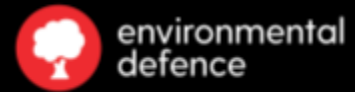


AI and Data Centres

Environmental and Climate Considerations

Media Backgrounder
August 2025



Context

Artificial Intelligence (AI) is emerging as a new force shaping global economies. It is being utilized across the world in all sectors, with companies and governments hoping to secure a competitive edge in this emerging technological race.

At its most basic level, AI involves training an algorithm with a dataset so that the algorithm can learn to perform new tasks and grow. The most common type of AI algorithm is a 'supervised learning' model, which uses clearly labeled data to predict outcomes. Unsupervised learning algorithms are trained using unlabeled data, and they create models and evaluate the relationships between data points. AI algorithms require an extensive amount of computational power to undergo training and are undertaken in dedicated data centres.

According to IBM,

*"A data center is a physical room, building or facility that houses IT infrastructure for building, running and delivering applications and services. It also stores and manages the data associated with those applications and services."*¹

Data centers house rows and rows of servers, which is a computer program or device that provides a service to another computer program and its users. Computers connect to servers via the Internet, and everything accessed via the internet is stored on a server in a data centre. Video and image based applications have historically been the largest driver of data center computational usage, until the boom of AI.

Different types and sizes of data centres each perform different functions. The largest 'hyperscale' data centres are run by major tech companies such as Amazon Web Services, Google Cloud Platform, IBM Cloud and Microsoft Azure. These hyperscale centers are millions of square feet with thousands of individual servers.

Data Centre Map counts 283 data centres in Canada, though this figure varies depending on the source.² The same source has over 10,000 centers listed worldwide, and 3955 in the US. Although Canada ranks sixth in the world by number of data centers, this

¹IBM. (2025). *Infrastructure*. <https://www.ibm.com/topics/infrastructure>

²Data Center Map. (n.d.). *Canada data centers*. <https://www.datacentermap.com/canada/>

represents a modest installed capacity.³ In 2024, all North American countries (excluding the USA) accounted for just 1.03% of installed data center capacity, a share expected to decline to 0.9% by 2030.⁴

Environmental Impacts

Along with the growing demand for AI and data centre services, there is also an increased awareness of the significant environmental footprint of these operations. Large technology companies have always had a significant environmental impact, but only with the recent proliferation in publicly available large language models have these environmental impacts made headlines.

Many headlines make broad claims about the water or energy use of a single ChatGPT prompt, but this generalisation is not reflective of an underlying reality. There is yet to be a comprehensive study on the life cycle environmental impacts of AI⁵, and such impacts vary greatly based on many factors.

Data centre footprints are determined by software (model efficiency, data collection, training models), operational policy (when certain services take place), hardware (computer chips, cooling resources, waste management) and electricity supply.

Electricity Demand

Electricity consumption from data centres was estimated to be around 1.5% of total global consumption in 2024.⁶ This represents electricity demand from all data centres services, including AI, cloud computing, web hosting, video streaming, data storage and all internet-based activities. The electricity consumption of large data centres is set to change extensively over the coming decade. Under the International Energy Agency 'Base Case' scenario, data centre energy consumption will reach just under 3% of total global consumption in 2030.⁷

³Data Center Map. (n.d.). *Data centers*. <https://www.datacentermap.com/datacenters/>

⁴International Energy Agency. (2025). *Energy and AI* (p. 259). <https://iea.blob.core.windows.net/assets/601eaec9-ba91-4623-819b-4ded331ec9e8/EnergyandAI.pdf>

⁵ United Nations Environment Programme. (2024). *Environmental impacts of artificial intelligence*. <https://wedocs.unep.org/handle/20.500.11822/46288>

⁶International Energy Agency. (2025). *Energy and AI*. <https://iea.blob.core.windows.net/assets/601eaec9-ba91-4623-819b-4ded331ec9e8/EnergyandAI.pdf>

⁷ International Energy Agency. (2025). *Energy and AI*. <https://iea.blob.core.windows.net/assets/601eaec9-ba91-4623-819b-4ded331ec9e8/EnergyandAI.pdf>

Despite data centres being a globally significant driver in electricity consumption, their impacts vary extensively by region. Combined, the US, Europe and China account for 85% of global electricity consumption from data centres.⁸

Despite Canada providing a globally small share of data centre services globally, provincial regulators are predicting significant increases in data centre driven electricity consumption in Canada. The Independent Electricity System Operator (IESO) estimates that data centers will represent 13% of new electricity demand and 4% of total demand in Ontario in 2035.⁹ Hydro Québec anticipates an increase of 4.1 TWh in data centre electricity demand between 2023-2032 (equivalent to 2.3% of Quebec's total electricity demand in 2032).¹⁰

The International Energy Agency (IEA) estimates that renewable sources are the fastest growing source of electricity for data centers, increasing annually by 22% between 2023 and 2040.¹¹ To date, tech companies utilizing data centers and AI are some of the most active purchasers of clean electricity in the world.¹² Three of the top five corporate purchasers of wind and solar power purchase agreements (PPAs) globally are Google, Meta and Amazon.¹³ These PPAs allow tech companies to adhere to their climate plans while expanding operations. However, PPAs typically function on an annual volume basis, as opposed to meeting actual hour-by-hour energy consumption. Due to their potential for rapid deployment, fossil fuels often meet the actual energy demands of data centres.

Near term demand is expected to be met by fossil fuel resources, particularly coal and natural gas. Scientific and legal opinions are unanimous in the ongoing role of fossil fuels in global energy systems:

"Failure of a State to take appropriate action to protect the climate system from greenhouse gas emissions — including through fossil fuel production, fossil fuel consumption, the granting of fossil fuel exploration licences or the

⁸International Energy Agency. (2025). *Energy and AI*.

<https://iea.blob.core.windows.net/assets/601eaec9-ba91-4623-819b-4ded331ec9e8/EnergyandAI.pdf>

⁹Independent Electricity System Operator. (2024, October). *Electricity demand in Ontario to grow by 75 per cent by 2050* [News release].

<https://www.ieso.ca/Corporate-IESO/Media/News-Releases/2024/10/Electricity-Demand-in-Ontario-to-Grow-by-75-per-cent-by-2050>

¹⁰Hydro Québec. (2022). *Growth in electricity demand expected to continue in Quebec* [News release].

<https://news.hydroquebec.com/news/press-releases/all-quebec/growth-in-electricity-demand-expected-to-continue-in-quebec.html>

¹¹International Energy Agency. (2025). *Energy and AI* (p. 87).

¹²International Energy Agency. (2024). *World energy outlook 2024*.

<https://www.iea.org/reports/world-energy-outlook-2024>

¹³BloombergNEF. (2024). *Amazon is top green energy buyer in a market dominated by US*.

<https://about.bnef.com/blog/amazon-is-top-green-energy-buyer-in-a-market-dominated-by-us/>

provision of fossil fuel subsidies — may constitute an internationally wrongful act which is attributable to that State.” - International Court of Justice, Obligations of States in respect of Climate Change, July 23, 2025¹⁴

If the federal government were to support the expansion of AI and data centre infrastructure in Canada, it would have to do so without supporting the proliferation of fossil fuels as a power source. The government could support this by setting binding power usage efficiency (PUE) targets. There is a suite of operational techniques companies can use to improve energy efficiency, including the temporal and spatial management of workloads across different times of the day and parts of a country.¹⁵

Oil and gas companies have cited AI-driven rising electricity demand as a rationale for expanding fossil fuel operations, but this justification is counterproductive [cite.] Increased electricity demand is a technical and policy challenge which governments are already meeting. Investments in renewables, energy storage and smart grids will help to meet growing data center electricity demand, without contributing to fossil-fuel lock-in.

While predominantly under provincial jurisdiction, connecting data centres to the grid is an increasingly complex issue. In particular, the changing energy efficiency of a data centre can have significant impacts on public ratepayers. When a facility first connects to the grid, it likely has significant energy demands, but this may fall over time with increased efficiency improvements. If this happens before the connection costs have been recouped, ratepayers may be required to make up the difference.¹⁶ Federal and provincial governments should work together to ensure that public ratepayers are not negatively impacted by data centre grid connections.

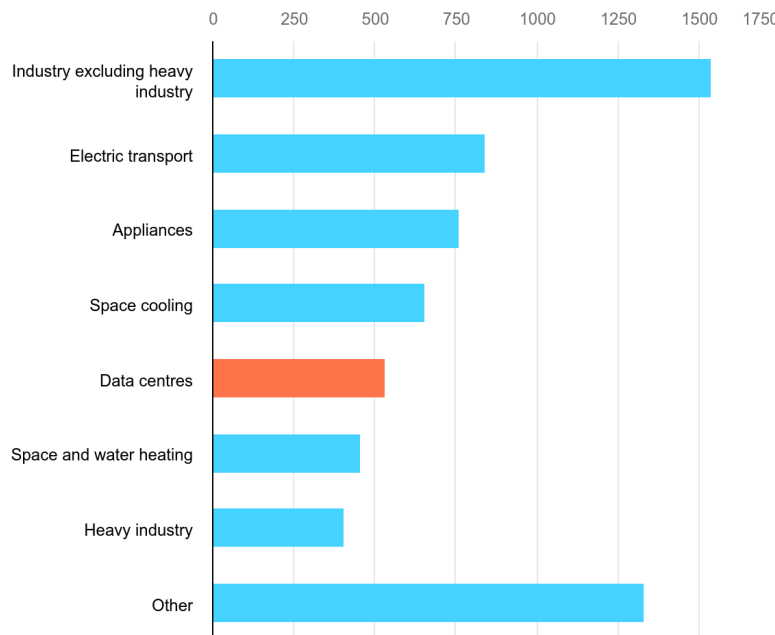
The federal government must also balance the energy demands of data centres with those of other technologies necessary for the energy transition and climate adaptation. Though data centres accounted for a 250Twh increase in electricity use between 2014-2024, heavy industry, electric transport and space cooling were all greater contributors to electricity demand increase globally.

¹⁴International Court of Justice. (2025, July 23). *Obligations of states in respect of climate change* [Advisory opinion]. <https://www.icj-cij.org/case/187>

¹⁵ International Energy Agency. (2025). *Energy and AI*.

¹⁶Energy Regulation Quarterly. (2025). *Connecting data centres in Ontario: Key considerations and challenges*. <https://energyregulationquarterly.ca/articles/connecting-data-centres-in-ontario-key-considerations-and-challenges>

Figure 1: Global Increase in electricity demand by sector, Base Case, 2024-2030



IEA (2025), *Increase in electricity demand by sector, Base Case, 2024-2030*, IEA, Paris <https://www.iea.org/data-and-statistics/charts/increase-in-electricity-demand-by-sector-base-case-2024-2030>, Licence: CC BY 4.0

Water Demand

Total data centre water footprint is the sum of on-site water usage, water use by facilities supplying electricity and water consumption during manufacturing of chips.¹⁷ Onsite water consumption is a product of the water withdrawn by a data centre, minus the water discharged by centres after use. Water is most often consumed through evaporation in evaporative cooling systems.

Water is primarily used on-site for cooling, which occurs both at an individual server and building level. There are alternative ways of cooling data centers that reduce water use, but oftentimes this involves a trade-off between carbon emissions and water use. For instance, air-cooled chillers use little water, but consume more energy and typically have a higher carbon footprint.¹⁸

¹⁷Environmental and Energy Study Institute. (2025). *Data centers and water consumption*. <https://www.eesi.org/articles/view/data-centers-and-water-consumption>

¹⁸Google. (2023). *Data center water risk framework whitepaper*. <https://www.gstatic.com/qumdrop/sustainability/2023-data-center-water-risk-framework-whitepaper.pdf>

In 2024, Google consumed approximately 8.1 billion gallons (31 billion liters) of water across its data centers and office¹⁹ Amazon Web Services has not disclosed its 2024 water consumption.²⁰ Microsoft did not clearly disclose its 2024 water consumption, though we can estimate it to be roughly 4.57 billion litres from available data.²¹ The IEA estimates that data centres consume approximately 560 billion litres of water per year, which could rise to 1.2 trillion litres per year in 2030.²²

The impact of datacentres on water supply should be most considered at a local level. Recent reporting by Bloomberg news found that two-thirds of new data centers built or in development since 2022 in the US are in areas of high water stress.²³ Data centres in these regions may be directly competing for potable water, as well as water used for agriculture.

The federal government should establish clear requirements for companies to disclose water consumption and water sources. Then, mandatory Water Usage Effectiveness (WUE) targets should be established, which measures cubic meters of water per megawatt hour of energy (m³/MWh). These measures are an important first step to understanding the impacts of water on a localised level.

Use case considerations

Misinformation

Over the last decade, misinformation has emerged as a major force impacting the extent to which general publics accept information, particularly from the government. For instance, during the Covid-19 pandemic, people who received misinformation about the vaccines were less likely to accept receiving it.²⁴

In a study run by NewsGuard in 2023, publicly available large language models were shown to generate and amplify misinformation at alarming rates. Chat-GPT (re)produced 100% of the false narratives that it was tested against.²⁵ At times, answers included

¹⁹Google. (2025). *Google 2025 environmental report*.

<https://www.gstatic.com/gumdrop/sustainability/google-2025-environmental-report.pdf>

²⁰Amazon. (2024). *2024 Amazon sustainability report: AWS summary*.

<https://sustainability.aboutamazon.com/2024-amazon-sustainability-report-aws-summary.pdf>

²¹Microsoft. (2025). *2025 Microsoft environmental sustainability report*.

<https://cdn-dynmedia-1.microsoft.com/is/content/microsoftcorp/microsoft/msc/documents/presentations/CSR/2025-Microsoft-Environmental-Sustainability-Report.pdf>

²²International Energy Agency. (2025). *Energy and AI* (p. 242).

²³Bloomberg. (2025). *AI impacts: Data centers water data*.

<https://www.bloomberg.com/graphics/2025-ai-impacts-data-centers-water-data/>

²⁴Loomba, S., de Figueiredo, A., Piatek, S. J., de Graaf, K., & Larson, H. J. (2021). Measuring the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and USA. *Nature Human Behaviour*, 5(3), 337–348. <https://doi.org/10.1038/s41562-021-01056-1>

²⁵NewsGuard. (2023, January). *Misinformation monitor*.

<https://www.newsguardtech.com/misinformation-monitor/jan-2023/>

disclaimers that the contained information was untrue, but at many times the bot produced misinformation with no qualifying disclaimers.

Generative AI can produce vast amounts of personalised content optimised for online algorithms. However, there is no real requirement for provided information to be correct or accurate.

AI in Oil and Gas Markets

One of the major industries in which AI is used is oil and gas extraction. To date, the oil and gas AI market is valued at over \$7 billion, but this is expected to rise to almost \$17 billion by 2030.²⁶ Machine learning is used to locate, extract and forecast the location of oil and gas.

44% of upstream oil and gas companies use AI in exploration, and 41% of downstream companies use AI in refining activities.²⁷ These numbers are expected to increase significantly in the coming three years, according to recent research by IBM. The research estimates that AI has increased output by 15%. The uptake of AI in the industry is also linked to labour market impacts; certain categories of oil and gas related jobs (e.g. equipment operators) are expected to decrease by 65% in 2040 due to automation from AI.²⁸

The rapid uptake of AI in the oil and gas sector is a problem from an environmental perspective as it strengthens the competitiveness of an industry that must be phased down and transitioned, if Canada is to meet its legally binding climate commitments. By making exploration and extraction cheaper and more efficient, AI may extend the viability of fossil fuel projects that would otherwise be unviable, locking in greenhouse gas emissions for decades to come. This runs counter to government responsibilities to prevent the proliferation of new fossil fuel projects.

AI in Climate Mitigation

There are many opportunities for AI to be used in climate mitigation efforts, particularly in the deployment of renewable energy, smart grids, emissions data availability and forecasting. New research shows that AI can help the energy transition in the following ways:

²⁶Research and Markets. (2024). *Artificial intelligence (AI) in oil and gas market research 2024-2029: Advanced solutions for drilling, extraction, and decision-making - focus on automation, safety, and predictive analytics*.

<https://www.researchandmarkets.com/reports/6014331/artificial-intelligence-ai-in-oil-gas-market>

²⁷IBM. (2025). *Oil and gas in the AI era* [Report].

<https://www.ibm.com/thought-leadership/institute-business-value/en-us/report/oil-and-gas-in-ai-era>

²⁸Ernst & Young. (2020). *Rethinking the oil and gas workforce in 2040*.

<https://www.ey.com/content/dam/ey-unified-site/ey-com/en-ca/insights/energy-resources/documents/ey-rethinking-the-oil-and-gas-workforce-in-2040.pdf>

- i) transforming complex systems
- ii) innovation technology discovery and resource efficiency
- iii) nudging behavioural changes
- iv) modelling climate systems and policy interventions
- v) managing adaptation and resilience.

This research found that an efficient integration of AI into the power, food and mobility sectors could result in a 3.2-5.4GtCO₂e annual emissions reduction by 2035.²⁹ AI has been used to optimise the integration of renewables energy into the grid by better forecasting supply and demand. In 2019, Google developed a custom AI tool to better predict wind power output and it was able to boost the economic value of wind energy by 20%.³⁰ AI can be used to optimize HVAC systems and reduce energy consumption. A study last year on the use of AI-optimised HVAC systems in commercial buildings found that AI could reduce energy consumption and carbon emissions by between 8-19% in 2050.³¹ Combined with low-carbon power generation, this could reduce energy consumption by 40%.

Policy Recommendations

Given the Government's commitments to expanding the country's AI capacity, it is important to create the enabling policy environment to ensure Canada is a leader in responsible and environmentally sustainable AI.

1. Establish mandatory efficiency and sustainability standards for data centers

- Require all new and existing data centers in Canada to meet binding Power Usage Effectiveness (PUE), Carbon Usage Effectiveness (CUE) and Water Usage Effectiveness (WUE) standards.

2. Mandate 100% renewable energy for new data center developments

- Ensure that all newly constructed data centers source electricity from verified renewable energy sources, either through 'bring-your-own-power'

²⁹Kaack, L. H., Donti, P. L., Strubell, E., Kamiya, G., Creutzig, F., & Rolnick, D. (2022). Aligning artificial intelligence with climate change mitigation. *Nature Climate Change*, 12(6), 518–527. <https://doi.org/10.1038/s44168-025-00252-3>

³⁰Google DeepMind. (2019). *Machine learning can boost the value of wind energy*. <https://deepmind.google/discover/blog/machine-learning-can-boost-the-value-of-wind-energy/>

³¹Chen, B., Padmanabhan, S., Elsworth, J., Nalawade, P., Lu, B., McElroy, M., ... & Li, X. (2024). Real-world validation and techno-enviro-economic analyses of energy-optimized HVAC setpoints in commercial buildings. *Nature Communications*, 15(1), Article 4966. <https://doi.org/10.1038/s41467-024-50088-4>

approaches, or through purchase agreements with hourly matching targets of 100% by 2035

3. Mandatory environmental disclosures

- Require all data center and AI service providers to publicly report annual metrics on greenhouse gas emissions, energy and water consumption, waste generation and electricity sources.

4. Restrict AI applications that increase fossil fuel production

- Disincentivize and prohibit the use of AI technologies that directly expands oil and gas extraction

5. Ensure fair cost distribution for AI-related energy demand

- Implement policies to ensure that infrastructure costs associated with accommodating AI energy demand are not disproportionately shifted to ordinary ratepayers, and that data centre and technology clients don't pay less than the public for electricity.

6. Limit disinformation proliferated by AI

- Establish standards that hold AI services providers accountable for generating, promoting or amplifying false or misleading information



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