**Cumulative risk and the hazards of toxic substances for Indigenous Peoples**

*Indigenous People represent less than ten percent of the global population, yet they are stewards of 80% of the earth’s biodiversity.* [[1]](#footnote-1)

*Stressors are everywhere*

Cumulative effects of ‘cocktails of chemical stressors’ in the environment are widespread.[[2]](#footnote-2),[[3]](#footnote-3) Indeed pristine habitats, if they still exist, are increasingly rare. Chemicals entering the environment are increasingly prevalent due to the more than 30-fold increase in synthetic chemicals used in the last century.[[4]](#footnote-4),[[5]](#footnote-5) Other environmental gradients, like climate change, can also contribute to shifts in environmental patterns making the determination of cause difficult. Individually, climate change and chemical inputs can negatively impact the abundance, diversity, and health of locally adapted species, contributing to biodiversity loss. Together, these environmental disturbances can erode ecosystem function, dramatically altering the very environment on which human populations depend for essential ecosystem services like drinking water. Impacts of degraded ecosystems are widespread (e.g., boil water orders, fish kills) and pose an ongoing and significant threat to Indigenous Peoples.

Indigenous Peoples depend on the quality and functioning of the environment for a wide range of activities including, but not limited to, access to food, medicine, drinking water, spiritual purification, and other cultural activities. Access to good water and high-quality habitats is important to protect plants and wildlife, such as caribou, that are integral parts of Indigenous culture and economies. In addition, Inuit, First Nations, and Métis Peoples in northern Canada are also likely to be affected by hazardous substances that can be transported by air and ocean currents over long distances from emission sources located both within and outside the Arctic. These chemicals can bioaccumulate (i.e., buildup in organisms) in food webs and reach elevated concentrations in top-of-the-food-web marine and terrestrial mammals that are important country foods to Arctic Indigenous Peoples’ diet and culture. These hazardous substances include persistent organic pollutants (POPs), mercury and other heavy metals, and unintentionally emitted toxic substances such as polycyclic aromatic compounds (PACs), dioxins, and furans. Many of these chemicals have few sources in the Arctic but can be transported long distances where they can bioaccumulate up to levels high enough in wildlife and humans to cause adverse health effects in some instances. New and emerging contaminants also pose their own unique challenges. For instance, plastic wastes (largely associated with packaging, followed by building and construction materials, or the automotive sector) are also increasingly found in the Arctic environment and wildlife. Single-use plastics account for between $5.5 and $7.5 billion (CAD) of the Canadian economy.[[6]](#footnote-6)

*Wholistic Approach with Free*, *Prior, and Informed Consent*

 From an Indigenous perspective, decision-making around development and conservation must be addressed wholistically. This will require respect for different ways of knowing and understanding the land and approaches to land use. To do this successfully will require extensive planning, strong inter-disciplinary knowledge sharing, and co-developed action-oriented research with community partners. The work will need to bridge contaminants, natural gradients, and different habitats. In short, this will require a partnership approach that recognizes that free, prior, and informed consent isn’t a one-off, rather it’s an ongoing conversation that requires open dialogue and long-term relationship-building.

 Although we consider it a given that advice provided to communities about toxic substances in the environment should always be culturally appropriate, collaborative, and ethical – that has not always been the case. [[7]](#footnote-7) Knowledge generated in partnership with communities, utilizing Indigenous concepts, resources, tools, or territories, necessitates Indigenous considerations such as Free Prior and Informed Consent (FPIC[[8]](#footnote-8)), Collective Benefit, Authority to Control, Responsibility, Ethics (CARE[[9]](#footnote-9)) and Ownership, Control, Access, and Possession (OCAP[[10]](#footnote-10)). Awareness and understanding of these principles outline important concepts and methods required to ensure that information is shared responsibly, and that data collected is managed in a manner consistent with National and International Standards.[[11]](#footnote-11) At all times, approaches must also be distinctions-based and respectful of the differences between Indigenous Nations and the extraordinary diversity within and between First Nations, Inuit and Métis communities.[[12]](#footnote-12),[[13]](#footnote-13),[[14]](#footnote-14)

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| *“Canada has recognized various human rights implicated by hazardous substances and wastes through its ratification of or access to seven United Nations human rights treaties. Under these treaties, Canada has the obligation to protect, respect and fulfill the human rights to life and dignity, health, security of the person and bodily integrity, safe food and water, adequate housing, safe and healthy working conditions, among others. Canada has obligations regarding the rights to information, participation, access to justice and remedies and specific obligations regarding the rights of Indigenous peoples, children, different genders, workings, minorities, migrants, and persons with disabilities, among other vulnerable groups…. These are all underpinned by the fundamental principle of non-discrimination.”* [[15]](#footnote-15)  |

In Canada, the recent adoption of United Nations Declaration on the Rights of Indigenous Peoples11 and seven United Nations human rights treaties15 has highlighted that work in this area continues to need meaningful dialogue and additional efforts towards reconciliation. Progress in this area includes Canada’s new Impact Assessment Act recognizes Indigenous Peoples as key participants with unique perspectives and interests. The intent of the new Act is to enable and support Indigenous Peoples through the early identification of potential impacts of proposed projects and by making more space for consultation and engagement during the assessment process (see Crown consultation[[16]](#footnote-16),[[17]](#footnote-17)). There will also be increased opportunities for Indigenous community participation in follow-up and monitoring programs post development. Thus, consultation can no longer be an after-thought, rather it is now an integral part of the impact assessment process.

The Government of Canada is also working directly with Arctic communities under the Northern Contaminants Program (NCP) (Crown-Indigenous Relations and Northern Affairs Canada, CIRNAC) to reduce and, wherever possible, eliminate contaminants in traditionally harvested foods, while providing information that assists informed decision making by individuals and communities in their food use. Established in 1991, the NCP is co-managed by CIRNAC, Environment and Climate Change Canada, Health Canada and five Regional Contaminants Committees representing the Arctic Indigenous communities. Scientific results from NCP feed into domestic and international multilateral environmental agreements (MEAs), including the United Nation Environment Programme (UNEP) Stockholm Convention on POPs, UNEP Minamata Convention on Mercury, and United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution. The work also feeds into Canada’s obligations to the Arctic Council’s Arctic Monitoring and Assessment Programme (AMAP) and Arctic Contaminants Action Program (ACAP). As a party to these programs and multilateral environmental agreements, Canada provides scientific information in support of the risk assessment and risk management of hazardous substances to reduce their input into the Arctic environment from sources worldwide. The NCP conducts outreach and communication and encourages western science and Indigenous Knowledge exchange in consultation with the Regional Contaminants Committees to promote awareness of the issue and contaminant information exchange.

 Indigenous-led initiatives looking at the cumulative effects of contaminants are also increasingly common in Canada. With a vision that Indigenous Peoples have the capacity and the ability to assess, monitor, and manage the cumulative effects occurring in their lands, waters, and communities, organizations like the Indigenous Centre for Cumulative Effects (ICCE)[[18]](#footnote-18) have a mission to create, develop and share knowledge to empower community-based approaches. Conceptually this will enable culturally relevant cumulative effects assessment, monitoring, and management to support Indigenous well-being and decision-making. The guiding principles for ICCE include *Etuaptmumk*19,[[19]](#footnote-19) (Two-Eyed Seeing), or the seeing from one eye the strength of Indigenous knowledge, science, and ways of knowing, and from the other eye with the strength of western knowledge, science, and ways of knowing.[[20]](#footnote-20) Organizations such as Unama’ki Institute (UINR) of Natural Resources, for example, was formed to represent five Mi’kmaq communities – Eskasoni, Membertou, Potlotek, Wagmatcook, and We’koqma’q, to address concerns regarding natural resources and their sustainability. Working together, the institute has forged partnerships with groups with the same interests and aspirations to protect and preserve the environment for future generations, strengthen Mi’kmaq research, and provide resources for equal participation in resource management in Unama’ki territory.[[21]](#footnote-21)

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| *“…Mi’kmaq eel fisheries were found to be underpinned by the values of kinship relationality, generosity and Netukulimk (respectful and sustainable resource use), whereas the governmental approach to eel fisheries was found to be governed by a Western scientific worldview that instead prioritizes process, compartmentalization, economic benefits and conservation”.* 19 |

*Community-based monitoring*

 The most cutting-edge work in community-based partnerships is only beginning to address the needs identified by local partners. A recent systematic literature review identified 74 published case studies that seek to bridge Indigenous and western sciences in ecological research, monitoring, or natural resource management across Canada’s freshwater ecosystems.1 Although the study highlighted the diversity of ways knowledge systems can be woven; it also found that the application of these approaches is limited to some key regions (Pacific and northern) and species (whitefish and salmon). This limited extent is perhaps, one of the most significant challenges in eliminating toxic exposures in Indigenous communities as some of the regions are remote, poorly studied, and limited relationship-building has been done to support respectful research with Indigenous partners.

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| *There is an enormous power imbalance when communities try to bring issues to government. Awareness of this imbalance and the historical context of these sensitive issues is imperative for meaningful engagement with First Nations, Inuit, and Métis Nation governments and communities.*[[22]](#footnote-22) |

*The way forward*

 As technology and methods for the detection of toxic chemicals in the environment has increased, our understanding of the risks of these substances to humans, animals, and the environment has also increased. For Indigenous Peoples, the risks are orders of magnitude higher because of the common practice of locating heavy industrial activity near Indigenous communities[[23]](#footnote-23) and the reliance of these communities on country foods for sustenance, medicinal, or other spiritual purposes. In northern and Arctic communities, although less likely to be near heavy development, must also contend with the long-range transport and accumulation of chemicals in Arctic food webs.

Indigenous-led initiatives, such as the First Nations Biomonitoring Initiative[[24]](#footnote-24), will be an important part of the path forward. This initiative is actively testing body burdens of chemicals in First Nations adults and children and has found a long list of chemicals among the participants. Future efforts in this area in other regions are warranted. However, given that the nature of the data collected is highly sensitive and involves supporting human health and sustainable futures for future generations, it is essential that these efforts are Indigenous-led and that any data created is handled in a manner consistent with Indigenous sovereignty using frameworks such as the OCAP principles.10 Biomonitoring is a powerful tool that is increasingly in the hands of Indigenous governments enabling communities to protect themselves by providing evidence of the toxic chemicals where they live, work, and play. Supporting the continuity and coordination of those efforts is where the most help is needed moving forward.

Chemicals are everywhere and every level of government has a part to play in helping protect against the risks from chemical substances.[[25]](#footnote-25) We would recommend that these efforts extend beyond the standard approach of including municipalities, provinces, territories, and the federal government. Rather, there should be more room at the table for Indigenous Nations, governments, and community partners to provide their insights at all stages of research, monitoring, and assessment processes. Indigenous Peoples have the right to redress for resources which they have traditionally owned or otherwise occupied or used, and which have been used or damaged without their free, prior, and informed consent (see UN Declaration on the Rights of Indigenous Peoples11) and there is a growing movement that maybe it’s time to take our lands back.

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