hypothesis or at least strengthen it. So, if it [Indigenous Knowledge] doesn't validate the findings, I feel it's dismissed. If it 'backs up' findings, then it's sort of heralded. That's a misuse of the knowledge; it's like misusing statistics to make a point. It's like painting a target around a bullet hole.*
> *— Barry Wilson*

> *… I used the word "input" versus "engagement." And this is where I think impact assessments woefully failed — is that someone goes out and gathers all the information they think of as 'input' and then they interpret it. I think good decision-making needs to be more than that. It needs engagement, especially with respect to this kind of knowledge. It's not a replicated experiment in a peer-reviewed journal. It's an expression of wisdom coming from an individual drawing on generations of experience. You can't deal with that knowledge in the same way as you would with others. It'd be like using a butter knife in place of a screwdriver. It's wrong to. As professionals, we need to use knowledge appropriately and put it in the right context for a decision-maker to be able to make a decision on it appropriately. If we disconnect it from the Knowledge Holder, problems*

> *arise. Yes, it takes longer. Yes, it is harder. But I think getting it wrong is the hardest. We all suffer greatly if we get it wrong. It's better to take a little more time to get it right and make sure it's being used appropriately.*
> *— Barry Wilson*

> *… we had Elders and knowledge holders sitting in the room as we went through the process of defining what the project would do–timelines, number of times we would meet and engage. Sharing knowledge and hearing response of the Knowledge Holder back. The result of that is that the strength of the impact assessment is orders of magnitudes stronger, because the knowledge has been integrated all along the way, not just as a side bar. And then lastly, what I did as a practitioner is that I personally asked the Knowledge Holder if I could share the story — if I had that permission. I think that's an important thing, too, it's just like when you started this interview and I said, "It'd be nice if you put my name in the report" — I want to be acknowledged and a part of it, right? I contributed. You get a lot better results when you work with people and engage and involve them meaningfully versus some bureaucratic process where you tick off all the check-boxes.*
> *— Barry Wilson*

IK needs to be present in all phases of the IA not just baseline: There was consensus among interview holders that the treatment of IK in IA must move beyond a 'tick box' approach. IK must be involved in the design of questions and methodologies, from scoping to mitigation. Participants also noted examples where collaborative mitigation and the use of qualitative and quantitative IK and science are being used together. Such examples have allowed for mutually agreed upon decisions to occur:

> *Indigenous Knowledge holders need to be involved from the outset through to the finish of the process. If they're not, then there's the dangerous potential of having it misunderstood or misrepresented.*
> *— Barry Wilson*

> *I think you see a lot where Indigenous Knowledge is in the baseline and background, but it often stops there. You don't see how it's in the Impact Assessment itself. How does it actually influence how the proponents got to their decision? It's missing in the effect's analysis itself.*
> *— Interview Participant*

> *The reason the approach that's in place fails, is because it's focused on the project not the system. … anytime I go and talk to any Indigenous Knowledge Holder, they are crystal clear about that. It's a holistic system; it's not a bunch of little pieces that you look at independently.*
> *— Barry Wilson*

Gender and diversity should be considered: The need to include perspectives of more segments of society, such as women's wisdom, was emphasized by participants. One participant noted:

> *It is critically important that that the main driver for transformative change is renewal of feminine spirit–inject emotional intelligence into process.*
> *— Interview Participant*

Clear, appropriate language and accessible communication is a critical component of gathering IK and respecting Indigenous rights in the process: There was consensus that the presentation of documents and output at each phase of the process must be in a format that individuals from many different cultures can thoroughly comprehend. Such understandings are essential for the respectful inclusion of IK and can heavily influence the outcomes at each phase of the IA process:

> *… some of the concepts or feelings, there might not be a comparable word; often there isn't. And for knowledge holders who may not be as comfortable with English or French or whatever other language, I think it's a level of respect. … when you're in other peoples' land, it's respectful to use their language. Even just small things like 'hello' and 'thank you'. And really saying the whole word for Inuit Qaujimajatuqangit. Those little things help.*
> *— Interview Participant*

> *Unfortunately, the nature of Impact Assessments is a lot of documents, a lot of big words. I feel very strongly that you don't need to rely on those big words. You should be able to make what you're doing accessible.*
> *— Interview Participant*

In addition, understanding differences in language and concepts between worldviews is critical to effective data collection:

> *…we were looking at lake whitefish–they were abundant in Northern Québec, which are very important for Cree. They eat them. They smoke the fish. As a fish biologist, I know cisco and whitefish lay eggs in late October and early November. This is the spawning time, i.e. the precise moment when fish lay their eggs. We ask them, "When do cisco and lake whitefish spawn?" They would answer, "In September". So we were surprised that this wasn't the same response information that we (fish biologists) know. And we were very surprised of this answer and we realized that for Cree, and particularly for Cree fishermen we met, when they observe cisco and lake whitefish migrate into the river, they know that it's for the purpose of reproducing. That is why they say that cisco and lake whitefish spawn in September. For many Cree, upstream migration is part of the fish reproduction process up to their spawning run, it's named "spawning". It has not the same «scientific meaning» of spawning which refers to the action of laying eggs. It's not the modern word for fish "laying their eggs." For them, it's this the migration. This is why we have to take into account the context of Indigenous Knowledge.*
> *— Louis Belzile*

3.4 Evaluation and Outcomes

IA does not stop with evaluation: Participants emphasized the need to include IK throughout follow-up and monitoring. The focus should be on continuing research and learning in ways that are meaningful to community members:

> *… we're monitoring minutiae … it's measurements that even I can't understand. We're trying to get input from them and [they] said, 'Your charts and everything … [that] doesn't tell anyone what it's like on the land or the changes, how I can't make tea with snow anymore, how the snow machines are dusty. You have no sense of what it's like out on the land anymore.' … there's so much technicality that it's meaningless to the community."*
> *— Mike Setterington*

> *If you're not doing follow-up and monitoring, you're not doing Cumulative Effects Assessment [CEA]. CEA means that you do follow-up monitoring, assess the predicted value, how close observations match to what is predicted, and you use that info when you're doing the next assessment.*
> *— Scott Findlay*

Respectful evaluation of different knowledge systems is fundamental: While some participants felt there is a need to evaluate IK and science in the same way, others felt that different systems of evaluation are necessary. There was agreement that knowledge holders should be involved in the review of IK and that good translation[16] was absolutely necessary.

> *... you cannot critique Indigenous Knowledge and scientific knowledge in the same way. … it's inappropriate.*
> *— Interview Participant*

> *Especially when working from a project standpoint and the Impact Statement, it's important to make it clear what the requirements are and how the proponents would show that the Inuit Qaujimajatuqangit within that document has been validated. … even something as simple as … a consultation or engagement log … Our Board doesn't rely just on the information that's provided within an Impact Statement or by the proponents. Our staff also go into communities. There are different rounds of engagement and consultation conducted throughout the review. We do have final hearings, and pre-hearing conferences, and a community roundtable. So, we'll have community representatives from the potentially affected communities. They will come share knowledge, ask questions, provide their views. So that's a way as well for the Board to confirm information that is provided within the Impact Statement Guidelines. One of the key things we're finding right now, where there is a divergence, is with regards to the*

[16] Translation is distinct from interpretation. In this case, translation refers to the choice and use of words. In many Indigenous languages there are not corresponding words. Interpretation is different. It is an explanation or intention behind the words

> *Significance Determination. We're working on that internally in developing our own Impact Statement Guidelines.*
> *— Interview Participant*

> *I've often seen Indigenous Knowledge being dismissed as anecdotal; I'm unsure about the precise reasons for that but some of it may be because it's shared orally versus written. Sometimes when it's shared by an Elder and English isn't their first language, it doesn't come across as 'articulate' or peer-reviewed. We can introduce biases into how valuable it is and dismiss that. I've also heard technicians dismiss Indigenous Knowledge because they think it's opinion and not validated — and yet, I'd say the knowledge being shared has been vetted through 1000's of years of experience and it's more validated than anything else.*
> *— Barry Wilson*

Several participants noted that because IK and science are two different systems with different objectives, purposes, methods, and processes, contrasting them is not necessarily helpful:

> *When you collect science and Indigenous Knowledge … [comparing the two systems] … must not be the goal of Indigenous Knowledge acquisition. We have to use Indigenous Knowledge as a guide for the proponent to better evaluate the impact of its' project on First Nations and guide efforts for collecting data…*
> *— Louis Belzile*

Several participants made note of the importance of involving knowledge holders in the evaluation:

> *… who is responsible for assessing the information and where it goes? So that was something that we'll define a bit more. But with regards to information shared by knowledge holders — they should be the ones interpreting that the information was correct and used as intended. We worked very closely with [the organization] on how to make sure of that interpretation point.*
> *— Interview Participant*

4 AN EXAMINATION OF FOUR CASE STUDIES

4.1 Case Study Selection

This section features four case studies developed from projects identified by the interviewees: one road-related example (Tłı̨chǫ All-season Road Project); one mining-related example (Hope Bay Mining Ltd.); one strategic environmental assessment (SEA) (Offshore Oil and Gas Strategic Environmental Assessment); and one cumulative effects assessment, featuring an alternate cumulative effects assessment approach for the purpose of regional planning (Adams Lake Cumulative Effects Land Use and Management Assessment). Case studies were intentionally chosen across a range of geographic locations and project types, to highlight practice and innovative insight for the treatment of IK and science.

- The Tłı̨chǫ All-season Road Project provides an example of IK and science interwoven and featured through an interactions diagram;
- The Hope Bay Minding Ltd. features the use of consensus building as a means of resolving divergences relating to IK and science;
- The Offshore Oil and Gas Strategic Environmental Assessment showcases an example of a joint assessment process with the Indigenous group leading the IK work to weave into the science. The process features the Indigenous group preparing an assessment based exclusively on IK including Indigenous laws; and
- The Adams Lake Cumulative Effects Land Use and Management Assessment demonstrates the feasibility of completing a cumulative effects assessment where the baseline starts at pre-contact. This approach may have applicability in project assessments cumulative effects evaluation where there is a divergence of opinion on baseline conditions.

4.2 Case Study 1: Tłı̨chǫ All-season Road Project

Keywords: experienced practitioners, standard guidelines, co-creation and collaboration throughout IA and post-development, community protocols, ability to request additional IK by decision-makers, systemic, holistic worldview not just valued component focus, consensus

4.2.1 BACKGROUND

The Tłı̨chǫ All-season Road Project is a proposed road in the Northwest Territories (NWT) within the Tłı̨chǫ Territory. The project proponent was the Government of the Northwest Territories. The project included:

- Construction of a 94-kilometre public, all-season road, and future operation;
- Development of borrow sources and related access and operation throughout construction and operations;
- Construction camps and related access; and
- Reclamation activities during construction and operation.

The environmental assessment was conducted according to the *Mackenzie Valley Resources Management Act,* focussing on the issues not settled during earlier phases. The Mackenzie Valley Environmental Impact

Review Board ("MVEIRB or Review Board") consulted on the overall approach and confirmed the issues to be considered. The environmental assessment acknowledged the Traditional Knowledge (TK) already collected and included in the evaluation. The consideration of TK and science was conducted according to the MVEIRB's TK guideline (MVEIRB 2005) and the instructions to the Proponent in the Terms of Reference.

In preparation for the use of TK, the Government of the Northwest Territories and the Tłı̨chǫ Government agreed to a Memorandum of Understanding for the preparation of a TK study. The First Nation did their own collection and documentation according to their own research standards and methodologies. The TK report included knowledge about the environment, use and management, values, anticipated changes, and mitigation measures. Complementary to the IK work was a socio-economic work that focused on the socio-cultural and economic factors important to the community of Whatì and their environmental perspective (TCLP 2015). The Tłı̨chǫ Government socio-economic process included the use of existing data, trend analysis and new primary data including TK. The Government of the Northwest Territories used these reports to support their own evaluation and development of mitigation measures.

The MVEIRB approved the project for development.

4.2.2 KEY FEATURES OF IK AND SCIENCE INCLUSION

4.2.2.1 Ways of Knowing and Issue Identification

The issue identification process is supported by several guidelines[17] including TK guidelines. The latter defines TK as including:

- Knowledge about the environment;
- Knowledge about use and management of the environment; and
- Values about the environment (MVEIRB 2005).

These guidelines also summarize how TK will be considered in the project evaluation, and roles and responsibilities of the different parties, including the Review Board itself. The guidelines also say that the Review Board shall consider both TK and scientific information that is made available. Specifically, with respect to TK, the "Review Board may seek assurance from those delivering traditional knowledge that:

- The TK was collected and peer–reviewed with the Aboriginal community or TK holders in accordance with appropriate community specific protocols; and
- The TK presented was approved by the appropriate individuals or organizations for use using the principle of prior informed consent (MVEIRB 2005, p.6)."

The issue identification was completed through a consultation process. The Board and staff all have IK and/or science experience. Currently, half the Board members are Indigenous. The experience and MVEIRB composition are considered an asset to the IA process.

[17] Socio-economic Impact Assessment Guidelines and Environmental Impact Assessment Guidelines found at http://reviewboard.ca/process_information/guidance_documentation/guidelines

4.2.2.2 Collection and Application

The MVEIRB undertook consultation on the proposed project and summarized the issues into a Terms of Reference document. Within the Terms of Reference issued to the proponent as direction for the completion of IA material, the MVEIRB specified the TK that would be required to evaluate the significant and adverse effects of the project. This was additional to what was already outlined in their TK guideline. The proponent would be required to acquire and include this TK in the project evaluation.

4.2.2.3 MVEIRB Evaluation

The evaluation process included information requests, technical and community sessions. The Review Board did ask for additional IK from the Indigenous peoples near the project to better understand the potential project effects and confirm the appropriateness of mitigation. The MVEIRB reported on the use and application of IK in its Report of Environmental Assessment.

In its presentation of IK and science in its Report of Environmental Assessment, the Review Board included a diagram (Figure 1.) that highlighted the interconnectedness of ecological, social and economic systems and how mitigation measures address the issues (MVEIRB 2018).

The Review Board's evaluation acknowledged the TK guidelines, and the TK of the Tłı̨chǫ, Yellowknives Dene and North Slave Métis Alliance. The Review Board accredited both TK and science in its decisions. The Review Board noted that the proponent needed to add the TK of the Yellowknives Dene and North Slave Métis Alliance into the evaluation (even though the project was not in their traditional territory) because of their knowledge of the area and potential effects on their traditional territories.

4.2.2.4 Follow-up and Monitoring

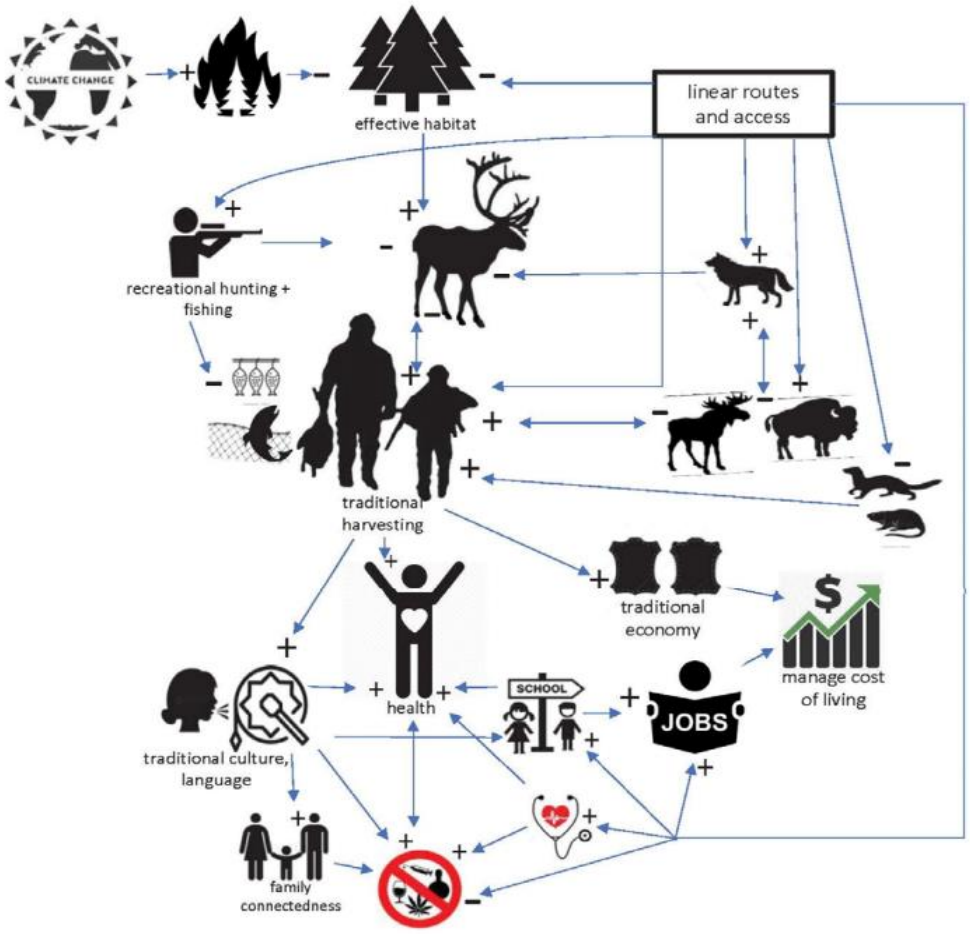
The Review Board determined that to prevent significant adverse impacts on the environment, additional mitigation measures, monitoring and reporting would be necessary. The monitoring and reporting would be necessary to test the predictions, effectiveness of mitigation actions and to inform adaptive management. This would be done with a working group, which would assist in identifying and mitigating impacts as part of an overall adaptive management system. The working group would include the Indigenous governments, the environmental management board, the proponent, and Elders. This working group would function during construction and the first five years of operations.

4.2.3 APPRAISAL

This project features TK and science in four ways:

- IK reports prepared by the Indigenous groups;
- Traditional reports prepared by the proponent;
- A socio-economic report which includes existing socio-economic information and TK that features the Indigenous perspective of socio-economic conditions; and
- Joint measures undertaken by the proponent and the Indigenous groups to clarify the impacts and develop mitigation.

TK also influenced the geographic extent of the consideration of the effects as first determined by science. The study area scope was extended.



(Source: MVEIRB 2018)

Figure 1. Representation of Indigenous interactions with ecological and economic systems

4.3 Case Study 2: Hope Bay Mining Ltd

Keywords: experienced practitioners, standard guidelines, NIRB and community terminology for Indigenous Knowledge, co-creation and collaboration, ways of knowing incorporated in mitigation, dealing with discrepancies, consensus

4.3.1 BACKGROUND

On December 8, 2011, the Nunavut Impact Review Board (NIRB) received the "Phase 2 Hope Bay Belt" project proposal from TMAC Hope Bay Project (Proponent). The project proposal is the second proposed mining and milling development along the 80-km Hope Bay greenstone belt. It would allow for gold mining at the Madrid and Boston mineral deposits using both crown pillar recovery and underground methods.

It is the Proponent's intention to sequence development of mineralized gold deposits for sustained operations. The Proponent expects to process up 6000 tonnes of ore per day. The project was screened by the NIRB in 2012 and environmental impact statement (EIS) guidelines were subsequently provided to the Proponent following community issue scoping sessions for the writing and submission of an EIS (NIRB 2012).

At the end of the EIS, the NIRB approved the project for development in June 2018.

4.3.2 KEY FEATURES OF IK AND SCIENCE INCLUSION

4.3.2.1 Collection and Application

The Proponent's approach to the inclusion of Inuit Traditional Knowledge (IQ) was to rely on knowledge held in a database by the Kitikmeot Inuit and a report prepared by them, caribou specific risk assessment workshops, and other relevant sources. As part of TMAC's agreements with the Kitikmeot Inuit Association, an Inuit Environmental Advisory Committee (IEAC) was appointed and supported the work. The Proponent specifically outlined how and where IQ was used including how it was considered along with science. The Proponent explicitly outlined how discrepancies in knowledge were addressed (TMAC n.d.).

4.3.2.2 Addressing Discrepancies and Mitigation

The Proponent was aware that another gold mining project in the same region was rejected by NIRB over concerns for caribou[18] and understood that a proactive approach would be needed to develop mitigation measures in collaboration with local land users and hunters. The mitigation planning work brought together Elders, harvesters, natural and social scientists. The "workshop" design focused on Inuit ways of knowing the environment, how to function in the environment, and understanding that Inuit relied on environmental consistency (ERM 2017 a,b,c). The approach also accounted for the requirements of the NIRB and the inclusion of TK (TMAC n.d.). The overall tactic was to reach a consensus on the impacts to caribou, the mitigation measures and monitoring needs to confirm the assumptions, and agreement on the cumulative effects. The outcome of the workshop was unanimous consensus. On the final day of the workshop, the participants reflected on the experience. Among the essential findings were:

- The need for site visits to understand the landscape and how the Proponent manages operations (Figure 2);
- The need to consider the project site in different seasons to establish a true picture of the project effects;
- The opportunity to influence design and mitigation measures; and
- The value of exchanging TK and science in a manner that extends beyond mere reporting (ERM 2017c).

[18] The NIRB has since undertaken additional evaluation with the proponent, regulators and the Inuit organizations and the project that was rejected was approved.

4.3.2.3 Evaluation

Throughout the Final Hearing Report, the NIRB panel acknowledged the inclusion of IK and in full consideration of the Inuit epistemology (NIRB 2018). The NIRB panel specifically noted how the proponent involved community members and the role Inuit TK played in reaching mitigation and adaptive management solutions, especially for issues related to caribou. They also noted the on-going involvement of community members in monitoring. Overall, the NIRB panel noted that Inuit TK was included throughout the assessment process.

4.3.3 APPRAISAL

The proponent was aware that consensus and inclusion of Inuit TK would be required if this project were to be approved. Both Inuit TK and science were included in the IA process through:

- An Inuit Environmental Advisory Committee;
- Joint workshops bringing together IK holders and science specialists with the purposes of seeking consensus on impacts, mitigation, and monitoring; and
- A process that views the environment from the perspective of Inuit and science.

(Source: TMAC 2017c)

Figure 2. Workshop participants

4.4 Case Study 3: Offshore Oil and Gas Strategic Environmental Assessment

Keywords: experienced practitioners, co-creation and collaboration throughout the strategic environmental assessment, community led, systemic, holistic worldview

4.4.1 BACKGROUND

The NIRB was asked by the Government of Canada in 2017 to complete a strategic environmental assessment for potential offshore oil and gas development for Baffin Bay and Davis Strait. Aboriginal Affairs and Northern Development Canada (AANDC) provided direction to the NIRB to include both Inuit

Qaujimajatuqangit[19] (IQ) and science, and that the collection of IQ would be led by the Qikiqtani Inuit Association (QIA). The process was to be conducted with meaningful community engagement (AANDC 2017).

To meet the Minister's requirements, a working group was established that included the NIRB, QIA, Nunavut Tunngavik Inc., Indigenous and Northern Affairs Canada, and the Government of Nunavut. The NIRB was responsible for:

- Coordinating the SEA and with input from the working group and the public;
- Undertaking developing the project proposal;
- Holding public engagement sessions;
- Community issue scoping sessions;
- Using available and shared scientific knowledge, IQ and community knowledge;
- Completing an effects analysis; and
- Presenting and confirming the effects evaluation results with community members at community sessions. The community sessions were attended and supported by working group members.

Finally, the NIRB held a final public meeting on the proposed strategic environmental assessment with representation by the full Board, community representatives, intervenors, government agencies, and members of the working group. The Board issued a Final SEA Report with recommendations to the Government of Canada for the following areas that require resolution before lifting the moratorium:

- Addressing consultation, co-ordination, and public engagement;
- Addressing regulatory and benefits regimes;
- Addressing baseline research;
- Addressing assessment of ecosystemic and socio-economic impacts; and
- Addressing mitigation, monitoring, modelling, mapping, and prediction.

Each of the recommendations include addressing gaps and uncertainties. Throughout the process and during the final public meeting, community members emphasized the need for a holistic approach and that the marine environment was the Inuit farm. At the end of the process, the NIRB itself committed to apply the IK lessons learned from the strategic environmental assessment to its own processes and encouraged regulators and researchers to evaluate their processes and do the same.

In September 2019, the Minister of Crown-Indigenous Relations provided its response to the NIRB. The Minister acknowledged the work undertaken by the NIRB and noted that the recommendations would be used to inform future decisions regarding the development of offshore oil and gas.

[19] Inuit traditional knowledge

4.4.2 KEY FEATURES OF IK AND SCIENCE INCLUSION

4.4.2.1 Issue Scoping

The NIRB (with the support of the working group) held community engagement meetings to inform the communities of the proposed strategic environmental assessment (SEA) and the issue scoping sessions. The QIA held their own consultations concurrent with the NIRB sessions to determine the IK study scope. An issue-scoping summary was prepared and released for comment and verification. The finalization of the issue-scoping document signaled the beginning of the IK and science study phase.

4.4.2.2 Collection and Application

The NIRB and the QIA engaged separate consultants to complete the IQ and science studies. However, at specific points the IQ and science knowledge holders were brought together to present and review each other's studies. The NIRB and government staff members observed the sessions so that they would understand how the two types of knowledge were brought together. The overall approach was agreed to collectively. During the process, the NIRB consultants prepared science-based effects assessment (Nunami Stantec 2018) based on previously documented science and some Inuit knowledge based on community-based monitoring. The QIA prepared an IQ based effects assessment that included using previously documented IK and newly collected IK (QIA 2018a, QIA 2019). The QIA established community IQ committees in each of the potentially affected communities that included Elders of both sexes and youth. They also created an overarching IQ advisory committee. The IQ advisory committee ensured that the effects assessment and recommended mitigation were based on Inuit laws. The IQ report was organized according to Inuit seasonal rounds, land use and ecological knowledge according to season (Figure 3). It was recognized that the IQ provided an understanding of the environment in the winter, which was not available in the science literature. The QIA undertook an additional food security study that reflected the relationship of Inuit to the environment and the implications of changes to the environment (QIA 2018b).

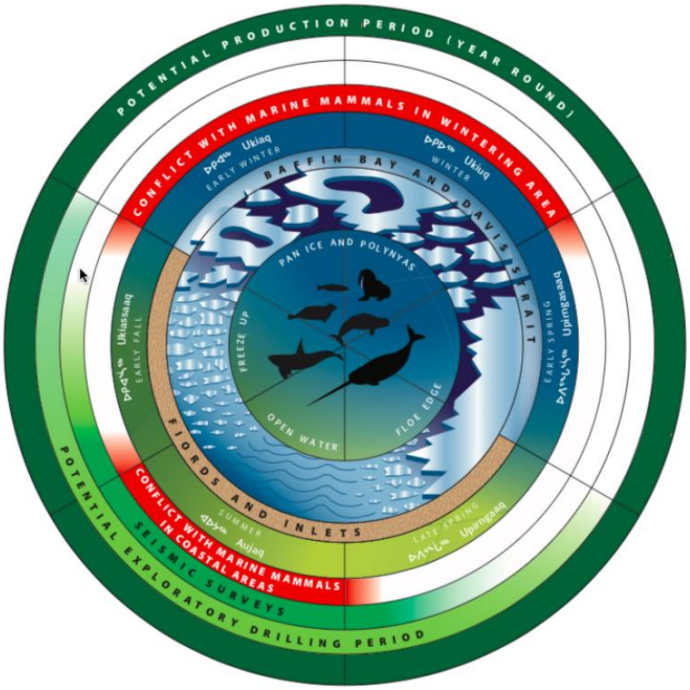
Upon completion of the respective studies, a *Preliminary Findings* report was jointly prepared by the NIRB and the QIA. This was a plain language report that brought together IQ and science (NIRB and QIA 2018). The NIRB and the QIA jointly held public engagement sessions based on the Preliminary Findings report and conducted food security activities with students in the communities.

4.4.3 APPRAISAL

The strategic environmental assessment approach included IK and science in the following ways:

- Inuit involved in the process design;
- IQ advisory committee;
- New and previously collected IQ;
- Preparation of an effects' assessment by the QIA based solely based on IQ;
- IQ and science knowledge sharing;
- Joint report writing of the plain language report;

- Community tours so that community members were kept fully informed and provided the opportunity to provide input;
- Community feedback incorporated into subsequent community tours; and
- Following a collaborative and transparent process.



(Source: QIA 2019)

Figure 3. Inuit knowledge of animal movement by season against the seasonality of oil and gas activities

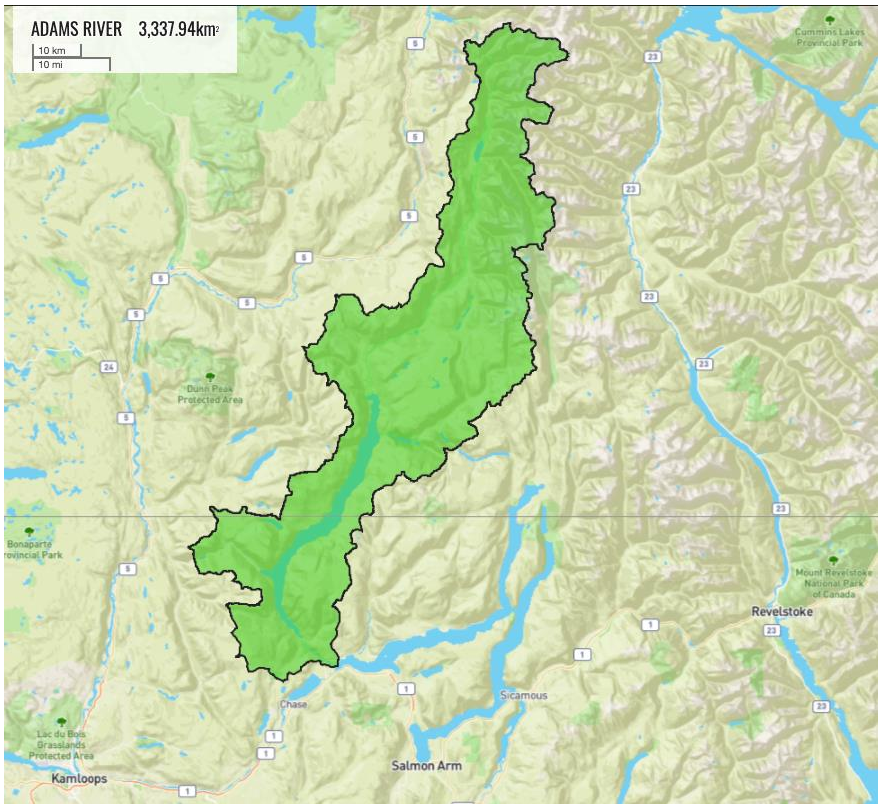
4.5 Case Study 4: Adams Lake Cumulative Effects Land Use and Management Assessment

Keywords: regional plan, cumulative effects assessment approach, pre-contact baseline

4.5.1 BACKGROUND

In response to development and planning pressures (i.e. forestry, tourism, mining, community expansion, fisheries, transmission lines, roads and agriculture), the Adams Lake Indian Band (ALIB), with support of the British Columbia provincial government, undertook a cumulative effects land use and management assessment in 2016 (Figure 4). The initiative to prepare the plan and community-based management strategies was part of the provincial reconciliation efforts. The ALIB saw this as an opportunity to bridge a current gap and hopefully avoid court and legal challenges, while allowing ALIB Title and Rights to be recognized. The objective was to understand the implications of alternative management strategies focusing on two key community values: water and forests, with a focus on Sockeye salmon. Ultimately, the ALIB wanted a management framework for the region that coincided with pre-contact conditions in the Adams River watershed and a regional plan for 50 years into the future.

The ALIB is currently further developing the Land and Resource Governance Framework that aims to bring together traditional governance, Traditional Use Studies, draft Land Use Zoning, cumulative effects assessment using scenario planning, oral histories and Secwépemc Laws (Wilson et al. 2018). Building upon this work, the ALIB have finished a hydrology and erosion study as part of their climate change adaptation planning. Subsequently, all of this work was utilized further with the addition of wildlife population dynamics models for key species responding to the cumulative effects of human land use, natural disturbance, and climate change. The ALIB collaborated with the BC government using these tools to rank all sub-drainages within the watershed for road decommissioning. The assessment ranked sub-drainages seeking to maximizing wildlife benefit of decommissioning by reducing cumulative mortality pressures from land uses and human access while simultaneously seeking to minimize disruptions in future timber harvest. The decommissioning is planned to begin in summer 2020. This case study summarizes the first stage of the work, which is the development of a baseline that starts from pre-contact (Wilson, 2020 pers. comm.).



(Source: Wilson et al 2018)

Figure 4. Adams River Watershed

4.5.2 KEY FEATURES OF IK AND SCIENCE INCLUSION

4.5.2.1 Methods and Approaches

The ALIB had two priorities to complete this project:

- Direct community engagement; and

- Ensure ALIB membership's understanding of the implications of alternative management strategies for development in the Adams River Watershed.

In undertaking this study, the IK was used to prepare a baseline scenario for pre-European contact conditions in the 1800s, reflective of ALIB worldview (Wilson et al. 2018). This knowledge relates directly to their tradition of Firekeepers and village establishment and movement in relation to prescribed fires. The ALIB wanted to ensure that traditional laws and values were part of the decision-making framework (Wilson et al. 2018). The science case was based on present day timber harvest management, mining, agriculture, road, transmission lines, seismic operations, fire suppression practices, and climate change.

Both types of knowledge were brought together in the ALCES (A Landscape Cumulative Effects Simulator) and Raven (hydrological modelling framework) to generate historical and potential future changes. Two land use scenarios were forecasted and compared (the Base Case and the ALIB scenario) so that a cumulative effects evaluation of human land use, climate, and nature disturbance 50 years forward was compared with pre-contact conditions in the Adams River Watershed (Wilson et al. 2018).

The approach taken involved four facilitated community workshops and a community planning team (engaged from start to finish). This provided an opportunity for direct community engagement in the Land and Resource Governance Framework. Workshops focused on using ALCES and Raven to assist ALIB community members with understanding different watershed management strategies and their implications. Four spatially explicit scenarios focused on water and forestry were developed and assessed: Pre-contact ('Range of Natural Variation', business as usual ('Base Case'), Climate Change, and ALIB's Scenario (a desired future) (Wilson et al. 2018). IK, in the form of known village locations, was input into the ALCES model for baseline (pre-contact) conditions with a focus on wildlife (both from Secwépemc Firekeepers and other sources) as the primary disturbance agents. The ALIB Scenario was guided by the ALIB's vision statement, the 'Our Common Future' Report of the World Commission on Environment and Development's definition of sustainable development, and traditional Secwépemc laws regarding management, access, processes and protocols regarding lands and resources.

4.5.2.2 Application

Results of the simulations found that there had already been significant and substantive negative cumulative effects changes in the Adams River watershed when compared to pre-contact conditions (Wilson et al. 2018). Results showed that positive cumulative effects were well documented, mostly economic-focused and realized by non-Indigenous peoples. However, negative cumulative effects on key Secwépemc values (such as fish, wildlife, water quality, food security, access to lands, heritage, timber, medicines, and berries) were significant but not well documented (Wilson et al. 2018).

Under the forecasted ALIB scenario strategies, it was demonstrated that improvements could occur across all indicators (with the exception of moose). The scenario included a reduction in timber harvesting to allow for Indigenous tourism areas, which would also allow for benefits such as increased wildlife (caribou and grizzly bear) habitat and health and increased economic and cultural benefits to the nation.

Through the workshops, the community was able to make some recommendations for moving forward. Recommendations included:

- Managing the watershed separate from the Kamloops Timber Supply Area;
- Reducing but not eliminating timber harvest for a positive trade-off for realizing more tourism with a spinoff positive effect on wildlife;
- Renaming watershed features and landmarks with traditional Secwépemc names;
- Developing indicators for salmon and salmon habitat; and
- Increase ALIB's capacity through training and mentorship.

Overall, the approach allowed for the weaving of IK and science through ALCES modelling and provided a demonstration that the baseline for cumulative effects evaluation could extend back to pre-contact conditions instead of using the present day. The BC government has accepted the land use modelling work and will be using it for making land use decisions going forward.

4.5.3 APPRAISAL

Cumulative effects assessment whether project level or regional is highly scrutinized. Among the criticisms launched over the practice is the failure to consider pre-contact perspectives of Indigenous peoples (Government of British Columbia 2016). The cumulative effect assessment for the Adams River watershed features how modelling using pre-contact IK and science can be applied. It is an example of complementary uses of knowledge and was a positive contribution to future land management practices including closure planning. This modelling approach for bringing IK and science together has shown that it is possible to account for Indigenous perceptions for the land back to pre-contact and allow for recognition of local Indigenous epistemology.

5 DISCUSSION: EMERGING PRACTICES IN WEAVING TOGETHER INDIGENOUS KNOWLEDGE AND SCIENCE

As noted earlier, the Agency is interested in identifying lessons-learned, including case studies where IK and science were both used in IAs. The Agency wants to better understand how the two knowledge systems can be woven together.

Original IAs did not consider the inclusion and use of IK. The inclusion of IK as a part of impacts assessments occurred roughly 30 years ago. IK's role in decision-making was characterized and recognized in the ground-breaking Delgamuukw Decision of 1997, whereby the Supreme Court of Canada ruled that Indigenous oral history and traditions were to "be placed on an equal footing with the types of historical evidence that courts are familiar with" (Delgamuukw *v.* British Columbia[20], para. 87). A more recent legal decision, Tsleil-Waututh Nation *v.* Canada[21] (2018), further emphasized the importance of improving the engagement of "Indigenous peoples and their knowledge in federal EAs" (Eckert et al. 2020, p. 69). Currently, the consideration of IK and science in IA is variable and dependent on geographic location and legislative requirements. For example:

- There is no effort to weave together IK and science. Rather, IK is treated as a separate report and the results are not featured in the evaluation (Chapman and Schott 2020);
- The Terms of Reference or Guidelines require the integration of IK but science dominates the IA evaluation process (Arsenault et al. 2019);
- Engagement by regulators and proponents in Indigenous communities is leading to more community knowledge in mitigation and monitoring (Johnson et al. 2016); and
- There is an emerging trend of "Two-eyed seeing[22]" (Abu et al. 2019; Bartlett et al. 2012; Mantyka-Pringle et al. 2017; Rowett 2018; Wright et al. 2019), Indigenous nations undertaking their own assessments and joint research and decision-making (GCI 2018).

In considering emerging trends in weaving together IK and science, TWC considered the five phases of the IA process as laid out in the new Act. It also considered the primary roles of the Agency, namely, providing direction and reviewing documents. The Agency also has a primary role of supporting Indigenous groups involved in IAs. As a result of the literature review and the interviews, TWC identified four areas that require special attention and concrete measures on the part of the Agency:

- Ways of Knowing;
- Methods and Approaches;
- Application; and

[20] Delgamuukw *v*. British Columbia, [1997] 3 S.C.R. 1010, Case Number 23799.

[21] Tsleil-Waututh Nation et al. *v.* Attorney General of Canada et al., 2018 FCA 153

[22] Two-eyed seeing refers to "learning to **see** from one eye with the strengths of Indigenous knowledges and ways of knowing, and from the other eye with the strengths of Western knowledges and ways of knowing ... and learning to use both these eyes together, for the benefit of all" (Institute for Integrative Science and Health n.d.).

- Evaluation.

5.1 Ways of Knowing

Among the key findings to emerge from this research was the understanding that there are different ways of knowing (Alberta Energy Regulator 2017; Chapman and Schott 2020; Clow et al. 2020; Dickison 2009; Eckert et al. 2020; MVEIRB 2005; Rowett 2018; Johnson et al. 2016), and that the impact assessment process is in itself is a Western scientific process (McGregor et al. 2019). Nearly all interview participants said that the Agency needs to understand this and the whole process of IA needs to reflect this.

5.1.1 ACTIONABLE ITEMS

- **IK and Science Guideline**. A guideline is needed to spell out the expectations throughout the IA process. This guideline would provide continuity throughout the IA process including the period prior to triggering. It would be supplemental to the Tailored Impact Statement Guidelines (Agency n.d.) which refers to IK to be collected as part of the baseline but offers no direction for IK in the evaluation. Guideline elements might include measures that the Agency consider as facilitating understanding between IK and science, such as a summary of occasions when IK and science agree, complement each other, and finally where the knowledge diverges (Figure 5). It may also include minimum requirements such as expectations to see both ecological knowledge and land use knowledge (NB. Only the latter is currently suggested as a requirement and does not reflect the entire epistemology). It may also require a summary of the Indigenous worldview for context. The guideline should also identify the expectations the Agency has for itself for developing the Summary of Issues, the continuity of IK and science from the Summary of Issues, into the Tailored Impact Statement Guidelines. Finally, the guideline could set parameters for evaluation of IK and science and acceptable practice such as is found in the Mackenzie Valley Environmental Impact Review Board's *Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment* (MVEIRB 2005), and featured in the Tłı̨chǫ All-season Road Project case study.

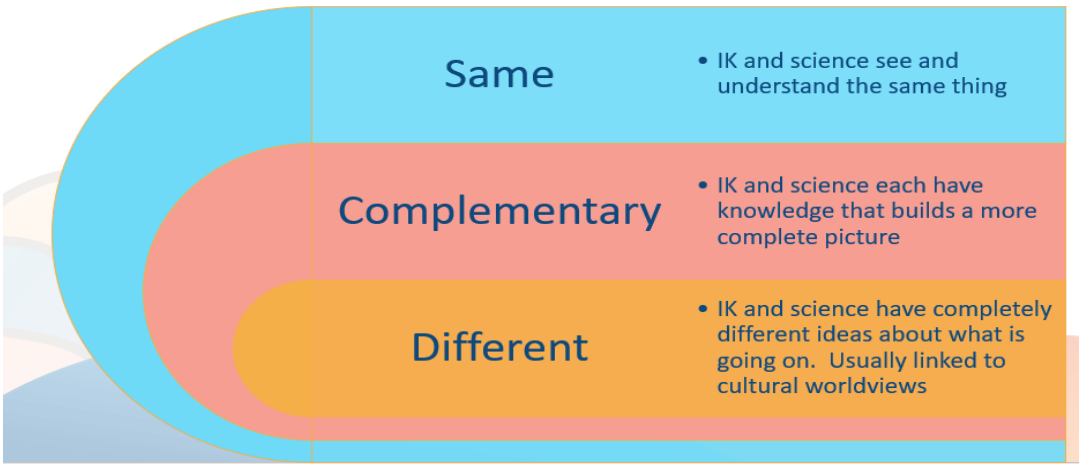


Figure 5. Indigenous Knowledge and science in IA

- **In-house IK facilitator or interpreter**. Different approaches have been used to increase understanding of "ways of knowing". These include advisory committees and in-house IK facilitators or interpreters such as used by Nuclear Waste Management Organization, which has an IK and Reconciliation position that includes facilitating understanding. This full-time facilitator or interpreter can help with various aspects of the impact assessment process, especially where there is disagreement between project specific IK and science matters.
- **Training**. Complete "ways of knowing" training for all Agency staff and anyone involved in the review process, including review panel members.
- **Issue scoping standards and procedures**. The issue scoping initiates the process and results in a Summary of Issues document on which the impact assessment will be developed. The weaving of IK and science starts with this step. The Agency needs a toolkit of approaches for issue scoping. Examples include:
  - Agency doing scoping with the support of an in-house facilitator or interpreter;
  - Indigenous group preparing its own issue scoping document; and
  - Joint issue scoping.

  Issue scoping standards and procedures need to include confirmation steps and documentation that reflects the integrated worldview and inter-relationships between culture, society, environment, and economics. The importance of moving away from only focusing on valued ecosystem or socio-economic components arose in the interviews and in the literature.

5.2 Methods and Approaches

The Agency was interested in practices being used to weave together IK and science. The research identified emerging practices that involved greater collaboration, co-creation, and cooperation. Understanding methods and approaches that facilitate the weaving of IK and science is important for the Agency and for proponents. As with understanding science techniques to evaluate impacts, it is important to understand which weaving approaches are good and which are poor.

The *Impact Assessment Act* (2019) requires consideration of project effects on Indigenous people and their rights. Legislation provides the process to be followed and establishes some of the minimum requirements. Practice interprets the requirements. For example, the literature reviewed and interview participants acknowledged that Indigenous peoples consider good IK collection and documentation should include Indigenous laws, sites and place names, use of Indigenous words and language, a description of the environment pre-contact, and the collection of knowledge from a broad section of Indigenous communities since IK is constantly evolving. Depending on the approach used to collect and apply, it can have an influence on the subsequent evaluation. The emerging practice looks beyond knowledge collection and documentation to focus on planning and problem solving.

As part of preparing impact assessments, project proponents are using different techniques to understand impacts on Indigenous communities and peoples. The literature and interviews highlighted advisory committees, the employment of Indigenous peoples to help with research, joint design of impact assessment research, and identifying mitigation measures and monitoring (Abu et al. 2019; Arsenault et a. 2019; Eamer 2011; Eckert et al. 2020; Gibson et al. 2018; Giles et al. 2007; Johnson et al. 2016; MVEIRB

2005; Wright et al. 2019). These measures are being used but not widely applied across Canada. The interview participants said that they felt the best results of weaving together IK and science came from situations where there was co-creation, collaboration, and cooperation. The popular practice of collecting IK and submitting a report separate from science research creates a situation where the impact assessment authors do not have the full context for how to interpret the IK. This has limited the extent to which IK is in included in the impact assessment document and in decision-making. Specifically, this current practice does not allow for easy reconciliation when the knowledge systems diverge in their understanding of the impacts. This then creates tension during the review process. A couple of interview participants, as well as the literature noted that the points of divergence should be the focus of the impact assessment and understanding impacts.

Among the biggest challenges interview participants identified in trying to weave together IK and science were identification of cumulative impacts, and the determination of their significance. With respect to cumulative effects assessment, the issue is fundamental. The participants were clear that the current cumulative effects assessment approach diverged on the agreement of baseline conditions. IK holders maintain it should be pre-contact conditions, while science knowledge holders maintain it is present day conditions. This is an ongoing source of tension. The Adams Lake case study shows that it is possible to do cumulative effects assessment going back to pre-contact conditions and still arrive at recommendations that are workable in the present day.

Under CEAA 2012, significance determination was also a challenge. Some participants noted that the scientific approach of considering impact significance of a change to a particular valued component did not account for use, pathways and connections, which was more consistent with Indigenous worldviews. A new approach for looking at the extent of significance of adverse effects is needed. Note that under the IAA, significance determination is not required; rather the extent of significance is just one of the factors to consider in the public interest decision. The Hope Bay Mining Ltd case study features a consensus-based approach to reach resolution on significant impacts in a project evaluation.

Even where it was recognized that co-creation and cooperation were the best way to proceed, there were challenges that could prevent these processes from being used successfully. More than one interview participant reflected on the challenges of seeking cooperation, including lack of community capacity, lack of community IK research protocols, or community politics that sometimes prevents community members from being involved in the impact assessment process. Each of the case studies reflect different attempts to achieve cooperation, with an exception for Adams Lake; reaching consensus was critical to obtaining project approval.

5.2.1 ACTIONABLE ITEMS

- **IK and Science Guideline**. A guideline is needed to provide additional direction that complements the requirements listed in the Tailored Impact Statement Guideline. The Guideline may also provide direction on including the knowledge of different genders or the necessity to be clear that IK is not pan-Indigenous but held separately by each Indigenous group.
- **New impact assessment toolkit**. Proponents are using new and different approaches to bring IK and science together. The Agency, along with technical reviewers need to evaluate which of its

tools do not support the weaving together of IK and science. For example, the practice of stand-alone baseline chapters without reflection in the rest of the impact assessment is likely a practice that needs to change. This does not reflect weaving.

- **Training**. Develop and deliver training to technical reviewers on the emerging practices in IK and science to facilitate their understanding of how IK could be utilized in the impact assessment.
- **Policy direction**. The Agency needs to provide policy direction on science and IK for the assessment of effects, including cumulative effects assessment. The Agency should review its current policy documents and ensure they reflect current practice.

5.3 Application and Documentation

Application, or how IK and science are documented and presented in a proponent's impact statement may affect the review and understanding by the Agency and/or review panel. There was agreement that the following items support easier understanding of IK and science in an impact statement. These items could be included in the IK and Science Guideline.

- **Presentation**
  - Plain language versions and summaries;
  - Diagrams that reflect Indigenous worldviews; and
  - Approved maps and figures with confirmation that the knowledge can be shared.
- **Reporting**
  - Concordance table to show where in the text IK can be found;
  - Involvement of IK holders in the preparation of the reports;
  - Involvement of an IK facilitators in the preparation of the reports;
  - Methodology that explains how and where IK was used, and how science and IK were interwoven;
  - Inclusion of Indigenous assessment reports and how the knowledge types were brought together;
  - Appropriate translation and use of Indigenous languages; and
  - Measures used to problem solve such as risk assessment.
- **Agreements**
  - Inclusion of the IK agreement that was negotiated and signed between the proponent and Indigenous groups. IK agreements are used in some impact assessments that can include items such as means of IK collection, use of the IK on the current project or in the future, or ability to review and comment on the use of the IK;
  - Involvement of IK holders in the preparation of the reports; and
  - Clear statements of which knowledge is confidential, and which is not.

5.3.1 ACTIONABLE ITEMS

- **IK and Science Guideline**. A guideline is needed to spell out the expectations throughout the process for all five phases. Content consideration can include:
  - IK agreements with communities;
  - Transparency in the use of IK and science; that is, clear documentation on how the two knowledge systems were used in decision-making;
  - Confidentiality;
  - Mitigation and monitoring agreements; and
  - IK and science methodology clearing outlining the approach.

5.4 Evaluation and Outcomes

Evaluation is the domain of the Agency. The Agency needs to develop evaluation procedures for how to consider IK and science i.e. cues of what to look for in the methodology and documentation. The literature reviewed was silent on this subject. The literature did offer possible means to resolve divergences but did not provide direction on the role of regulators. The interview participants were generally clear that it was not acceptable to examine IK knowledge in the same manner that science is examined; another approach is required. One regulatory participant stated that their procedures did allow for questions of clarification in addition to the submission of additional IK. The MVEIRB TK guidelines also provides some statements on what is found acceptable (MVEIRB 2005).

As already covered above in Methods and Approaches, the Agency can expect that IK will be presented in different ways in proponent impact statements. Likewise, the Agency should expect that Indigenous communities may submit their own evaluation based on IK. Both situations raise the possibility that the Agency could become responsible for weaving the IK with the science without having the necessary context. The Agency will need to know how to respond if this situation is presented.

5.4.1 ACTIONABLE ITEMS

- **Rules of Procedure**. Develop rules of procedure for how the Agency will treat IK including co-developing sections of the Agency's Impact Assessment Report. This will provide procedural transparencies for Indigenous groups and proponents.
- **Training**. Complete "ways of knowing" training for all Agency staff and anyone involved in the review process including review panel members.
- **In-house IK facilitator or interpreter**. Involve an in-house facilitator or interpreter in each impact assessment. Individuals should be dedicated to projects, and aid in understanding the use of IK and science especially where they are different. (see Figure 5)
- **Plain language summaries**. Develop a format for plain language summaries that includes interaction diagrams.

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Appendix B Questionnaire

TWO WORLDS CONSULTING

GUIDANCE WITH INTEGRITY.
info@twoworldsconsulting.com
(250) 900-6602
www.twoworldsconsulting.com

April 6, 2020

Interview Set-Up – April 6, 2020

Two Worlds Consulting is an Indigenous-owned environmental and social consultancy. We have been contracted by the Impact Assessment Agency of Canada ("Agency") to prepare a report on Indigenous knowledge ("IK") and Western science ("science") in impact assessments; specifically, we are looking for practical examples and lessons from different jurisdictions that provide insight into how the Agency can weave together the two knowledge systems in impact assessments across Canada. The Agency is seeking workable/practical insight and is less interested in theory. Part of the research includes interviewing practitioners for their reflections and experience on the topic. We are working with the Agency throughout the process, as well as conducting a literature review including documents provided by the Agency. The resulting product of all this research is a report featuring four case studies. The report will inform a discussion about IK and science by two Agency committees (the Technical Advisory Committee on Science and Knowledge and the Indigenous Advisory Committee). Finally, this work will be in line with the commitment to make sure that the impact assessment process aligns with the *Principles respecting the Government of Canada's relationship with Indigenous peoples* and the Government of Canada's commitment to implement the *United Nations Declaration on the Rights of Indigenous Peoples* (UNDRIP).

The interview will take about 60 minutes of your time. Your participation in the interview is voluntary. The information you provide may be used to support the development of policy and guidance on the part of the Agency. No comments will be attributed to any individual and your answers are completely confidential. The work is being conducted according to the federal *Access to Information* and *Privacy Acts,* and Agency-specific policies such as the Scientific Integrity Policy.

During the interview, we will be keeping verbatim written notes–the interview will not be recorded. We will share a summary of our notes with you following the interview for your review and validation. If we don't have enough time to cover all of the topics, you will have an opportunity to provide information in those other areas when you receive the summary. We have four themes we would like to discuss with you; we'll start by going over a bit more background to the project, followed by some questions about your role and experience, and then talk in more detail about insights you might be able to provide. You're free to stop the interview at any point.

If you have any questions, please, contact Heidi Klein (hklein@twoworldsconsulting.com) or Sarah Ravensbergen (sravensbergen@twoworldsconsulting.com). TWC supports the efforts to implement UNDRIP and the recommendations of the TRC *Calls to Action* report. TWC has approached this assignment so to ensure that work with Indigenous peoples is done in a just, equitable, and respectful manner.

Participant Name:	
Role/Title:	
Organization/Affiliation:	
Interview Date:	

1. Do you consent to your information being included in the final report? Yes, No
2. Do you consent to the use of specific quotes used in the final report (with your name not attributed)? Yes, No
3. Do you have any questions before we start?

Context and Interview Background

In preparing for this interview, TWC considered the roles of the Agency across the entire impact[23] assessment process. For the purposes of this research, we are focusing on the Agency's roles as follows: 1) they provide instruction on their expectation for the presentation of IK and science in Impact Statements, or support the collection of IK by Indigenous groups, and; 2) they evaluate or support the evaluation of Impact Statements and the use of IK/science in the Impact Statements. In keeping with this recognition of roles, TWC has identified two themes that relate to providing instruction for the collection and documentation, and two themes related to the review and evaluation process. We will discuss each of these, but first we are hoping to gain information on your general role and experience.

Warm-up

- Can you describe your organization and the type of work you do?
- How long have you been doing this work? With this organization?
- Generally, what has been your experience with IK and science in the impact assessment process?

Instructions: Cultural Context

[23] Impact includes both positive and negative, and direct and indirect changes

Cultural context frequently starts and ends with the provision of an IK definition. We would like to gain an understanding on how the cultural context is captured in the preparation of Impact Statements, and if a better understanding of cultural context would facilitate the review of impact assessments. We are looking for best practice ideas.

- Do you feel that an improved understanding of cultural context is important when Impact Statements are being prepared? If so, how could this process be improved?
- What challenges have you encountered when trying to understand IK or science in the impact assessment process? [Prompt for the specific topics below if possible]

Potential Topics of Discussion:

- Multiple IK definitions and concepts
- What IK is collected and how is it presented?
  - Cultural rules and context
- Does cultural context facilitate understanding different worldviews e.g., IK or science?
- Gender-specific knowledge; intergenerational knowledge
- Impact assessment process framework and practice, and how it influences understanding of IK

Instructions: Methods and Approaches

We would like to develop an understanding of whether the way IK and science are collected and documented influences their use in an Impact Statement and Impact Assessment Report. We are looking for best practice ideas.

- What do you think are important elements of good practice in collecting and documenting IK, and why?
- What do you think are good techniques in collecting and documenting IK and science alongside each other and why? [Prompt for the specific topics below if possible]

Potential Topics of Discussion:

- Timing of engaging knowledge holders
- Timing and amount of time needed for IK collection start
- Involvement in collection — gender, youth
- Indigenous Knowledge holders and scientists working together
  - What did they do? Study design? Did they share knowledge of the area, how did this go?
  - Did they work together on understanding their respective knowledge and what it means in terms of understanding project impacts?
    - Sharing ecological knowledge such as food webs and variations that have been noted over the seasons? Years?
- IK collection

  - Who does the collection and documentation? Did it make a difference the quality of the Impact Statement?
- What is collected

Baseline information, present day knowledge, earlier knowledge, knowledge about the land / ecology, knowledge related to culture, seasonality, spirituality, social, health and economic conditions, etc.

Analysis: Application

There is a requirement to consider IK and science alongside each other in the impact assessment process. In this case, we want to explore how IK and science have been presented or reported in Impact Statements. We are looking for best practice ideas.

- Do you think that the way IK and science are combined is influenced the review? Why or why not? [Prompt for the specific topics below if possible]

Potential Topics of Discussion:

- Baseline IK and science presentation
- Presentation and use in scoping the impact assessment and in evaluation of impacts (e.g., selection of valued components and consideration of areal extent)
- Adequacy of the use of the IK along science

Analysis: Evaluation

The Agency, federal departments, and staff are required to evaluate the effects of a project. In the review, IK and science will be considered as part of the evaluation of potential effects. We are looking for best practice ideas.

- How have you seen both IK and science evaluated as part of this process? Have you seen conflicts in this regard? What have you observed? If so, what do you think are ways that such conflicts could be resolved? [Prompt for the specific topics below if possible]
- Have you come across approaches that might be used by reviewers that would provide direction on the use and application of IK and science, such as a checklist or markers related to appropriate consideration of IK? Quality of use and application?

Potential Topics of Discussion:

- Conflicts between IK and science and the source of that conflict
- Acceptable ways to consider IK in the evaluation
- Acceptability of commenting on IK collection and presentation [but not on the IK itself]
- Differences in the interpretation of impacts, and handling the differences

Project Examples

Finally, TWC is looking for examples of environmental or impact assessments of major projects that speak to the themes we've identified (methods and approaches, cultural context, and application, and evaluation).

- We are looking for recommendations and helpful documents; can you provide us with any examples of projects that you think showcase best practices in the themes that we've talked about (methods, approaches, application, etc.)? [Prompt for the specific topics below if possible]

Potential Topics of Discussion:

- Potential ideas of assessments of major projects
- With which theme does it align?
- Why is this project being suggested?

Final Reflections and Comments

This set of questions allows for further reflections and comments.

- What are issues being dealt with when dealing with IK and science, and how have you seen them be addressed? To your knowledge, how has this changed in light of the new Act — if it hasn't, do you expect to, why or why not?
- Is there anything else you would like to add?

End of interview — thank you for your participation. TWC will provide a summary to you for validation. [Interviewer to ensure correct contact info for providing notes].

Appendix C Letter of Introduction

Impact Assessment Agency of Canada
Agence d'évaluation d'impact du Canada

160 Elgin St., 22nd floor
Ottawa ON K1A 0H3

160, rue Elgin, 22e étage
Ottawa ON K1A 0H3

RE: Interview with Two Worlds Consulting for work on Indigenous knowledge and science in impact assessment

To whom it may concern,

The Impact Assessment Agency of Canada has contracted Two Worlds Consulting to prepare a report of case studies on Indigenous knowledge and science in impact assessment. We hope you are available to provide them with an interview to hear your experience and perspective on this important topic.

This work is being done to inform a joint discussion of the Agency's two advisory committees, the Indigenous Advisory Committee and the Technical Advisory Committee on Science and Knowledge, on the topic of Indigenous knowledge and science in impact assessments. The work will also inform the Agency's implementation of the *Impact Assessment Act*.

The consultant's report will provide to the committees case studies that show methods and processes to help bring the two knowledge systems together, and how to address issues related to the topic (such as how to bridge world views and how to create ethical space appropriately and respectfully).

Providing Two Worlds Consulting with an interview will help the expert advisors on our committees and Agency staff in their work on this important topic under the *Impact Assessment Act*. We sincerely hope you are able to participate so that your valuable perspective is included in the report. Thank you very much for considering this request.

Sincerely,

Miriam Padolsky,
Director of Science Policy
Impact Assessment Agency of Canada