

EMPOWERING IMPACT ASSESSMENT



Artificial Intelligence (AI) and Impact Assessment (IA) Memo August 2025

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EXECUTIVE SUMMARY

The use of artificial intelligence (AI) in human society is still very novel. There are few regulatory approaches and best practices developed to guide the use of AI, including in an impact assessment (IA) context. As a result, IA practitioners and regulators in Canada have considerable work to do in order to determine how to effectively, safely, and transparently incorporate AI into IA processes (if appropriate).

This memo explores the potential use of AI in an IA context. Examples of potential applications of AI throughout the IA process are provided, and the potential benefits and negative consequences of AI use are discussed. Current regulatory approaches for the use of AI are discussed, with a focus on Canada and the European Union, with additional details provided in Appendix A. Best practice recommendations for the use of AI in IA is also discussed, with a focus on recently published best practice guidance from the IAIA (2025).

Overall, best practice recommendations encourage regulators to work on the development of specific impact assessment policy, guidance, and legal requirements to guide the future use of AI, with meaningful public participation throughout. Although it is currently unclear what specific regulatory requirements should be adopted, at a minimum, best practice materials suggest IA regulatory frameworks include requirements for public reporting about the use of AI, transparency, protection of privacy, and linkages to the jurisdiction's broader AI governance framework. There should also be measures taken to ensure humans remain part of IA processes. For example, in the context of public participation, AI tools should be viewed as complementary to current human-led processes and should not replace existing engagement opportunities during the IA process, especially those that involve direct engagement between different stakeholders.

Research Questions:

- What is Artificial Intelligence (AI)?
- How is AI used in Impact Assessment (IA) Processes?
- What are the potential benefits and limitations of use of AI in IA?
- How is AI Regulated?
- What are the potential implementation challenges arising from incorporating AI into impact assessment processes in Canada?

- Are there any best practice standards for use of AI in IA?

Research Approach:

This memorandum draws on a combination of regulatory frameworks, case studies, and policy documents from both Canada and the European Union. Specific focus was placed on the regulatory frameworks administered by the European Union, the federal government of Canada, and the provincial government of Ontario.

1. What is Artificial Intelligence (AI)?

There are many descriptions of Artificial Intelligence (AI). However, there has been increasing adoption of the definition adopted by the European Union in June 2024 under the *Artificial Intelligence Act*, where “artificial intelligence” is defined as:

“...a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments.” (EU 2024, Art. 3(1); IAIA, 2025)

Artificial Intelligence involves “machine learning” (ML), with computers being taught to perform tasks through “dynamic algorithms that learn from large data sets and provide data-driven decisions, unlike models that follow static programming instructions” (Curmally, et. al., 2022).

There are a range of different types of ML that can be used to achieve different outcomes. For example, Natural language processing (NLP) is a type of ML that focuses on understanding and manipulating human language (Curmally, et. al., 2022). NLP is an approach used to identify, extract, and analyze data and inferences from text data. The NLP algorithms can organize and structure information to perform useful tasks such as: summarization, translation, named-entity recognition, relationship extraction, sentiment analysis, speech recognition, and topic segmentation. (Curmally, et. al., 2022)

2. How is AI used in Impact Assessment Processes (IA)?

As AI technology has developed, it seems to have been incorporated into virtually every area of human society, at varying degrees. AI has been adopted into a range of governance processes, including impact assessment (IA). The IA process is complex and requires consideration of significant amounts of data, from highly technical engineering reports to plain language public comments. As a result, AI has potential to offer significant benefits, while also having risks, as will be discussed in the next section. (Bond, et. al., 2024)

There are a growing number of academics and IA practitioners who have identified specific uses for AI in impact assessment processes or related environmental management activities. This section explores a range of successful AI applications in the context of IA, with a focus on the prediction and identification of impacts, and the analysis and communication of IA

data. This is by no means an exhaustive list of examples, as there is ongoing development of a range of potential and actual applications of AI throughout the whole IA process cycle.¹

i. Prediction and Identification of Impacts

Different AI tools have been used to assist with the prediction of environmental impacts and the analysis of IA data in jurisdictions around the world. For example, AI algorithms and ML approaches have been used by researchers and IA experts to facilitate the prediction and assessment of:

- harmful algal blooms in water supply reservoirs (Bongseok Jeong, et. al., 2022),
- methane emissions from Sargassum, i.e., seaweed (Louime and Raza, 2024),
- air pollution, e.g., ambient PM2.5 – concentrations of fine particulate matter (Modal, et. al., 2024),
- the impacts of flooding in flood-prone regions (Sampurno, et. al., 2024),
- the impacts of Ocean Energy Converters (Rezaei and Javadi, 2024),
- net environmental impacts (Palaniappan, et. al., 2025),
- carbon emissions (Suprijanto, et. al. 2025),
- land surface temperature (Ullah, et. al., 2025),
- human toxicity and ecotoxicity (von Borries, et. al., 2023), and
- marine biodiversity (Zhou, et. al., 2024).

While these examples are largely focused on the identification of environmental impacts and, to a lesser degree, impacts on human health, there is also potential for similar application of AI tools to the collection of other types of IA data, including information about social, cultural, and economic impacts, among others. This can involve use of NLP algorithms to analyze text and language, as discussed in the next part. However, caution is needed when it comes to the use of AI to analyze language, culture, and other human interactions. There are ethical and moral questions that need answering before respectful protocols can be developed for AI use in certain contexts, particularly when Indigenous rights holders (and other rights holding groups) are involved. This is explored more in Part 3 of this Memo.

ii. Analysis and Communication of IA Data

There has also been specific development of AI tools to assist government and public decision-makers with the analysis of impacts, the categorization of proposed developments, and a range of other IA regulatory responsibilities. In particular, there seems to be considerable potential for the use of NLP techniques² to assist decision-makers with the review of high volumes of information. For example, Achiam et al (2023), used NLP algorithms to assist

¹ For example, the International Association of Impact Assessment (IAIA) 2025 Annual Conference was focused on “Impact Assessment in the Age of Artificial Intelligence” (Bologna, Italy, 2025) where top IA experts and practitioners presented on new and ongoing research to integrate AI into IA processes. See the conference proceedings online: <https://2025.iaia.org/proceedings/>.

² For example, use of transformers such as Bidirectional Encoder Representations from Transformers (BERT) [Devlin et al., 2019], Robustly Optimized BERT Approach (RoBERTa) [Liu et al., 2019], or Generative Pre-Trained Transformer (GPT) [Achiam et al., 2023].

decisionmakers with the classification of industrial projects in the Chilean IA system, which resulted in significant improvements in efficiency and timing.

Although there should be serious caution taken when using AI as part of public engagement, there are some limited context where it may be of use. AI has the potential to help fill gaps in data due to low participation rates, facilitate translation to address cultural differences, and help identify potential stakeholders (Curmally, et. al., 2022). This is another area where NLP algorithms seem useful, as they can pull information from text data (e.g., written comments) as well as alternative data sources such as social media content to gain insight on public perspectives and enable further public consultation. (Curmally, et. al., 2022) Caution must be applied in these context; for example, if non-participation by parties is intended as a marker of resistance, utilizing AI to fill gaps in public feedback is counterproductive. Secondly, if the parties are members of rights-deserving groups, low participation may be a sign of poorly designed engagement; relying on AI as a remedy for bad process will never achieve the desired outcomes of *meaningful engagement* of parties. There are also serious ethical and legal concerns (discussed later in this memo) with AI algorithms mining the internet for the opinions and identifying information of potential participants. Therefore, AI should be used to complement public engagement processes, but should not replace direct engagement with the community (e.g., having participants engage with a chatbot instead of human-to-human interactions).

While this section has provided examples of the increasing number of ways AI could be used in the context of impact assessment, it must be noted that these new AI applications are not necessarily creating new IA methods or procedures, they instead seem to most often change the way existing IA methods are utilized (Fonseca, 2022). Many AI applications are focused on automating aspects of existing processes to handle more data, aggregate integrate and communicate information, and boost evaluative capacities (e.g., more regional analysis), instead of creating entirely new ways of doing things. (Fonseca, 2022)

Overall, the huge scope of potential applications of AI will inevitably impact the way impact assessments are undertaken around the world. As a result, there is a need for regulators and users of AI systems to have a comprehensive understanding of both the potential positive and adverse impacts of the use of AI tools before widespread use is adopted in Canada.

3. Benefits and Consequences of AI in Impact Assessment Processes

As a novel technology that is still being adapted for use in human society, the benefits and negative consequences of using AI are still largely being discovered and academic discourse is still largely focused on 'potential' impacts. However, there are a growing number of examples of AI use, including in an impact assessment/environmental management context, that provide data about actual impacts and further insights on the longer-term consequences. This section provides an overview of the main potential positive and negative implications of AI in an impact assessment context that have been identified by academics and experts so far.

Potential Benefits:

The application of AI to impact assessment processes has been recognized as having significant potential to improve and support IA processes throughout the entire assessment cycle, from the planning stage through to monitoring and follow-up (Curmally, et. al., 2022). The use of AI in IA is viewed as a pathway to “improved efficiency, predictability, and insights”. (Bond, et. al., 2024) The recognized benefits of utilizing AI algorithms to assist with impact assessment processes include:

- **Regulatory Process Improvements:** the large volume of data, technical complexity, and time required to analyze impact assessment data can create delays in government decision-making and follow-up processes. AI tools can assist decision-makers with a range of data analysis and risk management tasks, including the review of large volumes of information that varies from plain language to very technical (e.g., summation, translation). (Curmally, et. al., 2022) This can result in regulatory processes working quicker and more effectively as government actors experience time savings and a better understanding of the issues. (Louime and Raza, 2024; Rezaei and Javadi, 2024; Leal, et. al., 2025; Zhao et. al., 2024) There is also potential for cost savings. (Rezaei and Javadi, 2024)
- **Supporting Public Participation Programs:** AI has the potential to complement the public engagement tools used in IA processes, especially when it comes to public access to information and the analysis of public feedback by IA officials. For example, AI has potential to help with translation, summarizing large volumes of information for dissemination to the public, and help fill gaps in data caused by low public participation rates. (Curmally, et. al., 2022) Public engagement should not be a strictly AI experience, but AI could be helpful in other ways, such as consolidating background information.
- **Addressing Data Deficiencies:** When the data needed for IA is missing, incomplete, or inaccurate, it affects the preparation of IA reports, prediction of impacts, and can lead to poor IA outcomes for all stakeholders. (Curmally, et. al., 2022) AI has the potential to address many of the data-related challenges faced during all stages of the IA process and fill gaps in existing data. The use of AI in combination with other data processing, mapping, and data collection (including drones, satellites, etc.) techniques can provide highly accurate data about potential and actual impacts, resulting in more effective mitigation strategies. (Bongseok Jeong, et. al., 2022; Louime and Raza, 2024)

Potential Challenges and Negative Consequences:

Despite the possibilities and potential benefits of AI, there are currently many challenges with the incorporation of AI into IA. (Bond, et. al., 2024) Experts have identified a broad range of challenges and potential negative consequences that could stem from the use of AI in impact assessment processes. The following list provides an overview of these recognized consequences, largely based on the work of Bond et al. (2024):

- **Ethical and legal considerations:** Although there has been considerable development and increasing application of AI tools around the world, there are still many ethical and legal concerns about its use. For example, there have been “more than 600 actual

AI incidents ...), and more than 10,000 possible hazards with AI have been catalogued” by AI experts and regulatory agencies. (Bogucka, 2024, 37; Barrett, et. al., 2022; Hayrda and Rakova, 2020)³ This includes situations where AI can unintentionally become biased if the data used to train the AI does not accurately represent all ecological and social contexts, resulting in important perspectives or components being excluded during AI analysis. (Bond, et. al., 2024; Fonseca, 2022) There are also many complexities in IA analysis that require consideration of data that may not be easily categorized by AI, such as local knowledge, socio-cultural impacts, and ethical implications. (Fonseca, 2022) Thus, AI tools should not replace the involvement of humans in IA processes, as there is still much to understand about the potential implications of the use of AI.

- **Environmental impacts of AI technology:** There are many concerns and unknowns when it comes to the environmental impacts of AI technology. (Quintavalla, 2023) One of the most discussed environmental impacts of AI is the necessary use of large quantities of energy, which results in high levels of greenhouse gas emissions. (Quintavalla, 2023; Hao, 2021) Although there is widespread knowledge that emissions and other climate impacts are being caused by the use of AI, it remains difficult to clearly evidence the environmental costs of AI. (Dhar, 2020) Increasing attempts have been made to develop assessment and reporting metrics (Quintavalla, 2023; Schwartz et. al., 2020; Lacoste et. al., 2019), however this is still a new area, and no consensus has been reached on best practices or the effectiveness of recently developed approaches.
- **Negative economic and social impacts:** There are also potential negative economic and social consequences for Canadians with the introduction of AI into IA processes. The integration of AI might lead to a loss of jobs for both private and public sector IA professionals in certain areas, which could result in negative economic consequences and social repercussions. (Bond et. al., 2024; Fonseca, 2022) While this loss of jobs may be counterbalanced by the creation of new jobs, it will still affect the structure of the labour market in many fields, including impact assessment. (Fonseca, 2022) This loss of human expertise in the IA sector could eventually reduce the number of experienced professionals who add their intuition and expertise to IA processes. (Bond, et. al., 2024) There is also the potential risk that government systems could become too reliant on AI’s analysis without critical human evaluation of the AI’s results. (Bond et. al., 2024)
- **Regulatory and legal issues:** The use of AI in IA processes is still a largely novel approach in most situations, so regulatory systems, including IA laws and policies, have not yet addressed this issue in a comprehensive manner (if at all). This can lead to legal ambiguities and challenges in capturing AI activities in legally binding documents or decisions. (Bond, et. al., 2024) There are also many privacy and

³ For example, you can find a record of AI harms reported on the following websites: <https://incidentdatabase.ai> [The AI Incident Database is a project of the Responsible AI Collaborative, an organization chartered to advance the AI Incident Database]; <https://oecd.ai/en/incidents> [The OECD AI Incidents and Hazards Monitor (AIM) documents AI incidents and hazards to help policymakers, AI practitioners, and all stakeholders worldwide gain valuable insights into the risks and harms of AI systems.].

confidentiality concerns, as AI systems are vulnerable to cyber threats. Data breaches can expose sensitive environmental and community information and increase legal liabilities. (Bond, et. al., 2024) Current regulatory frameworks also largely fail to address the environmental consequences of the use of AI, as most states have limited available data on energy consumption, underdeveloped environmental standards, and a lack of governance guidance on sustainable practices for the development and deployment of AI. (Quintavalla, 2023; See also, Cox et. al., 2016)

- **Standardization and Validation**: Since IA is a data-driven process, AI is considered to have significant potential to improve the collection and use of data in IA process. However, there are also many potential negative consequences associated with the use of AI to analyze and manage data in an IA context. For example, there are many differences between AI models in their design and training processes. This makes it difficult to establish standardized methods for AI integration and assess their effectiveness if there is no way to compare and evaluate the AI tools used. (Bond, et. al., 2024)
- **Poor Data Quality**: The potential for poor quality data is also a concern associated with the use of AI in IA. If the data on which the assessment process is incomplete, outdated, or biased, it can delay decision-making processes and lead to misinformed decisions, among other issues. (Bond, et. al., 2024) Problems with IA data can impact the training of AI tools and lead to environmental misrepresentations. When AI is poorly trained, it can fail to recognize unique or rare environmental phenomena, which can prevent the prediction of potential impacts during the IA process. (Bond, et. al., 2024) Similarly, AI trained using past data might not be able to predict future environmental changes, especially with the rapidly changing environmental conditions we are experiencing globally, such as those associated with climate change. (Bond, et. al., 2024) There are also concerns that the use of AI could actually result in too much information, slowing down and complicating IA processes further. (Fonseca, 2022) “[M]ore environmental data does not necessarily lead to better decisions; it could unfold into a situation that has been described as ‘data drowning’, i.e., when too much data prevents users from finding meaning and insights (e.g., notions of impact significance) in information.” (Fonseca, 2022)
- **Data security and privacy**: The complexity and confidentiality (i.e., to protect proprietary information) involved in the use of AI algorithms can make it difficult to understand how AI has been used to derive specific results. (Bond, et. al., 2024) In the context of impact assessment, this can make it hard for stakeholders to trust or understand the AI’s conclusions, or the decisions made based on the information provided by AI. (Bond, et. al., 2024; Curmally, et. al., 2022; Stahl, et. al., 2023)
- **Data Ownership**: Along with issues related to privacy and security when it comes to the use of IA tools, there are also challenges associated with intellectual property rights and data ownership. For example, there are significant concerns around the use of Indigenous Traditional Knowledge to train AI algorithms and issues of consent when such knowledge is mined from the internet by AI. (Roberts and Montoya, 2023; Bhattocharjee, 2024) Thus, maintaining Indigenous data sovereignty is an important goal for any situation where AI tools are utilized. (Bhattocharjee, 2024; Bourgeois-

Doyle, 2019; Chakravarty and Gattupalli, 2024)) There are also concerns around the interpretation of Traditional Knowledge, as there are specific contexts and nuance required to understand Indigenous histories, stories, and law, that cannot be replicated by AI. (Bhattacharjee, 2024)

- **Transparency and Interpretability:** The lack of transparency and interpretability, as referred to above, can make it difficult to replicate results, and contribute to difficulties using the AI tools in other scenarios or geographies. (Bond, et. al., 2024) There are also concerns about public access to the information produced by AI tools as environmental data platforms are likely to keep expanding and lead to problems with proprietary information, monopolies, and governance of AI. (Fonseca, 2022) The datasets produced by AI algorithms may not reflect the true scope of public concerns (especially when there are gaps in the data used to train the AI) due to imbalances in access to online participation platforms or desires to protect personal, cultural or local practices. (Fonseca, 2022) So it is likely that existing gaps in understanding of stakeholder perspectives, biases, limited access, and reliability of data are likely to remain a concern in the context of impact assessment. (Fonseca, 2022)

4. How is AI Regulated?

Governments at every level have been grappling with the regulation of emerging technologies such as artificial intelligence. The uncertainties associated with the use of AI and the potential environmental and human rights impacts, among others, has led to the recognition that AI needs to be regulated through law and policy. As a result, there has been development of a suite of different legal and policy approaches to guide the development and use of AI technology.

The European Union appears to be leading the way with the adoption of the first comprehensive AI law in 2024. At the international level, the Global Partnership on Artificial Intelligence (GPAI), of which Canada is a founding member, has been seeking to ensure “the responsible development and use of artificial intelligence, grounded in human rights, inclusion, diversity, innovation, and economic growth.” (GPAI, n.d.) However, there are currently no international laws addressing the use of AI. In Canada, the Federal government has been developing both policy and law addressing the use of AI. At the provincial and territorial level, Ontario is the only jurisdiction to adopt legislation specifically addressing the use of AI. For more details about the approach to regulating AI used in these jurisdictions, please see Appendix A.

Overall, most regulatory mechanisms address the use of AI generally. There do not yet appear to be specific legal requirements at any level for the use of AI in impact assessment processes, although best practice guidance has recently been published by the International Association for Impact Assessment (IAIA, 2025). This best practice guidance will be discussed in more detail in the last section of this memo.

5. What are the potential implementation challenges arising from incorporating AI into impact assessment processes in Canada?

In Canada, there has so far been no official integration of AI into Canadian IA regulatory frameworks or guidance from regulators on the use of AI in an IA context. However, there has been an increasing integration of AI tools into government systems over the past five years in a more general sense. There are still many unknowns and corresponding challenges with the integration of AI and the regulation of AI use in all Canadian jurisdictions. Key challenges that will need to be addressed if AI is to be effectively adopted into IA processes include:

- **Ethical Use of AI:** There are many questions and concerns around the implications of AI use for humans and the environment. The use of AI has recognized negative environmental consequences, in large part due to the high amount of energy needed to run AI leading to increase GhG emissions and exacerbate the impacts of climate change. (Kaack, 2022) There is also much discussion of the potential impacts of AI use on humans, as there are potential violations of a range of human rights. (Balcerzak and Kapelanska-Pregowska, 2024; Akhtar and Jorgensen, 2024; Bankey 2024; Beraina, et al, 2025; Laukyte, 2023; Milczarek, 2024; Wang and Qu, 2024.) Negative consequences for humans discussed previously in this memo include a loss of skills and expertise, loss of jobs, and AI bias contributing to further marginalization of certain perspectives, among others. Finally, there are ongoing discussions about the legal rights of AI itself, as experts and regulators grapple with the huge implications for human society if AI is granted legal personhood, a topic that has not been explored in this memo. (Forrest, 2024)
- **Regulation of AI:** The regulation of AI use is a huge challenge for both regulators and users of AI tools as the regulatory framework is still actively in development around the world, including in Canada. (Da Silva, Herder and Flood, 2022; Gaon and Stedman, 2019) In Canada there are currently almost no guidance or regulatory requirements for the use of AI, with no specific discussion of the use of AI in an impact assessment context. The few legislative examples we have seen (e.g., Federal, Ontario) have been heavily criticized, largely because they were very light on details and left most of the regulatory requirements to be developed at a later date through regulations. There are currently few legal protections that could prevent potentially negative consequences from the use of AI and no certainty for users of AI tools in terms of how the use of new AI technologies will change their legal liabilities and impact approval processes.
- **Technical Requirements:** AI technology is still very new and many tools are still in active development. Unless there is in-house development and training currently occurring, it will be difficult for most governments and organizations to access the AI technology that is being piloted for use in an impact assessment context. Most new AI tools also require existing technology infrastructure so the AI tools can be incorporated into the already functional process (e.g., standardized online monitoring computer programs being used by all proponents within a jurisdiction). If there is no such existing technological infrastructure, there will be significantly more challenges in terms of compatibility and transferability when adopting standardized use of AI tools. Similarly, new technology requires considerable human expertise involved to check data, run the AI tools, and enforce AI regulatory requirements, among other things. Thus, a lack of human

knowledge and expertise in the use and regulation of AI is a considerable challenge in any context, including impact assessment.

- **Protection of Data:** There are still many concerns with confidentiality, privacy, and data ownership that have not yet been addressed by regulators and users of AI tools. This includes the development of rules and disclosure requirements indicating where the data will be stored (e.g., local of AI servers) and protective measures so data sovereignty is maintained, particularly when Indigenous Traditional Knowledge is involved. Without legal protections in place, it will be difficult to meaningfully collaborate with the public, experts, and local knowledge holders if they are worried about their data being mined by AI and used without their knowledge or consent.

6. Best Practice: IAIA Principles for use of AI in IA (2025)

As the use of AI has been rapidly adopted and regulators around the world have begun to grapple with the development of regulatory requirements to guide the use of AI, there have been a growing number of academics and experts who have been turning their minds to identifying best practices and guiding the integration of AI into their respective fields, including impact assessment.

Generally, IA experts have been urging governments to be cautious in the adoption of AI and work on adopting strong regulatory requirements to protect citizens from the many known and unknown negative outcomes that can occur due to the use of AI (as discussed in an earlier section of this memo). As noted by Bond et al., “[g]iven the challenges and current limitations, it’s crucial to strike a balance between leveraging AI’s capabilities in IA and ensuring that human judgment, expertise, and local context continue to play pivotal roles in the assessment process.” (Bond, et. al., 2024, Box 2)

Regulators have been cautioned to carefully monitor the development of AI tools and adjust the regulatory framework as needed. Fonseca advises that, “[f]rom a practical standpoint, lawmakers and policy-makers need to constantly monitor the development of new technologies to make sure that they are adequately incorporated in the decision-making process, so that they can deliver not only procedural efficiency gains but also, and perhaps most importantly, positive outcomes to the environment and society.” (Fonseca, 2022, 141)

The best guidance currently available on the use of AI in impact assessment was recently published by the International Association for Impact Assessment (IAIA). The IAIA has published *Principles for the use of AI in IA* (IAIA, 2025), to inform those engaged in all aspects of impact assessment and “serve as guardrails in the ethical and responsible use of AI technology.” The IAIA intends to revise these principles every two years.

The definition of “artificial intelligence” adopted by the IAIA is the same language used in the EU AI Act, discussed above. AI is considered to be “...a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments”. There are eight principles captured in the IAIA’s guidance document, as follows:

- 1) **Responsibility:** Humans must take full responsibility and accountability for the application of AI to IA processes, from inception through to completion.
- 2) **Transparency:** The use of an AI tool or system must be disclosed in an open and transparent manner (e.g., name of tool, date, manner of use). Transparency requires insights on how AI was used in producing a final IA and how data was analyzed at each stage. Compliance with AI policies of an institution, government standards or other standards must be declared.
- 3) **Integration with Regulatory, Standardized, or Approved Methods:** AI tools and systems may supplement or complement but should not replace, supersede, or breach recommended or regulatory processes (e.g., scientific principles, standardized calculations and modelling techniques, or data protection rules), unless they have been pre-approved by regulatory authorities. All IA processes must comply with any AI policies or requirements of the country in which the IA is conducted and with the policies and standards of any organization that is funding or supporting the IA.
- 4) **Expertise and Oversight:** Professional oversight is essential. Experts, specialists, and researchers with professional expertise should conduct independent verification of the outputs of AI tools used in IA processes.
- 5) **Awareness and Limitation of Risks:** Human oversight must be used to prevent errors and ensure accurate representation. All actors involved in IA processes must ensure that they look for and address limitations of AI tools and systems (e.g., bias, AI hallucinations, incomplete data, and lack of knowledge of the source and credibility of data).
- 6) **Vulnerability and Privacy:** AI should not replace direct communication with those affected or the judgment of experts. “To ensure trust in IA, AI must be used responsibly, recognizing that AI might inadvertently release private or secure information and, therefore, needs oversight of data protection. AI should be used in IA only when respecting the rights of those affected, and only when privacy, safety, non-discrimination, cultural and Indigenous beliefs, and intellectual property are protected.”
- 7) **Competence in AI:** IA specialises need to gain competence in order to apply AI. “AI should only be used in IA contexts by those with appropriate AI competence, i.e., professional knowledge and experience.”
- 8) **Model Collapse:** “Efforts should be made to prevent AI-generated output used in IA from becoming part of a dataset used to train generative AI tools—a process that could otherwise lead to inaccurate output, known as model collapse.”

CONCLUSION:

The use of artificial intelligence continues to largely be a novel approach in all areas of human society. The potential benefits and consequences of incorporating AI into everyday life are unknown or mostly theoretical at this point in time. Thus, there are few regulatory approaches and best practices developed to guide the use of AI, including in an impact assessment context. However, guidance on the development and use of AI in IA processes can be drawn from existing discourse and the growing number of case studies where AI has actually been applied to various parts of IA processes.

In Canada, there appears to be a lot of work needed to facilitate the integration of AI into government processes like impact assessment. From the few examples of best practice and expert analysis of AI in an IA context, it is clear there is a need for considerable learning on behalf of regulators and users of AI systems in Canada to first gain the expertise needed before safely incorporating AI tools in IA processes.

At the same time, regulators need to work on the development of specific impact assessment policy, guidance, and legal requirements to guide the future use of AI, with meaningful public participation throughout. Although it is currently unclear what specific regulatory requirements should be adopted, at a minimum, IA regulatory frameworks should contain requirements for disclosure of AI use, reporting and transparency rules, protection of privacy, and linkages to broader AI regulation and guidance. Canadian jurisdictions should develop their regulatory approaches based on learnings from the adoption of the EU's AI Act and the best practice principles developed by the IAIA.

Appendix A:

This appendix provides more details about the regulatory approaches to AI that were summarized in the “How is AI Regulated?” section of the above memo, with a focus on the European Union’s AI Act and approaches currently taken in Canadian jurisdictions.

a) European Union

In June 2024, the European Union Parliament adopted the *Artificial Intelligence Act* [EU AI Act], which is the world’s first comprehensive AI law. Responsible authorities under the Act include a number of national and EU-level actors.¹ Member States must establish or designate at least one market surveillance authority and at least one notifying authority to ensure the application and implementation of the act.

The purpose of the Act is to “improve the functioning of the internal market and promote the uptake of human-centric and trustworthy artificial intelligence (AI), while ensuring a high level of protection of health, safety, fundamental rights enshrined in the Charter, including democracy, the rule of law and environmental protection, against the harmful effects of AI systems in the Union and supporting innovation.” (EU AI Act, Art 1, p 44-45)

The AI Act introduces:

- harmonised rules for the placing on the market, the putting into service, and the use of AI systems in the Union;
- prohibitions of certain AI practices;
- specific requirements for high-risk AI systems and obligations for operators of such systems;
- harmonised transparency rules for certain AI systems;
- harmonised rules for the placing on the market of general-purpose AI models;
- rules on market monitoring, market surveillance, governance and enforcement; and
- measures to support innovation, with a particular focus on SMEs, including start-ups. (EU AI Act, Art 2)

The EU AI Act creates a classification system for AI with different regulatory requirements based on a risk-based approach, see Figure 1 below. (EU Parliament, 2024) AI systems with ‘unacceptable’ risks (e.g., violations of fundamental EU rights and values) are prohibited under the regulatory framework. High-risk AI systems with negative impacts on human health, safety, or fundamental rights are subject to a set of rules and requirements, if authorized to enter the EU market. Systems with “Transparency risk” are deemed to have limited risks due to a lack of transparency, and are allowed proceed if complaint with information and transparency requirements. Minimal risk AI systems are not subject to additional requirements. (EU Parliament, 2024)

¹ For example, the Commission, the AI Board, the Artificial intelligence act AI Office, the EU standardisation bodies (CEN and CENELEC) and an advisory forum and scientific panel of independent experts. The EU AI Office was established to provide advice on the implementation of the new rules, in particular as regards GPAI models and to develop codes of practice to support the proper application of the AI act.

EU AI act risk-based approach

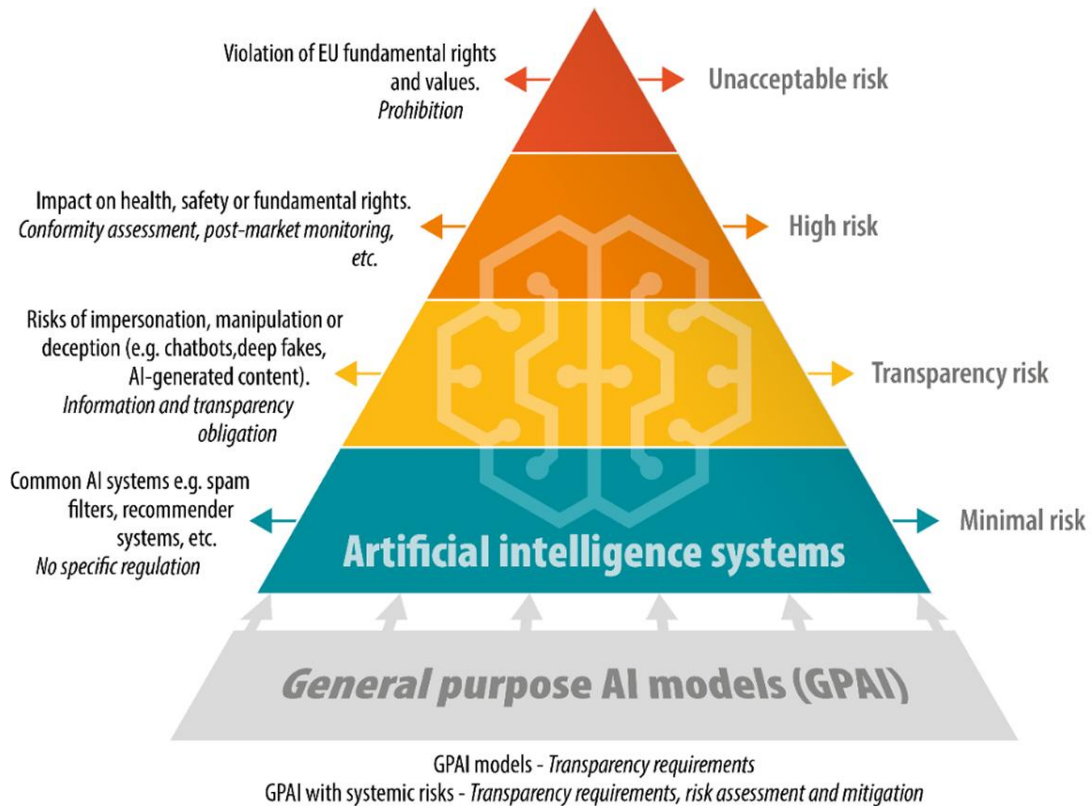


Figure 1: European Union Risk Based Approach to AI Regulation (EU Parliament, 2024)

Enforcement of the EU AI Act involves significant fines for non-compliant entities. “For instance, up to €35 million or 7 % of the total worldwide annual turnover of the preceding financial year (whichever is higher) for infringements on prohibited practices or non-compliance related to requirements on data.” (EU Parliament, 2024)

The EU’s AI Act is the most comprehensive regulatory framework enacted in the world, so is currently discussed as the primary model for AI regulation. While the reaction has been generally positive, based on the recognition that there are very significant potential problems with the use of AI and as an emerging technology, we don’t even know what the full scope of impacts may be, there are still a range of critiques of the EU’s current approach. (For example, see Pagallo, 2025) Updates to the regulatory regime should be anticipated as further learning and application of AI continues.

b) Canada

In Canada, a comprehensive regulatory framework for the development and use of AI has not yet been developed. However, some jurisdictions have developed a range of different AI policies and AI legislation is slowly being adopted.

i. Government of Canada:

The federal government has been developing legal and policy responses to the development and use of AI over the past five years. There has not yet been successful adoption of federal legislation. Bill C-27, the *Digital Charter Implementation Act, 2022*, which died on the order paper in January 2025, was the first attempt to pass comprehensive AI legislation. Similar legislation has not yet been reintroduced under the new federal government. Instead, the Government of Canada has been focused on developing a range of policy instruments focused on “Responsible use of artificial intelligence in government”.

This includes the:

- *Guiding Principles for the Use of AI in Government*,
- *Guide on the Use of Generative Artificial Intelligence*,
- *Treasury Board Directive on Automated Decision-Making*, and
- *AI Strategy for the Federal Public Service 2025-2027*.

This section discusses these five legal/policy approaches used by the Federal Government to regulate and guide the use of AI in Canada.

Guiding Principles for the Use of AI in Government

The Government of Canada has been working towards harmonized adoption of AI across Canada through the *Pan-Canadian Artificial Intelligence Strategy*. The AI Strategy focuses on three pillars: Commercialization, Standards, and Talent and Research. The pillar of most interest in the context of IA is Pillar 2: Standards. Current government commitments under this pillar involve working through the Standards Council of Canada to support efforts to advance the development and adoption of standards related to artificial intelligence (e.g., ISO/IEC 42005:2025 (2025)). (Government of Canada)

Guide on the Use of Generative Artificial Intelligence

In 2024, the Government of Canada updated their guide for employees of the federal public sector to facilitate the use of generative AI “responsibly and in line with the Values and Ethics Code for the Public Sector” (Canada, 2011). Generative AI produces material such as text and images based on what you ask (e.g., ChatGPT, Copilot, Gemini). The guide provides suggestions for how AI should and should not be used, provides tips for responsible AI use, and links some additional information about AI use by the Government of Canada. (Canada, 2024)

Treasury Board Directive on Automated Decision-Making

Adopted by the federal government in 2019 and updated in 2023 and 2025, the *Directive on Automated Decision-Making* is a mandatory policy which applies to most federal government institutions, with the notable exception of the Canada Revenue Agency (CRA). (Treasury Board of Canada, 2025) The Directive is linked to the *Treasury Board Policy on Service and Digital* and sets out requirements that must be met by federal institutions to ensure the responsible and ethical use of automated decision systems, including those using artificial intelligence (AI). This includes requirements for:

- Algorithmic impact assessment,
- Transparency (notice, reasons for decision),

- Quality assurance (testing and monitoring outcomes, data quality, peer review, gender-based analysis plus, security, ensuring human involvement),
- Recourse options for clients who want to challenge administrative decisions, and
- Reporting. (Treasury Board of Canada, 2025)

AI Strategy for the Federal Public Service 2025-2027 (2025)

In 2025, the Government of Canada adopted a new AI Strategy for the Federal Public Service to ensure that its AI adoption and use is: aligned with government values, ethics, and objectives; prioritizes uses that will meet the needs and benefit public servants; is developed efficiently and collaboratively; and is responsible safe and secure, mitigating harms to people and the environment. The strategy applies to all types of AI technologies with adaptive capabilities after initial training, and focuses on four priority areas, with an accompanying set of key actions:

- Central AI capacity: actions in this area include establishing an AI Centre of Expertise to support project teams, create common infrastructure, and developing a lighthouse project to serve as a test case.
- Policy, legislation and governance: this priority area focuses on the development of a common AI governance and risk management framework, aligning policy and legislation and addressing current regulatory gaps, and adopting a “think AI” approach (i.e., require departments to identify key business problems that could be transformed using AI, consider AI options before defaulting to traditional IT or HR approaches, and make planned investments in AI).
- Talent and training: priority actions in this area are focused on meeting AI talent needs through “training, upskilling, and recruitment”. They include the development of a training plan, benchmarking talent needs, and developing a talent plan.
- Engagement, transparency and value to Canadians: this priority area focuses on increasing public engagement and greater transparency about the government’s use of AI. Key actions include strengthening accountability and transparency requirements, developing metrics and performance indicators to demonstrate the impact and value of AI use, and a commitment to “early and meaningful public and stakeholder engagement on AI initiatives of significant public interest or concern”. (Canada, 2025)

The priorities and actions were chosen by government “because they are concrete, can be achieved or initiated within the AI Strategy’s two-year timeline, and have the greatest potential to advance responsible AI adoption within the public service.” The strategy will be reviewed regularly and will be renewed in 2027. (Canada, 2025)

Bill C-27, the Digital Charter Implementation Act, 2022

The Government of Canada introduced Bill C-27, *The Digital Charter Implementation Act*, in 2022.² Bill C-27 was the first attempt to pass comprehensive AI legislation and would have facilitated the adoption of three new statutes – the *Consumer Privacy Protection Act*, the *Personal Information and Data Protection Tribunal Act*, and the *Artificial Intelligence and Data Act* (AIDA). The AIDA identified regulatory requirements relating to the use of anonymized data

² First reading of the Bill occurred on June 16, 2022.

in AI systems, the design, development and use of AI systems generally, and the design, development and use of “high-impact” AI systems (although “high-impact” is not defined). Many of the details of this proposed regulatory framework were left to the development of future regulations. The responsible Minister of Innovation, Science and Industry was granted significant powers and responsibilities under the Act. Enforcement measures included substantial Administrative Monetary Penalties and prosecution for offences under the AIDA. (Scassa, 2023)

Overall, the AIDA seems to have been considered a weak approach to the regulation of IA, in particular due to the lack of details in the body of the Act, and the lack of definition for “high-impact”. There was also no public consultation on the contents of the AIDA, which perhaps contributed to a lack of public understanding and interest in the success of the new regulatory framework. Bill C-27 died on the order paper in January 2025. Similar AI legislation has not yet been reintroduced under the new federal government.

ii. Ontario:

In 2024, the government of Ontario adopted the *Strengthening Cyber Security and Building Trust in the Public Sector Act, 2024* (SO 2024, c 24) which “[r]ecognizes the importance of protecting the privacy of the people of Ontario and the value of enhancing Ontario’s privacy safeguards through increased transparency and independent oversight.” (Preamble)

Schedule 1 enacted a new law, the *Enhancing Digital Security and Trust Act, 2024*. Although this Act is considered to be the first “comprehensive” law in Canada that addresses the regulation of AI, there are few details in the body of the Act in terms of how this will actually be accomplished. Most of the requirements will be developed later through a range of different regulation making powers assigned to the Minister and Lieutenant Governor in Council.

The Act does not define “artificial intelligence” but the Act defines “artificial intelligence system” as “a machine-based system that, for explicit or implicit objectives, infers from the input it receives in order to generate outputs such as predictions, content, recommendations or decisions that can influence physical or virtual environments,” and “other systems” identified by government.(s 1(1)) The regulatory requirements in the Act focus on the use of artificial intelligence systems by public sector entities – systems that are “publicly available, developed or procured by the public sector entity, or developed by a third part on behalf of the public sector entity.” (s 1(2)) The Act contains requirements for disclosing the use of AI, ensuring there is human oversight, and transparency measures (e.g., reporting).

iii. Other Canadian Jurisdictions:

No other jurisdiction in Canada has adopted comprehensive AI policy or law, in a general context or otherwise. However, AI is mentioned in a growing range of different provincial and territorial statutes.

- In Nova Scotia, regulation making power was recently granted under An Act Respecting Agriculture, Energy and Natural Resources (SNS 2025, c 4) to allow for the development

of “standards for the use of artificial intelligence and other technology in the practice of agrology” (s 46(1)(d)).

- In British Columbia (BC Reg 196/23), Northwest Territories (NWT Reg 115-2014), and the Yukon (YOIC 2012/94), “artificial intelligence” is included as part of the definition of “drone” under conservation and wildlife regulations.
- In Ontario (SO 2024, c 3) and Quebec (CQLR c I-0.2.1, r 8), the use of AI has been addressed in employment standards and immigration regulatory frameworks to require disclosure of AI use during the hiring process (e.g., job postings, screening) and facilitate immigration of workers in the AI and information technology sector.

Resources:

Abdelnapi, N. MM, et al., Artificial Intelligence in Finance Sector for Risk Prediction, in Hassanien, Aboul Ella, et al. *Artificial Intelligence for Environmental Sustainability and Green Initiatives*. 1st ed. 2024., Springer Nature Switzerland, 2024, <https://doi.org/10.1007/978-3-031-63451-2>.

Abdo, A.S., Darwish, A. and Hassanein, A.E., in Hassanien, Aboul Ella, et al. *Artificial Intelligence for Environmental Sustainability and Green Initiatives*. 1st ed. 2024., Springer Nature Switzerland, 2024, <https://doi.org/10.1007/978-3-031-63451-2>.

Akhtar, Marya and Rikke Frank Jorgensen, Chapter 4: A rights-based approach to automated decision-making in the public sector, in Balcerzak, Michał, et al. *Artificial Intelligence and International Human Rights Law: Developing Standards for a Changing World*. First edition., Edward Elgar Publishing Limited, 2024.

Anifowose, Babatunde, and Fatai Anifowose. "Artificial Intelligence and Machine Learning in Environmental Impact Prediction for Soil Pollution Management – Case for EIA Process." *Environmental Advances*, vol. 17, 2024, pp. 100554-, <https://doi.org/10.1016/j.envadv.2024.100554>.

Balcerzak, Michał and Julia Kapelanska-Pregowska, Introduction: AI and international human rights law, in Balcerzak, Michał, et al. *Artificial Intelligence and International Human Rights Law: Developing Standards for a Changing World*. First edition., Edward Elgar Publishing Limited, 2024.

Balcerzak, M., Chapter 1: Implications of the United Nations human rights standards for the development of artificial intelligence, in Balcerzak, Michał, et al. *Artificial Intelligence and International Human Rights Law: Developing Standards for a Changing World*. First edition., Edward Elgar Publishing Limited, 2024.

Bankey, Ruth, More Than "Responsible AI" Bridging Artificial Intelligence Systems (AIS) and AI Systems Ethics into Practice, 2024 21-2 Canadian Journal of Law and Technology 137, 2024 CanLIIDocs 3190, <<https://canlii.ca/t/7nl8v>>, retrieved on 2025-06-20

Barrett, A.M., D. Hendrycks, J. Newman, and B. Nonnecke, "Actionable guidance for high consequence AI risk management: Towards standards addressing AI catastrophic risks," 2022, arXiv:2206.08966.

Bertaina, Samuele, et al. "Fundamental Rights and Artificial Intelligence Impact Assessment: A New Quantitative Methodology in the Upcoming Era of AI Act." *Computer Law & Security Review*, vol. 56, 2025, pp. 106101-, <https://doi.org/10.1016/j.clsr.2024.106101>.

Bhattocharjee, Ritwik, "Indigenous data stewardship stands against extractivist AI" (UBC, 2024), online: <<https://www.arts.ubc.ca/news/indigenous-data-stewardship-stands-against-extractivist-ai/>>

Bogucka, Edyta, et al. "AI Design: A Responsible Artificial Intelligence Framework for Prefilling Impact Assessment Reports." *IEEE Internet Computing*, vol. 28, no. 5, 2024, pp. 37–45, <https://doi.org/10.1109/MIC.2024.3451351>.

Bond, A., Cilliers, D., Retief, F., Alberts, R., Roos, C., & Moolman, J. (2024). Using an Artificial intelligence chatbot to critically review the scientific literature on the use of Artificial intelligence in Environmental Impact Assessment. *Impact Assessment and Project Appraisal*, 42(2), 189-199. doi:10.1080/14615517.2024.2320591

Bongseok Jeong, et al. "Machine Learning-Based Prediction of Harmful Algal Blooms in Water Supply Reservoirs." *Water Quality Research Journal*, vol. 57, no. 4, 2022, pp. 304–18, <https://doi.org/10.2166/wqrj.2022.019>.

Bourgeois-Doyle, Dick (2019) "Two-Eyed AI", (Canadian Commission for UNESCO IdeaLab).

British Columbia, *Ecological Reserve Regulation*, BC Reg 196/2023.

Canada, Bill C-27: An Act to enact the Consumer Privacy Protection Act, the Personal Information and Data Protection Tribunal Act and the Artificial Intelligence and Data Act and to make consequential and related amendments to other Acts (Digital Charter Implementation Act, 2022), [2nd reading (2023) in HOC] 4th Parliament, 1st session, Monday, November 22, 2021, to Monday, January 6, 2025, <https://www.parl.ca/LegisInfo/en/bill/44-1/c-27>. [Bill C-27]

Costa, Victor, et al. "Artificial Intelligence for Impact Assessment of Administrative Burdens." *Emerging Science Journal*, vol. 8, no. 1, 2024, pp. 270–82, <https://doi.org/10.28991/ESJ-2024-08-01-019>.

Cox, Emly, Sarah Royston, and Jan Selby, 'The Impacts of Non- Energy Policies on the Energy System: A Scoping Paper' (2016) 100 *UK Energy Research Centre* 1.

Curmally, Atiyah, Sandwidi, B.W., Jagtiani, A., Chapter 9: Artificial intelligence solutions for environmental and social impact assessments, in Fonseca, Alberto, and publisher Edward Elgar Publishing. *Handbook of Environmental Impact Assessment*. Edited by Alberto Fonseca, Edward Elgar Publishing Limited, 2022.

Da Silva, Michael, Matthew Herder and Colleen M Flood, Regulation of Health-Related Artificial Intelligence in Medical Devices: The Canadian Story, 2022 55-3 *UBC Law Review* 635, 2022 *CanLII Docs* 4342, <<https://canlii.ca/t/7n1sq>>, retrieved on 2025-06-20.

Daly, Paul, Artificial Intelligence and Administrative Tribunals, For Groves and Ng eds., *Automation in Public Governance: Theory, Practice and Problems* (Hart, Oxford, 2025 (forthcoming)).

Demirel, Yaşar, and Marc A. Rosen. Chapter 8: Artificial Intelligence, in *Sustainable Engineering: Process Intensification, Energy Analysis, and Artificial Intelligence*. CRC Press, 2023.

Dhar, Payal, 'The Carbon Impact of Artificial Intelligence' (2020) 2(8) *Nature Machine Intelligence*, 423.

European Parliament, (2024), *Briefing: EU Legislation in Progress: Artificial intelligence act*, online, [https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698792/EPRS_BRI\(2021\)698792_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698792/EPRS_BRI(2021)698792_EN.pdf)

European Union, *The EU Artificial Intelligence Act* (2024), online: <<https://artificialintelligenceact.eu/>>

Feng, Yanchao, et al. "Reducing Carbon Emission at the Corporate Level: Does Artificial Intelligence Matter?" *Environmental Impact Assessment Review*, vol. 114, 2025, pp. 107911-, <https://doi.org/10.1016/j.eiar.2025.107911>.

Fonseca, Alberto, Chapter 7: The benefits and perils of digital and automated technologies: impact assessment methods in the fourth industrial revolution, in Fonseca, Alberto, and publisher Edward Elgar Publishing. *Handbook of Environmental Impact Assessment*. Edited by Alberto Fonseca, Edward Elgar Publishing Limited, 2022.

Forrest, Katherine B., "The Ethics and Challenges of Legal Personhood for AI" (April 22, 2024) *The Yale Law Journal Forum*.

Gaon, Aviv and Ian Stedman, A Call to Action: Moving Forward with the Governance of Artificial Intelligence in Canada, 2019 56-4 *Alberta Law Review* 1137, 2019 *CanLII Docs* 2093, <<https://canlii.ca/t/skqg>>, retrieved on 2025-06-20

Global Partnership on Artificial Intelligence, (n.d.), online: <https://gpai.ai/>

Government of Canada, (n.d.) "Responsible Use of AI" online: <<https://www.canada.ca/en/government/system/digital-government/digital-government-innovations/responsible-use-ai.html> >

Government of Canada, (n.d.) Progress on AI in government, online: <https://www.canada.ca/en/government/system/digital-government/digital-government-innovations/responsible-use-ai/progress.html>

Government of Canada, "Pan-Canadian Artificial Intelligence Strategy" <https://ised-isde.canada.ca/site/ai-strategy/en> (last updated 2024)

Government of Canada, "Values and Ethics Code for the Public Sector" (2011), online: <https://www.tbs-sct.canada.ca/pol/doc-eng.aspx?id=25049> [Canada, 2011]

Government of Canada, "Generative AI in your daily work" (updated 2024), online: <https://www.canada.ca/en/government/system/digital-government/digital-government-innovations/responsible-use-ai/generative-ai-your-daily-work.html> [Canada, 2024]

Government of Canada, AI Strategy for the Federal Public Service 2025-2027, online: <<https://www.canada.ca/en/government/system/digital-government/digital-government-innovations/responsible-use-ai/gc-ai-strategy-overview.html>> [Canada, 2025]

Hadzovic, Suada, et al. "It's Time for Artificial Intelligence Governance." *Internet of Things (Amsterdam. Online)*, vol. 27, 2024, pp. 101292-, <https://doi.org/10.1016/j.iot.2024.101292>.

Hao, Karen, 'AI Researchers Need to Stop Hiding the Climate Toll of Their Work' (*MIT Technology Review*, 2021).

Hassanien, Aboul Ella, et al. *Artificial Intelligence for Environmental Sustainability and Green Initiatives*. 1st ed. 2024., Springer Nature Switzerland, 2024, <https://doi.org/10.1007/978-3-031-63451-2>.

Havrda, M. and B. Rakova, "Enhanced well-being assessment as basis for the practical implementation of ethical and rights-based normative principles for AI," in *Proc. IEEE Int. Conf. Syst., Man, Cybern.*, Piscataway, NJ, USA: IEEE Press, 2020, pp. 2754–2761.

International Association of Impact Assessment (2025) *Principles for the use of AI in IA*, online: https://www.iaia.org/uploads/pdf/SP16_AI%20in%20IA.pdf [IAIA, 2025]

Kaack, Lynn H., et al. "Aligning Artificial Intelligence with Climate Change Mitigation." *Nature Climate Change*, vol. 12, no. 6, 2022, pp. 518–27, <https://doi.org/10.1038/s41558-022-01377-7>.

Khan, Mehreen, et al. "ChatGPT and the Future of Impact Assessment." *Environmental Science & Policy*, vol. 157, 2024, pp. 103779-, <https://doi.org/10.1016/j.envsci.2024.103779>.

Kim, Dongwoo, Artificial Intelligence Governance through Communicative Action: A Habermasian Perspective, 2024 82-1 *University of Toronto Faculty of Law Review* 103, 2024 CanLIIDocs 949, <<https://canlii.ca/t/7ncc5>>, retrieved on 2025-06-20

Lacoste, Alexandre, et. al., 'Quantifying the Carbon Emissions of Machine Learning' (2019) arXiv.

Laukyte, Migle, Chapter 19: Artificial Intelligence and Data Analytics: A Recipe for Human Rights Violations, in Quintavalla, Alberto, and Jeroen Temperman, editors. *Artificial Intelligence and Human Rights*. First edition., Oxford University Press, 2023, <https://doi.org/10.1093/law/9780192882486.001.00>.

Lawal, A.M., et al. "Evaluation of Stakeholder Perceptions and Applicability of Artificial Intelligence Integration into Environmental Impact Assessment Processes in Nigeria." *Journal of Applied Sciences and Environmental Management*, vol. 28, no. 10, 2024.

Leal, Alonso, et al. "Enhancing Environmental Governance: A Text-Based Artificial Intelligence Approach for Project Evaluation Involvement." *Environmental Impact Assessment Review*, vol. 110, 2025, pp. 107707-, <https://doi.org/10.1016/j.eiar.2024.107707>.

Liao, Mochen, et al. "Sustainability Implications of Artificial Intelligence in the Chemical Industry: A Conceptual Framework." *Journal of Industrial Ecology*, vol. 26, no. 1, 2022, pp. 164–82, <https://doi.org/10.1111/jiec.13214>.

Louime, Clifford Jaylen, and Tariq Asleem Raza. "Development of Artificial Intelligence/Machine Learning (AI/ML) Models for Methane Emissions Forecasting in Seaweed." *Methane*, vol. 3, no. 3, 2024, pp. 485–99, <https://doi.org/10.3390/methane3030028>.

Milczarek, Ewa, Chapter 9: The evolution of copyright in the age of artificial intelligence: challenges and perspectives, in Balcerzak, Michał, et al. *Artificial Intelligence and International Human Rights Law: Developing Standards for a Changing World*. First edition., Edward Elgar Publishing Limited, 2024.

Mondal, Sabyasachi, et al. "Utilizing Machine Learning for Air Pollution Prediction, Comprehensive Impact Assessment, and Effective Solutions in Kolkata, India." *Results in Earth Sciences*, vol. 2, 2024, pp. 100030-, <https://doi.org/10.1016/j.rines.2024.100030>.

Morawska, E.H., Chapter 2: Council of Europe standards and activities related to AI: towards a Framework Convention on AI and human rights?, in Balcerzak, Michał, et al. *Artificial Intelligence and International Human Rights Law: Developing Standards for a Changing World*. First edition., Edward Elgar Publishing Limited, 2024.

Northwest Territories, *Wildlife General Regulations*, NWT Reg 115-2014

Ontario, *Strengthening Cyber Security and Building Trust in the Public Sector Act, 2024*, SO 2024, c 24, <<https://www.canlii.org/en/on/laws/astat/so-2024-c-24/latest/so-2024-c-24.html>>

Ontario, *Working for Workers Four Act, 2024*, SO 2024, c 3 (amends: *Employment Standards Act, 2000*, SO 2000, c 41)

Pagallo, Ugo. "On Twelve Shades of Green: Assessing the Levels of Environmental Protection in the Artificial Intelligence Act." *Minds and Machines (Dordrecht)*, vol. 35, no. 1, 2025, <https://doi.org/10.1007/s11023-025-09713-4>.

Perrin, Benjamin, *Artificial Intelligence & Criminal Justice: A Primer*, Canadian Legal Information Institute, 2024 CanLIIDocs 2727, <<https://canlii.ca/t/7nhrw>>, retrieved on 2025-06-20.

Quebec, *Permanent immigration pilot program for workers in the artificial intelligence, information technologies and visual effects sectors*, 2021, CQLR c I-0.2.1, r 8.

Quintavalla, Alberto, Chapter 28: Artificial Intelligence and the Right to a Healthy Environment, in Quintavalla, Alberto, and Jeroen Temperman, editors. *Artificial Intelligence and Human Rights*. First edition., Oxford University Press, 2023, <https://doi.org/10.1093/law/9780192882486.001.00>.

Raab, Charles D. "Information Privacy, Impact Assessment, and the Place of Ethics." *Computer Law & Security Review*, vol. 37, 2020, pp. 105404-, <https://doi.org/10.1016/j.clsr.2020.105404>.

Rangone, Nicoletta. "Artificial intelligence challenging core State functions." *Revista de derecho público: teoría y método*, vol. 8, 2023, https://doi.org/10.37417/RDP/vol_8_2023_1949

Rezaei, Taha, and Akbar Javadi. "Environmental Impact Assessment of Ocean Energy Converters Using Quantum Machine Learning." *Journal of Environmental Management*, vol. 362, 2024, pp. 121275–121275, <https://doi.org/10.1016/j.jenvman.2024.121275>.

Roberts, Jennafer Shae, and Laura N. Montoya, "In Consideration of Indigenous Data Sovereignty: Data Mining as a Colonial Practice" 180-196 in Kohei Arai (ed.), *Proceedings of the Future Technologies Conference (FTC) 2023, Vol 2*.

Sampurno, Joko, et al. "Flood Impact Assessment in Remote Areas Using Machine Learning, SAR, and GIS: A Case Study of Ngabang District, Indonesia." *Journal of Hydroinformatics*, vol. 26, no. 11, 2024, pp. 2928–38, <https://doi.org/10.2166/hydro.2024.324>.

Sayed, G.I. and Hassanién, A.E., Machine Learning-Based Forecasting of Electricity Demand for Sustainable Electricity Planning, in Hassanién, Aboul Ella, et al. *Artificial Intelligence for Environmental Sustainability and Green Initiatives*. 1st ed. 2024., Springer Nature Switzerland, 2024, <https://doi.org/10.1007/978-3-031-63451-2>.

Scassa, Teresa, *Regulating AI In Canada : A Critical Look at the Proposed Artificial Intelligence and Data Act, 2023 101-1 Canadian Bar Review 1*, 2023 CanLIIDocs 1143, <<https://canlii.ca/t/7n4ch>>, retrieved on 2025-06-20

Sellappan Palaniappan, et al. "Machine Learning Model for Predicting Net Environmental Effects." *Journal of Informatics and Web Engineering*, vol. 4, no. 1, 2025, pp. 243–53, <https://doi.org/10.33093/jiwe.2025.4.1.18>.

Schwartz, Roy, et. al., 'Green AI' (2020) 63(12) *Communications of the ACM* 54.

Stahl, B. C., Antoniou, J., Bhalla, N., Brooks, L., Jansen, P., Lindqvist, B., ... & Wright, D. (2023). A systematic review of artificial intelligence impact assessments. *Artificial Intelligence Review*, 56(11), 12799-12831.

Staszczuk, Piotr, Chapter 3: Navigating the AI landscape in the EU: fostering innovation while upholding ethical principles, in Balcerzak, Michał, et al. *Artificial Intelligence and International Human Rights Law: Developing Standards for a Changing World*. First edition., Edward Elgar Publishing Limited, 2024.

Suprijanto, Agus, et al. "Industrial Heat Island and Carbon Emissions: Machine Learning-Based Environmental Impact Assessment in Cilegon, Indonesia." *Environmental Challenges (Amsterdam, Netherlands)*, vol. 19, 2025, pp. 101141-, <https://doi.org/10.1016/j.envc.2025.101141>.

Tomeo, M. et al, "A Quantitative Study on the Negative and Positive Impacts of Using Artificial Intelligence (AI) in the Information Technology Field." *Issues in Information Systems*, vol. 25, no. 1, 2024, pp. 341–51, https://doi.org/10.48009/1_iis_2024_128.

Treasury Board of Canada, "Directive on Automated Decision-Making" (Updated in 2025), online: <https://www.tbs-sct.canada.ca/pol/doc-eng.aspx?id=32592> [Treasury Board of Canada, 2025]

Ullah, Sajid, et al. "Impact Assessment of Planned and Unplanned Urbanization on Land Surface Temperature in Afghanistan Using Machine Learning Algorithms: A Path toward Sustainability." *Scientific Reports*, vol. 15, no. 1, 2025, pp. 3092–18, <https://doi.org/10.1038/s41598-025-87234-x>.

von Borries, Kerstin, et al. "Potential for Machine Learning to Address Data Gaps in Human Toxicity and Ecotoxicity Characterization." *Environmental Science & Technology*, vol. 57, no. 46, 2023, pp. 18259–70, <https://doi.org/10.1021/acs.est.3c05300>.

Wagenaar, Dennis, et al. "Invited Perspectives: How Machine Learning Will Change Flood Risk and Impact Assessment." *Natural Hazards and Earth System Sciences*, vol. 20, no. 4, 2020, pp. 1149–61, <https://doi.org/10.5194/nhess-20-1149-2020>.

Wang, Peng and Guannan Qu, Chapter 17: AI in court: the promotion and regulation of information technology in China's Smart Court movements, in Balcerzak, Michał, et al. *Artificial Intelligence and International Human Rights Law: Developing Standards for a Changing World*. First edition., Edward Elgar Publishing Limited, 2024.

World Wildlife Federation, "Inshore fisheries: Building Indigenous Knowledge and Artificial Intelligence to Enable Adaptation" (2023) online: <<https://www.arcticwwf.org/the-circle/stories/blending-indigenous-knowledge-and-artificial-intelligence-to-enable-adaptation/>>

Xiang, Xiaojun, et al. "Urban Water Resource Management for Sustainable Environment Planning Using Artificial Intelligence Techniques." *Environmental Impact Assessment Review*, vol. 86, 2021, pp. 106515-, <https://doi.org/10.1016/j.eiar.2020.106515>.

Yu, Kan Hua, et al. "Environmental Planning Based on Reduce, Reuse, Recycle and Recover Using Artificial Intelligence." *Environmental Impact Assessment Review*, vol. 86, 2021, pp. 106492-, <https://doi.org/10.1016/j.eiar.2020.106492>.

Yukon, *Wildlife Regulation*, YOIC 2012/84

Zhang, Xiaheng, et al. "Research on Deep Integration of Application of Artificial Intelligence in Environmental Monitoring System and Real Economy." *Environmental Impact Assessment Review*, vol. 86, 2021, <https://doi.org/10.1016/j.ejar.2020.106499>.

Zhang, Junqi, et al. "Impact Assessment of Coupling Mode of Hydrological Model and Machine Learning Model on Runoff Simulation: A Case of Washington." *Atmosphere*, vol. 15, no. 12, 2024, pp. 1461-, <https://doi.org/10.3390/atmos15121461>.

Zhao, Zeming, et al. "Machine Learning-Based Surrogate Models for Fast Impact Assessment of a New Building on Urban Local Microclimate at Design Stage." *Building and Environment*, vol. 266, 2024, pp. 112142-, <https://doi.org/10.1016/j.buildenv.2024.112142>.

Zhou, Peng, et al. "Towards Standardizing Automated Image Analysis with Artificial Intelligence for Biodiversity." *Frontiers in Marine Science*, vol. 11, 2024, <https://doi.org/10.3389/fmars.2024.1349705>.

Zhou, Yuanyuan, et al. "Gap Infilling of Daily Streamflow Data Using a Machine Learning Algorithm (MissForest) for Impact Assessment of Human Activities." *Journal of Hydrology (Amsterdam)*, vol. 627, 2023, pp. 130404-, <https://doi.org/10.1016/j.jhydrol.2023.130404>.