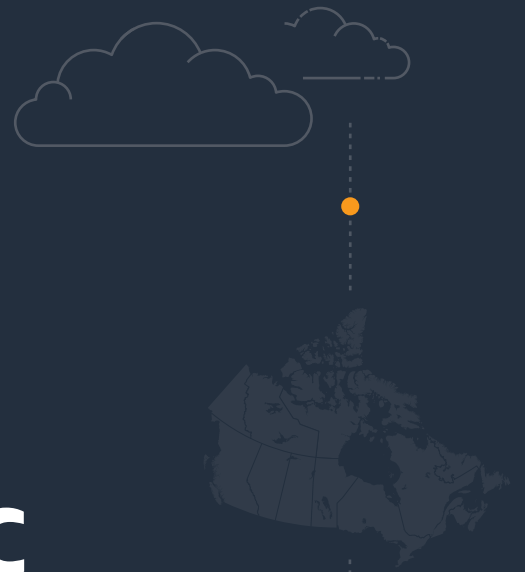




AWS Economic Impact Study

AWS Investment in Canada

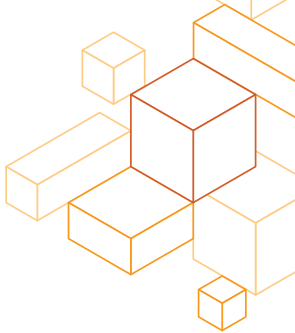




Contents

| | |
|--|----|
| Executive Summary | 3 |
| AWS Overview | 5 |
| AWS in Canada | 7 |
| AWS Customers in Canada | 9 |
| AWS Partner Network in Canada | 11 |
| Economic Impact of AWS Infrastructure Investment in Canada | 13 |
| Economic Impact of AWS Infrastructure Investment on Regional Economy (Quebec and Alberta) | 15 |
| AWS Workforce Development in Canada | 17 |
| AWS and Sustainability in Canada | 19 |
| Appendix A: Input-output Methodology | 21 |

Executive Summary



CA\$21 billion

Data center investment in Canada by 2037

CA\$39 billion

Increase in GDP due to construction and operation of our data centers by 2037.

5,195

Full-time equivalent (FTE) jobs supported through construction and operation of data centers by 2037.

This Amazon Web Services (AWS) Economic Impact Study provides an overview of existing and planned AWS infrastructure investments in Canada, and the substantial economic benefits AWS investments create for the Canadian economy.

Since 2016, AWS in Canada has operated an AWS Region in Montreal. The AWS Canada (Central) Region consists of three clusters of data centers, called Availability Zones (AZs). By late 2023/ early 2024, AWS will open a new Region in Calgary, Alberta in Western Canada. This new AWS Region (also with three Availability Zones), together with the existing AWS Region, will give local customers with data residency requirements a way to store their data in Canada, with the assurance that they retain complete control over the location of their data.

AWS infrastructure in Canada has allowed customers to transform the way businesses, educational institutions, and government agencies serve their stakeholders. It has also helped bolster the growth of partner ecosystem from coast to coast. This new Region in Alberta will contribute to the province’s economic diversification objectives by helping to develop a more resilient economy and promote long-term economic growth.





In addition to these benefits for AWS customers and partners, the construction, operation, and maintenance of AWS data centers generate direct and spillover effects on the Canadian economy. We provide quantitative estimates of these effects.

- **AWS plans to invest up to CA\$21 billion by 2037 in both its existing Montreal Region and in the newly announced Calgary Region.** Using the input-output methodology and statistical tables provided by Statistics Canada¹, **we estimate that the planned investment in both infrastructure Regions will add CA\$39 billion to the GDP of Canada and support 5,195 full-time equivalent (FTE) jobs in the Canadian economy.**
- **From 2016–2021, AWS has already invested over CA\$1.4 billion in Canada,** including both capital and operating expenditures, in establishing and running the AWS Region in Montreal. Using the same methodology, we estimate that AWS investment has added CA\$1.1 billion to the GDP of Canada and supported 687 FTE jobs.
- Of the CA\$21 billion planned investment, **AWS will invest up to CA\$4.3 billion by 2037 in the new AWS Region in Calgary.** The investment includes both capital and operating expenditures, such as imports of highly specialized and proprietary equipment, and in-country spending on construction labor and materials, utilities, and so forth.
- The in-country spending on the construction and operation **of the new AWS Region in Calgary** will stimulate business activity in Canada, generating new employment and sales for providers in the data center supply chain and related sectors. **We estimate the GDP of Canada will increase by CA\$4.9 billion by 2037 because of the Calgary Region alone.**
- **The AWS investment in Calgary alone will support 963 FTE jobs in the Canadian economy.** These jobs include both AWS direct employment and non-AWS employment in sectors supporting AWS infrastructure, such as telecommunications, nonresidential construction, electricity generation, and data center personnel.
- Sustainability is also an important marker for Amazon overall, and this year, two major projects have been announced. Amazon has invested in two renewable energy projects in Alberta—an 80 megawatt (MW) solar project in the County of Newell and a 375 MW solar farm in Vulcan, Alberta that is the largest in Canada. **In total, they will bring Amazon’s renewable energy capacity in Canada to more than 1 million megawatt hours (MWh)—enough to power more than 100,000 Canadian homes.**

¹ <https://www.statcan.gc.ca/en/start>

AWS Overview

Cloud computing is the on-demand delivery of information technology (IT) resources over the internet. Instead of buying, owning, and maintaining servers, customers access computing power and data storage from a cloud provider like AWS. AWS offers pay-as-you-go pricing, which means that the customer only pays for the resources used instead of the traditional IT model, where computing and storage come as a fixed cost.

Organizations of every type, size, and industry use the cloud for various use cases, such as data backup, disaster recovery, email, virtual desktops, software development, testing, big data analytics, contact centers, and customer-facing web applications.

Cloud computing users have access to a broad range of the latest technologies, so they can innovate faster, experiment freely, and quickly spin up resources as needed. They don't have to over-provision resources upfront to handle peak levels of business activity in the future. Instead, they provision only the resources they need.

AWS is the world's most comprehensive and broadly adopted cloud platform, offering over 200 fully featured services from data centers globally. Millions of customers—ranging from startups to large enterprises and public sector organizations—use AWS to lower costs, increase agility, and innovate faster.

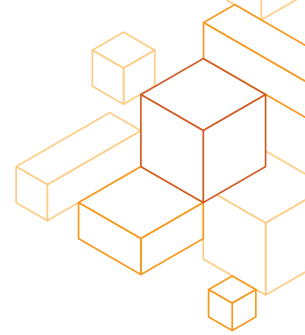
AWS enables business formation and supports business growth. Access to cloud computing lowers the cost of starting new businesses, encourages innovation, spurs development of new technologies. It also attracts more funding for startups, which generates further economic growth. Researchers from Harvard University and Massachusetts Institute of Technology (MIT) found that AWS lowers the cost of starting new businesses by 15-27%, encourages innovation, and attracts more funding for startups. Their study affirms that “many practitioners see the introduction of cloud computing services by Amazon as a defining moment that dramatically lowered the initial cost of starting internet and web-based startups.”²



² Ewens M, Nanda R, Rhodes-Kropf M. Cost of Experimentation and the Evolution of Venture Capital. NBER Publications. National Bureau of Economic Research, 2018.

In addition to economic gains, replacing in-house computing with cloud technology is also good for the environment. In 2019, Amazon co-founded The Climate Pledge—a commitment to be net-zero carbon across our business by 2040, 10 years ahead of the Paris Agreement. As part of this pledge, Amazon is on a path to powering our operations with 100% renewable energy by 2025—five years ahead of our original target of 2030. AWS contributes towards these goals by constantly improving the energy efficiency of our computing resources and by increasing the share of renewable energy in total consumption by our data centers. As a result, the carbon footprint of AWS Cloud computing is much lower than that of in-house computing and most other data center providers. By adopting AWS Cloud technology, governments and private firms can take advantage of the energy efficiency and clean energy goals of AWS while meeting their own computing needs.





AWS in Canada

The newly announced infrastructure Region in Calgary, Alberta, adds to AWS's ongoing investment in Canada. In 2016, AWS opened a Region in Montreal and added more capacity in early 2020 to deal with burgeoning demand from customers and partners. AWS has five Amazon CloudFront edge locations in Vancouver, Toronto, and Montreal. Amazon CloudFront is a highly secure and programmable content delivery network (CDN) that accelerates the delivery of data, videos, applications, and APIs to users worldwide with low latency and high transfer speeds. The Region and edge locations support the rapid growth of demand for AWS services in Canada, and support the growing Canadian technology sector.

AWS currently has two major tech hubs located in Vancouver and Toronto, and a corporate office in Winnipeg. These locations are home to developers, engineers, sales representatives, marketing teams, and business development professionals for our local customers and channel partners. Our Winnipeg office is home to AWS Thinkbox, which focuses on development of solutions and services for the creative industry. In March 2021, Amazon Games launched a new development studio in Montreal, and Amazon has 17 fulfillment centers, six sortation centers, and 35 delivery stations across the country.

AWS locations in Canada



Amazon Offices

Vancouver, Winnipeg,
and Toronto



AWS Regions

Montreal
Calgary (Coming Soon)



Amazon CloudFront Edge Locations

Vancouver, Toronto, and
Montreal



Amazon Solar Farms

Newell, AB
Vulcan, AB

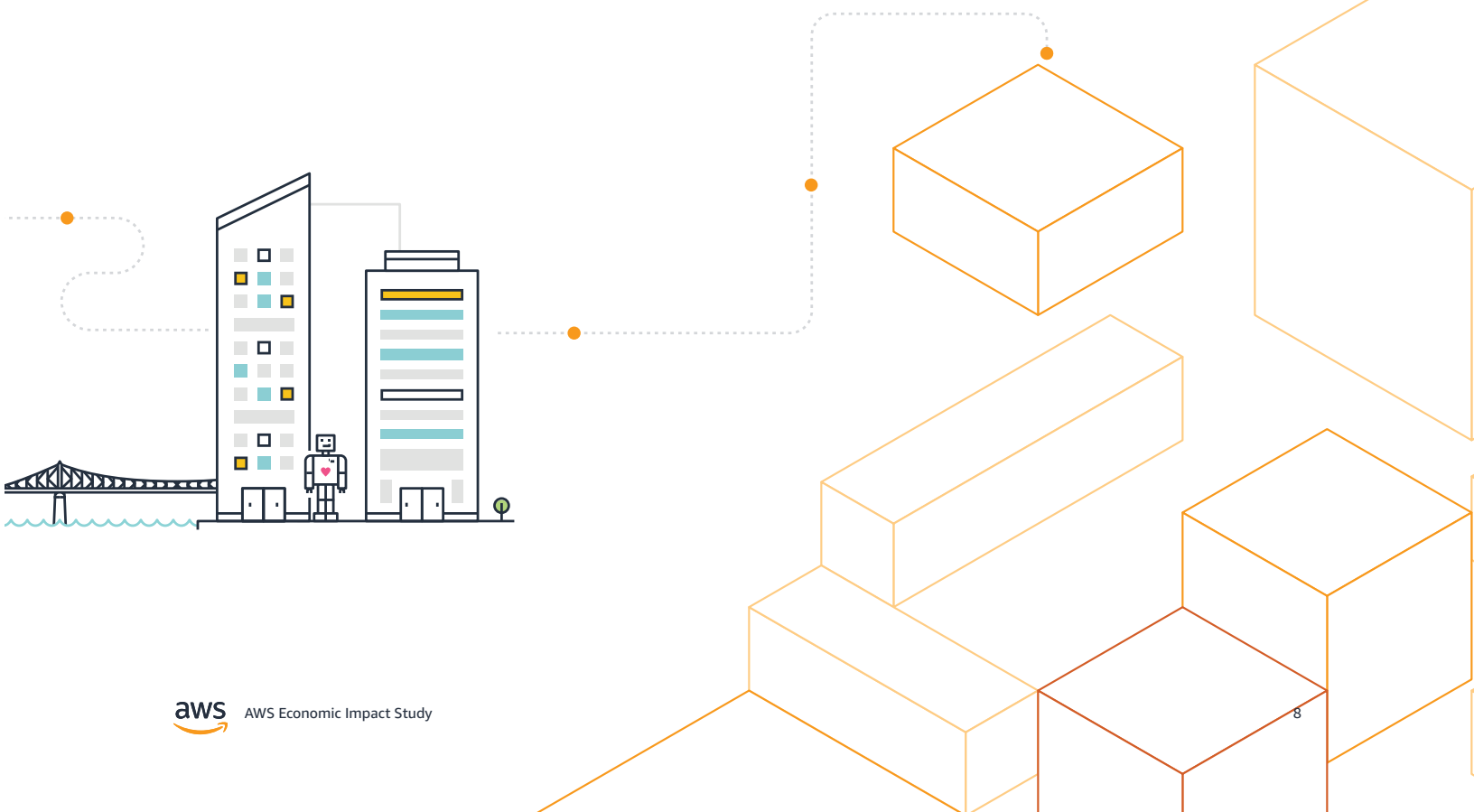


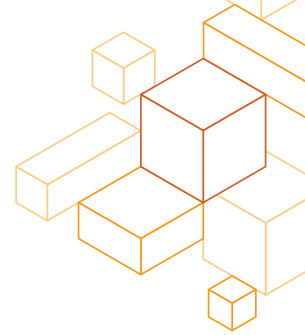
Amazon has more than 39,500 full- and part-time employees in Canada, and has announced plans to hire thousands more by 2023. Among them, over 2,800 professionals support AWS business. This includes solution architects, data center technicians, account managers, sales representatives, professional services consultants, technical account managers, software development engineers, and cloud experts.

Since 2006, Canadian companies of all sizes—including the fastest-growing startups and largest enterprises—have used AWS to lower costs, increase agility, and accelerate innovation. AWS has tens of thousands of customers in Canada, with the pace of adoption having accelerated in the last five years. Customers in Canada can use any of AWS's Regions around the world, which is one of the main benefits of AWS's global footprint. AWS customers increasingly operate in more than one AWS Region because their customers are located all over the world. AWS customers always retain complete ownership of their data, and it will not be moved between Regions without their consent.

AWS also maintains an AWS Partner Network (APN) in Canada to help with cloud adoption. AWS Partners build innovative solutions and services on AWS, and the APN provides business, technical, marketing, and go-to-market support to partners. Together, AWS employees and AWS Partners help Canadian customers adapt cloud technologies to meet the needs of their organizations.

Since 2013, AWS Activate has also supported hundreds of thousands of startups globally. Last year alone, we provided more than CA\$1.2 billion in AWS credits globally to help startups accelerate and grow their business.





AWS Customers in Canada

Tens of thousands of Canadian organizations choose AWS to run their workloads to drive cost savings, accelerate innovation, and speed time to market.



Government

- Canada Border Services Agency
- Government of Ontario
- Provincial Health Services Authority
- Purolator



Education

- Athabasca University
- Blindsight Networks
- D2L
- Humber College



Healthcare

- AlayaCare
- CIHI
- Dialogue



Retail

- Aldo
- Clearly
- Herschel Supply Co.
- lululemon athletica



Financial Services

- BMO
- National Bank of Canada
- Sun Life
- Wealthsimple



Energy

- Keyera
- Parkland
- Pason
- TC Energy



Media & Entertainment

- Kidoodle.TV
- La Presse
- The Globe and Mail
- Vidyad



Startups

- 1Password
- Ada
- Brainbox AI
- Paladin AI



Gaming

- Apocalypse Studios
- Behaviour Interactive
- Eastside Games
- Ubisoft



Non-Profits

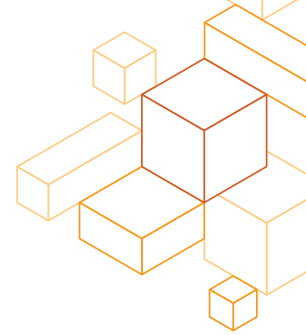
- BCAA
- Imagine Canada
- MPAC
- Viamo



Enterprises

- Air Canada
- Bell Canada
- BlackBerry
- Magna

Below are a few case studies that illustrate the many ways in which AWS Cloud helps companies innovate and grow.



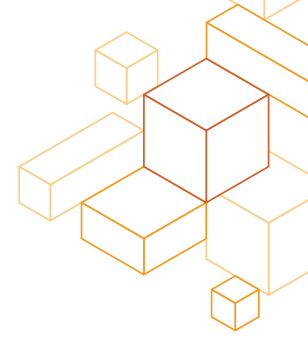
TC Energy completed its migration to AWS in early 2020. TC Energy is using the breadth and depth of AWS services—including machine learning, analytics, databases, serverless, storage, and compute—to deliver energy and generate power more efficiently for millions of homes in North America. “Since moving to AWS, we’ve shifted our focus to automating workflows and unlocking efficiencies, rather than operating infrastructure and managing costly and complex upgrades,” said Chris Foster, Vice President, Information Services and Chief Information Officer of TC Energy. “The visibility we now have across our business has helped us to drive efficiency in our operations and explore new solutions to advance our efforts on environmental stewardship to reduce our impact on land disturbance, carbon intensity, and energy consumption. Our teams identify business hurdles and work with information services to develop new cloud-native applications in a way that just wasn’t possible before we started running on AWS.”

Kidoodle.TV, a children’s streaming service out of Calgary, says using AWS is similar to Lego for kids who love tech. Today, AWS is the backbone of the Kidoodle.TV service and has allowed the company to create new and innovative products, as well as expand its streaming capabilities while ensuring high availability and low latency across a variety of devices and regions. They deliver videos in over 190 countries and territories globally, to millions of families per month—and went into hypergrowth over the course of the pandemic. The ad-supported streaming service also used AWS Elemental MediaTailor to provide seamless ad delivery to children and families. In 2020 alone, Kidoodle.TV grew its viewer base 3,200% and is poised to use its scalable cloud environment to continue its upward trend in 2021 and beyond.

“Because the cloud existed when we started this company, we could build everything off premises. We didn’t have the need for huge overhead costs. We could build essentially the same service architecture that multibillion-dollar companies were able to deploy.”

Daniel Riddell, CTO, Kidoodle.TV

Since the onset of the COVID-19 pandemic, organizations across all sectors have continuously adapted their health and safety programs as evidence-based practices evolve. In Ontario, Public Services Health & Safety Association (PSHSA) saw website chat volumes rapidly triple as public sector organizations sought out the latest guidance. PSHSA worked with Qalius—an Amazon Web Services (AWS) Partner Network (APN) Advanced Consulting Partner specializing in serverless applications on AWS—to implement an artificial intelligence (AI) chatbot. Qalius built the chatbot with Amazon Lex and integrated it with on-premises PSHSA systems. The chatbot answers questions, directs website visitors to information on the website, and manages updates for virtual training registrations. By automatically resolving one out of every three enquiries, the chatbot allows PSHSA’s Customer Experience team to focus on high-priority requests.



AWS Partner Network in Canada

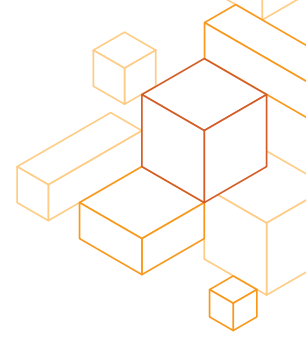
Canada-based partners are part of the AWS Partner Network (APN), which includes over 100,000 independent software vendors (ISVs) and systems integrators (SIs) around the world. AWS Partners build innovative solutions and services on AWS, and the APN provides business, technical, marketing, and go-to-market support to partners. APN SIs, consulting partners, and ISVs help enterprise and public sector customers migrate to AWS, deploy mission-critical applications, and provide a full range of monitoring, automation, and management services for customers' environments. Examples of AWS Consulting Partners supporting Canadian customers include Accenture, Bell Canada, Deloitte, FuseForward, FX Innovation, Levio, OpsGuru, Rackspace, Slalom, Softchoice, Qalius, Quantiphi, Xerris, and many others. ISVs using AWS to support customers in Canada include Arctic Wolf, Benevity, CrowdStrike, D2L, Lightspeed POS, Salesforce, SmartSimple, Tidal Migrations, Vidyard, and Workday. These partners, and many others, are using AWS to deliver their software to customers in Canada and around the world.

A good example is Xerris Inc., an Advanced AWS Partner based in Calgary, Alberta, that specializes in providing technology-based solutions for agricultural, banking, energy, and ecommerce companies. In 2020, they grew from eight people to over 50 by the end of December. Xerris worked with its customer StellarAlgo to scale and optimize a key data solution, which provides valuable insight into fan behavior and engagement for the sports and entertainment industry. StellarAlgo developed a machine-learning retention model that analyzes more than 40-billion sport specific data points across more than 100-million unique fan records while continually monitoring, assessing and adapting to changing fan behavior in order to issue a highly accurate fan retention score. This score allows the industry to create a better experience for fans and predict behaviors such as season ticket renewal. Xerris' experience working with AWS, including with Amazon SageMaker, allowed them to set the foundation to train hundreds of thousands of machine learning models concurrently, allowing StellarAlgo to expand this key product across teams and leagues.

Another APN partner using AWS to innovate is Benevity, a leading provider of global corporate purpose software, providing the only integrated suite of community investment and employee, customer and nonprofit engagement solutions. Recently, the company moved all-in to the AWS

Cloud to support its hundreds of enterprise customers globally. “As we grow and build our business around the world, we know that we can rely on AWS Regions to scale with our needs,” said Rob Woolley, Benevity’s VP Technology Operations. “No matter where are customers are, they get an experience that has low latency and high availability. Also, as Benevity is a Certified B Corp, Amazon’s commitment to having its global infrastructure be 100% powered by renewable energy by 2030 helps us with our environmental accountability.

Another Canadian ISV using AWS to rapidly scale is Arctic Wolf, one of the leading cybersecurity technology innovators in the world, with a key office located in Waterloo, Ontario. In 2021, it achieved the AWS Level 1 Managed Security Service Provider (MSSP) designation in AWS Partner Network, recognizing its work in the security space. “In July 2021, Arctic Wolf used AWS to process and analyze more than 1.6 trillion security events per week, including threats such as viruses, ransomware attacks, and compromised websites,” said Nick Schneider, President and CEO of Arctic Wolf. “Our customers rely on us to help keep them secure, and we can only do that with the compute power provided to us by the AWS Cloud. No matter where customers are globally, we can replicate our IT architecture in additional AWS Regions in a matter of weeks rather than construct new data centers.”



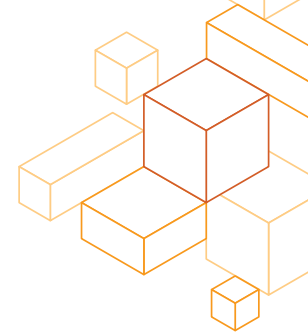
Economic Impact of AWS Infrastructure Investment in Canada

AWS Regions are physical locations around the world with clusters of data centers. Each group of logically connected data centers is called an Availability Zone (AZ). Each AWS Region consists of multiple, isolated, and physically separate AZs within a geographic area. Unlike other cloud providers, who often define a region as a single data center, the multiple AZ design of every AWS Region offers advantages for customers. Each AZ has independent power, cooling, and physical security and is connected via redundant, ultra-low latency networks. AWS customers focused on high availability can design their applications to run in multiple AZs to achieve even greater fault-tolerance. AWS infrastructure Regions meet the highest levels of security, compliance, and data protection.

From 2016–2021, **AWS has invested over CA\$1.4 billion in Canada**, including both capital and operating expenditures, in establishing and running the AWS Region in Montreal. **Reaffirming our commitment to Canada, AWS plans to invest up to CA\$21 billion by 2037, in both the existing infrastructure and the new Region in Alberta. The investments include the following:**

- Capital expenditures on the development of data centers and related infrastructure. In the next few years, the capital expenditure will include tailoring both new and existing data center space to suit AWS specifications. Additional expansions of data center capacity might be needed to support growing customer demand.
- Recurring operating expenditures, including employee and contractor compensation, utilities, facility costs, and goods and services purchases from regional businesses.
- Imports of highly specialized and proprietary equipment, such as servers.

These expenditures will significantly impact the economy, bringing direct, indirect, and induced economic benefits, as illustrated in the figure below. Using an established input-output methodology and statistical tables provided by Statistics Canada, we estimate the economic impact of the construction and operation of AWS Cloud infrastructures in Canada:



Economic Impact 2016–2021

AWS investments have added CA\$1.1 billion to the GDP of Canada. The GDP contribution includes value added by AWS services to the IT sector in Canada, as well as impacts related to in-country spending on goods and services for the construction and operation of AWS data centers.

The construction and operation associated with the AWS Region in Canada supported an estimated annual average of 687 FTE jobs. These jobs include:

- **Direct Effects:** 377 FTE jobs in the AWS supply chain, such as construction, facility maintenance, electricity, and telecommunications.
- **Indirect Effects:** 124 FTE jobs in sectors that support the AWS supply chain. These jobs are supported when AWS suppliers spend the funding received from AWS on procuring the labor, materials, and services needed to fulfill the work for AWS.
- **Induced Effects:** 186 FTE jobs in the broader Canadian economy. Over the next 15 years, AWS expects to spend hundreds of millions of dollars in employee compensation for its data center employees, sales account managers, solutions architects, and others. The additional spending power from this income will support jobs in the broader Canadian economy, primarily on sectors that support household consumption.

Economic Impact of Future AWS Investments

Canada's GDP will increase by an estimated CA\$39 billion by 2037, due to the construction and operation of AWS Regions.

In the next 15 years, AWS investments will support an estimated annual average of 5,195 FTE. Among them, 3,079 jobs will be supported through direct effects, 647 jobs will be supported through indirect effects, and 1,469 jobs will be supported through induced effects.

Measuring Economic Impact



Direct Effects

Investments in construction and expenditures for operations



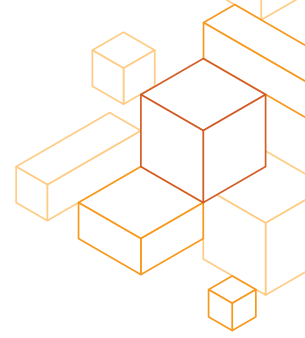
Indirect Effects

Inter-industry and supply chain spending



Induced Effects

Household income spending in local economy



Economic Impact of AWS Infrastructure Investment on Regional Economy (Quebec and Alberta)

In addition to quantifying the economic impact of AWS investment on the Canadian economy, we also estimated the regional economic impact of AWS investment in Quebec and Alberta.

In this report, “regional economic impact” refers to the effect of an investment on the local economy at provincial level (Quebec and Alberta). Regional economic impact is different from country-level economic impact, because it captures the portion of impact that is local. For example, a construction company might hire local employees and purchase concrete and steel from a different Canadian province. If a new corporate neighbor hires the construction company to build a new data center, the construction company will spend more money on hiring local labor, but its increased spending on concrete and steel will go outside the region. Our regional economic impact estimates are based on the same input-output methodology and the provincial-level input-output multipliers provided by Statistics Canada.

AWS Investment Impact on the Economy of Alberta

Alberta’s regional GDP will increase by an estimated CA\$4.9 billion, due to the construction and operation of the new AWS Region.

The in-region portion of the AWS investment in Alberta will sustain an estimated annual average of 871 FTE local jobs by 2037. Among them, 409 jobs will be supported through direct effects, 181 jobs will be supported through indirect effects, and 227 jobs will be supported through induced effects.

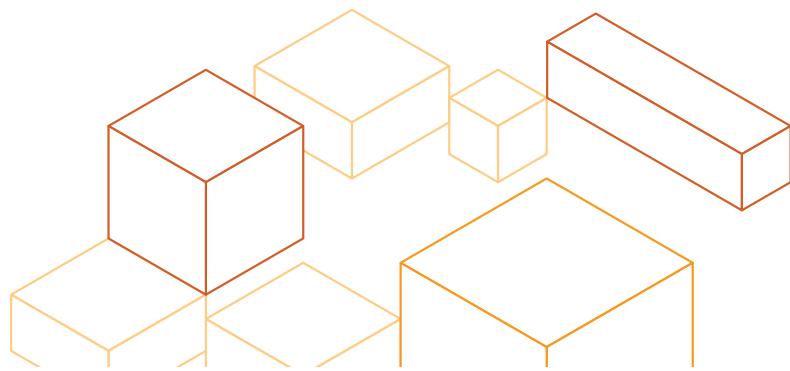


AWS Investment Impact on the Economy of Quebec

Since 2016, AWS investments have added CA\$929 million to the regional GDP of Quebec. Quebec's regional GDP will increase by an estimated CA\$30 billion by 2037.

The construction and operation associated with the AWS Region in Quebec supported an estimated annual average of 484 FTE jobs during the period 2016-2021. All of them are local jobs in Quebec. In the next 15 years, AWS investments in Quebec will support an estimated annual average of 3,412 FTE local jobs.

The development and operation of the AWS Regions in Quebec and Alberta will generate numerous additional benefits that are significant but not captured by standard input-output methodologies. In the following sections, we provide more details on the impact of AWS investments.



AWS Workforce Development in Canada

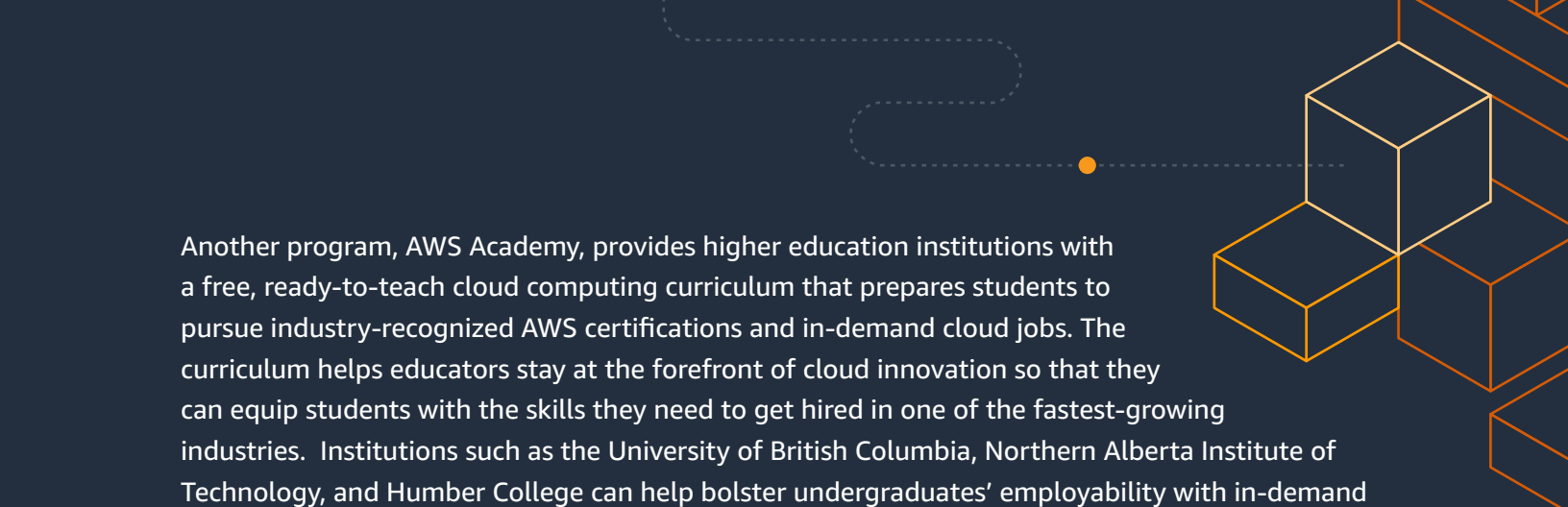
AWS's commitment to Canada goes well beyond infrastructure investments and has been investing in upskilling and reskilling people through cloud computing education programs for many years.

Since 2013, AWS has helped train more than 100,000 individuals in Canada with cloud skills. AWS collaborates with universities and institutions in Canada to prepare the workforce of tomorrow through programs such as AWS re/Start, AWS Academy, and AWS Educate. These AWS Education Programs help learners of all backgrounds and experiences prepare for careers in the cloud. From college courses to full-time training programs and self-paced learning content, AWS Education Programs offer access to the skills needed to begin a career in cloud computing. AWS also provides training directly to customers, including customized programs like the AWS Skills Guild. One Canadian customer, Sun Life, launched this training program this year with a goal of certifying 450 business and technical employees with cloud skills.

Amazon and AWS are also committed to offering free training and made a commitment in 2019 help 29 million people around the world grow their tech skills with free cloud computing skills training by 2025.

One of the programs providing free skills training to people in Canada is AWS re/Start. This is a free, 12-week, digital skills training program that prepares unemployed, underemployed, and transitioning individuals for careers in cloud computing and connects graduates to potential employers.

- The first cohort was held in Toronto, through Youth Employment Services (YES) in the summer of 2020, with plans to expand to other Canadian cities.
- In October 2021, we announced a cohort for Indigenous students across Canada. PLATO, Canada's only Indigenous-led and Indigenous-staffed IT services and training firm, is working with BMO Financial Group to run the re/Start program virtually in January 2022, adding a six-month internship with BMO as well.
- AWS and Mount Royal University have teamed up to deliver the AWS re/Start program through Calgary's [Edge Up 2.0](#) program, in early 2022.



Another program, AWS Academy, provides higher education institutions with a free, ready-to-teach cloud computing curriculum that prepares students to pursue industry-recognized AWS certifications and in-demand cloud jobs. The curriculum helps educators stay at the forefront of cloud innovation so that they can equip students with the skills they need to get hired in one of the fastest-growing industries. Institutions such as the University of British Columbia, Northern Alberta Institute of Technology, and Humber College can help bolster undergraduates' employability with in-demand skills and certifications in cloud computing .

In 2021, AWS partnered with Invest Ottawa to launch the Xtreme Talent Acceleration Program (XTAP) designed to equip members of the Ottawa-based tech community with the most in-demand skills of today and the future. The program provides technical and hands-on training to participants, preparing them to obtain their architecting, developing, and machine learning certifications.

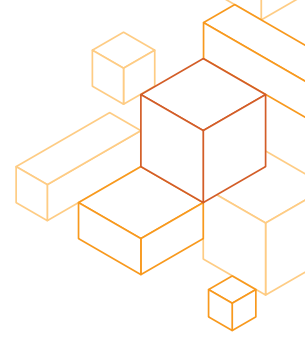
Pioneered in Canada, the DigiSeries program helps working professionals and business-decision makers understand cloud computing fundamentals and the practical applications of cloud computing within a given sector. AWS instructors and subject matter experts guide participants through core concepts including cloud architecture principals, security and compliance, and real-world examples. In 2021, AWS worked with the Government of Canada and Canadian Health Information Management Association (CHIMA) to deliver AWS DigiGov and AWS DigiHealth, in addition to partnering with Imagine Canada to pilot AWS DigiNPO. These programs promote cloud fluency in government, healthcare, and not-for-profit sectors.

In 2021, AWS worked with a number of organizations across Canada including hosting Executive Education Course with the Canada School of Public Service, providing cloud training to students for Skills/Compétences Canada's national competition, and signing an agreement with Invest Vancouver to create a workforce development initiative that will prepare thousands of Metro Vancouver residents for well-paying jobs in the region's growing tech sector, helping to attract high-tech firms to the area.

AWS also opened the Cloud Innovation Center at the University of British Columbia (UBC CIC) in January of 2020. The private-public partnership works on digital transformation challenges by providing subject matter expertise, technical cloud talent, and Amazon's innovation process to help develop proofs of concept (POCs) that are made available to anyone globally via open source on GitHub. The challenges the UBC CIC works on are related Community Health and Wellbeing. To date, the team has published more than 20 projects including reference architecture and deployment guides.

⁴ <https://aws.amazon.com/training/awsaemy/member-list/>

AWS and **Sustainability** in Canada



Our Climate Pledge to Achieve Net-Zero Emissions

As part of Amazon’s Climate Pledge, Amazon (including AWS) is committed to reaching net-zero carbon emissions across its business by 2040, which is 10 years ahead of the Paris Agreement goals.

A key component of our commitment to net zero is powering Amazon’s infrastructure with 100% renewable energy. The company is now on a path to achieve this milestone by 2025, five years ahead of the initial 2030 target. In December 2020, Amazon became the world’s largest corporate purchaser of renewable energy. Amazon has 232 renewable energy projects across the globe, with over 10,000 MW of renewable capacity, and delivers more than 23 million MWh of energy annually—enough to power the equivalent of more than 2 million Canadian homes.

Emissions Reductions with AWS Cloud

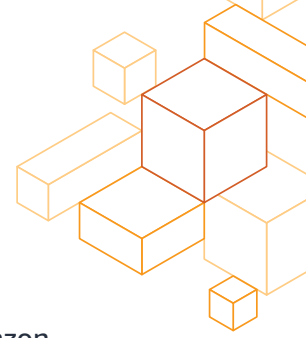
AWS is committed to running our business in the most environmentally friendly way possible and reducing our impact on the environment. Our scale allows us to achieve higher resource usage and energy efficiency than typical on-premises data centers. We continuously work to increase the energy efficiency of our facilities and equipment, and innovate the design and manufacture of our servers, storage, and networking equipment to reduce energy and water use, and limit waste. In addition to helping our customers increase agility and reduce costs, moving to AWS is much more sustainable. Customers no longer have to provision for peaks; AWS’s infrastructure is designed to operate efficiently at scale.

A study by 451 Research⁵ found that AWS’s infrastructure is 3.6 times more energy efficient than the median of surveyed enterprise data centers, with more than two-thirds of this advantage due to a more energy-efficient server population and higher server usage. AWS data centers are also more energy efficient than enterprise sites due to comprehensive efficiency programs that touch every facet of our facilities.

“When we factor in the carbon intensity of consumed electricity and renewable energy purchases, which reduce associated carbon emissions, AWS performs the same task with an 88% lower carbon footprint.”

- 451 Research, 2019

⁵ 451 Research, The Carbon Reduction Opportunity of Moving to Amazon Web Services, 2021. <https://d39w7f4ix9f5s9.cloudfront.net/e3/79/42bf75c94c279c67d777f002051f/carbon-reduction-opportunity-of-moving-to-aws.pdf>



AWS Renewable Energy Investment in Canada

The Government of Alberta is committed to being a responsible developer of energy and lowering overall greenhouse gas (GHG) emissions in the province through innovation. Amazon shares the same commitment of producing clean energy as part of Amazon's Climate Pledge to power 100% of its activities with renewable energy by 2030 and be net-zero carbon by 2040. Amazon recently announced its first renewable energy investment in Canada—an 80 MW solar project in the County of Newell in Alberta. Once complete, it will produce over 195,000 MWh of renewable energy to the grid, or enough energy to power more than 18,000 Canadian homes for a year. AWS continuously works to increase the energy efficiency of its facilities and equipment, and innovates the design and manufacture of its servers, storage, and networking equipment to reduce energy use.

Amazon's second renewable energy project in Alberta is a 375 MW solar farm that is also the largest in the country. When it comes online in 2022, it will bring Amazon's capacity in Canada to more than 1 million MWh, enough to power more than 100,000 Canadian homes for a year.

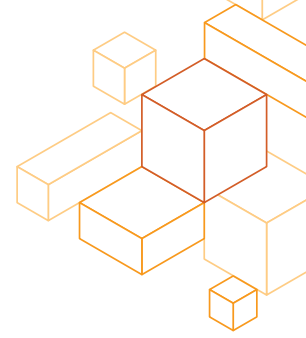
Amazon also signed a strategic collaboration agreement with Canadian company Brookfield Renewable, which operates one of the world's largest publicly traded, pure-play renewable power platforms. The agreement is to develop new renewable energy projects supported by power purchase agreements and to work together on additional green energy opportunities in the future. This agreement will leverage Brookfield's deep operating capabilities and local teams in North America, Europe, Brazil, and Asia.

Water Use Efficiency in AWS Data Centers

AWS has multiple initiatives to improve our water use efficiency and reduce the use of potable (drinking) water for cooling data centers. We develop our water-use strategy by evaluating each AWS Region for climate patterns, local water management and availability, and opportunities to conserve drinking water sources.

We demonstrate our commitment to water stewardship by using reclaimed or recycled water instead of potable (drinking) water in multiple Regions. A key component of our water-use strategy focuses on working with local utilities to expand the use of reclaimed water. In some Regions, AWS has installed on-site water treatment systems to remove scale-forming minerals, enabling us to use water for more cycles in our cooling units and continue to reduce our water footprint.

Appendix A: Input-output Methodology



To compute the economic impact of data center investments, we use the input-output methodology. Input-output models measure the impact of the expansion or contraction of one economic activity on other economic activities and the local economy as a whole. The input-output methodology is credited to Harvard economist Wassily Leontief, who was awarded a Nobel Prize in economics, in 1973, for the development of this method and its applications. In this model, a “local” is typically a country but could also be a smaller division, such as a county, metropolitan statistical area (MSA), state, or region (for example, Lombardy in Italy). The method uses historical data from the country, maintained by the Organization for Economic Co-operation and Development (OECD) or the country’s government statistical agency. The data shows the impact of each dollar spent in one industry on all other industries. For example, a dollar spent on construction might typically be associated with 20 cents spent on electricity and other utilities. We also use internal Amazon projections on how much we will spend on each industry while building and maintaining the data center. We use standard procedures for computing multipliers from OECD’s data. See, for example, Ronald Miller and Peter Blair, “Input-Output Analysis: Foundations and Extensions,” 2009, Cambridge University Press.

