AWS INVESTMENT IN ISRAEL

AWS Economic Impact Study

Contents

Executive Summary

ILS 26.6 billion

Total planned investment associated with the AWS Israel (Tel Aviv) Region from 2023 through 2037[1]

ILS 51.7 billion

Estimated gross domestic product (GDP) contributed to Israel by the AWS Israel (Tel Aviv) Region from 2023 through 2037

Over 7,700 jobs

Estimated annual average of full-time equivalent (FTE) jobs supported at local businesses by the AWS Israel (Tel Aviv) Region from 2023 through 2037

In 2023, Amazon Web Services (AWS) launched the AWS Israel (Tel Aviv) Region, along with a 15-year plan to expand related infrastructure and operations in Israel through 2037. The launch of the AWS Israel (Tel Aviv) Region will enable local customers with data residency requirements to securely store data in Israel while providing customers with even lower latency across the country to drive greater productivity, more efficient business operations, and enhanced real-time application performance. Customers will also have access to advanced AWS technologies to accelerate innovation including compute, storage, networking, business applications, developer tools, data analytics, security, machine learning (ML), and artificial intelligence (AI).

In 2021, the Israeli government announced the selection of AWS as its primary cloud provider as part of the Nimbus contract for government ministries and subsidiaries. The Nimbus framework will provide cloud services to Israeli government ministries, including local municipalities, government-owned companies, and public sector organizations with the aim of helping to accelerate government-wide digital transformation. The cloud transformation enabled by Nimbus at these organizations will be instrumental in driving innovation and enabling new digital services for Israeli citizens.

[1]The local currency values in this report were obtained by using the June 6, 2023 spot exchange rate of ILS 3.7 per U.S. dollar. At the time of publication, the total planned investment value is USD $7.2 billion, and contribution to GDP is USD $13.9 billion.

The construction, connection, operation, and maintenance of AWS infrastructure in Israel will support billions of shekels in revenue at businesses in the AWS supply chain, resulting in compensation paid to workers in skilled technical and information technology (IT) roles. AWS further invests in cloud workforce and education programs to grow the cloud ecosystem in Israel. The AWS economic impact methodology that quantifies these effects uses Amazon company data, the input-output methodology, and statistical tables provided by the Organisation for Economic Co-operation and Development (OECD).

- AWS plans to **invest up to ILS 26.6 billion in the AWS Israel (Tel Aviv) Region from 2023 through 2037**. This investment includes both capital and operational expenditures associated with the construction, connection, operation, and maintenance of the AWS Israel (Tel Aviv) Region. It encompasses all cash expenses directly attributable to the project, such as imports of highly specialized and proprietary equipment and software, as well as in-country spending on construction and data center operations.

- The investment associated with the AWS Israel (Tel Aviv) Region **will contribute an estimated ILS 51.7 billion to the gross domestic product (GDP) of Israel from 2023 through 2037**. The contribution to GDP includes the value added by the direct sale of AWS technologies to the information and communications technology (ICT) sector in Israel and in-country spending on goods and services for construction, connection, operation, and maintenance of AWS data centers, which generate new employment and revenue for businesses in the data center supply chain.

- The economic opportunities created by AWS investment will **support an estimated annual average of more than 7,700 full-time equivalent (FTE) jobs at local businesses** in the Israeli data center supply chain from 2023 through 2037. Our investment supports employment in sectors across the data center supply chain, such as telecommunications, non-residential construction, electricity generation, facilities maintenance, and data center operations.

- The new AWS Region continues AWS's commitment to Israel, which started in 2014 when AWS and Amazon opened its first in-country marketing office and research and development (R&D) center, respectively. Since then, **Amazon's presence in Israel has expanded to include Prime Air, Alexa Shopping, and Amazon Devices**. Additionally, Amazon R&D efforts encompass the development of AWS-designed semiconductors through **Annapurna Labs**, which Amazon acquired in 2015.

- AWS investment in Israel is beneficial for the economy and for the environment. A recent study by 451 Research shows **AWS's infrastructure is 3.6 times more energy efficient than the median of the surveyed U.S. enterprise data centers, and up to five times more efficient than the average of surveyed European enterprise data centers**. This advantage is attributable to the combination of more energy-efficient servers developed by Annapurna Labs and much higher server usage achieved by AWS infrastructure. As Israeli customers move their workloads from enterprise data centers to AWS, the carbon footprint of these workloads is reduced due to much lower energy consumption.
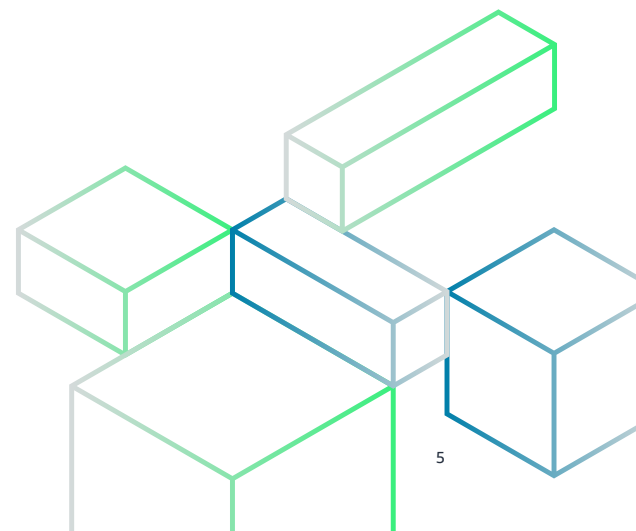
AWS Overview

AWS provides cloud computing, which enables the on-demand delivery of IT resources over the internet. Instead of purchasing, owning, and maintaining servers, customers can leverage the computing power, data storage, and services offered by cloud providers like AWS. AWS offers pay-as-you-go pricing, where customers only pay for the resources they use, as opposed to the traditional IT model where expenses come as a fixed cost. Organizations of all types, sizes, and industries rely on the cloud for various purposes, including data backup and recovery, software development and testing, data analytics, enterprise resource planning, email, virtual desktops, contact centers, and customer-facing web services.

AWS customers have access to a broad range of the latest technologies, so they can innovate faster, experiment freely, and quickly set up and use resources as needed. They do not have to over-provision resources upfront to handle peak levels of business activity in the future. Instead, they can provision only the resources they need. AWS is the world's most comprehensive and broadly adopted cloud provider, offering more than 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 plays a crucial role in helping customers launch and grow their businesses. By providing access to cloud computing, AWS lowers the cost barriers associated with starting new business ventures, promotes innovation, and facilitates the development of new technologies. This results in attracting more funding for startups, which generates further economic growth. Research conducted by Harvard University and the Massachusetts Institute of Technology (MIT) found that AWS reduces the cost of starting new businesses by 15% to 27%. 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]

In addition to economic gains, the adoption of cloud technology also yields positive benefits for the environment. In 2019, Amazon co-founded **The Climate Pledge**. As part of the Pledge, Amazon and over 300 other signatory businesses have committed to achieving net-zero carbon emissions across their businesses by 2040, 10 years ahead of the Paris Agreement. As a result, Amazon is on a path to powering our operations with 100 percent renewable energy by 2025—five years ahead of our original target of 2030. AWS contributes toward 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. Analysis by 451 Research shows AWS's infrastructure is 3.6 times more energy efficient than the median of the surveyed U.S. enterprise data centers, and up to five times more efficient than the average of surveyed European enterprise data centers. By adopting AWS technology, private and public sector organizations can align with the environmental goals of AWS while benefiting from the advantages offered by cloud computing.

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

AWS in Israel

The AWS Israel Region is part of AWS's history of continued investment in Israel. Amazon initially opened an AWS office in Israel in 2014 to support the rapid growth of local demand for AWS cloud computing. In the same year, Amazon established an R&D center in Israel. Since then, Amazon's R&D presence in the country has increased significantly thanks to the 2015 acquisition of Annapurna Labs, a computer chip designer and semiconductor company. Amazon's presence in Israel has expanded to also include Prime Air, Alexa Shopping, and Amazon Devices.

In 2018, teams working across AWS, Annapurna, Alexa Shopping, Amazon Devices, and Prime Air moved to new, expanded **offices in Tel Aviv**. The office also houses **Floor28,** a purpose-built space where anyone interested in AWS can attend industry events, workshops, and meetups and receive free, in-person technical and business guidance from AWS experts through AWS Experience. Additionally, Amazon operates a corporate office in Haifa to support AWS operations in Israel.

In 2019, AWS launched its first infrastructure in Israel, opening an Amazon CloudFront Edge Location. **Amazon CloudFront** is a highly secure and programmable content delivery network (CDN) that accelerates the delivery of data, videos, applications, and APIs to customers worldwide, with low latency and high transfer speeds.

AWS Locations in Israel

Amazon Offices:
Tel Aviv, Haifa

AWS Region:
Israel

**CloudFront Edge Location:**
Israel

Haifa

Tel Aviv

Note: This map is a stylistic representation meant to convey the locations of AWS in Israel. It is not meant to represent an accurate or complete map of Israel

In 2020, AWS brought AWS Outposts and AWS Direct Connect to Israel, providing Israeli organizations with the ability to establish dedicated connections to AWS and run AWS technology in their own data centers. **AWS Outposts** deliver fully managed and configurable racks built with AWS-designed hardware that allow customers to run AWS compute, storage, database, and other services on premises, while seamlessly connecting to AWS's broad array of services in the cloud for a truly consistent hybrid experience. **AWS Direct Connect** simplifies the establishment of a dedicated network connection between the customers' premises and AWS. This enables customers to establish private connectivity between AWS and their data center, office, or colocation environment, which reduces their network costs, increases bandwidth throughput, and provides a more consistent network experience compared to internet-based connections.

In 2023, Amazon launched the AWS Israel (Tel Aviv) Region with three Availability Zones (AZs). An **AWS Region** is a physical location comprising multiple, isolated, and physically separate AZs, which in turn form clusters of logically connected data center infrastructure. They are designed to be located up to 100 kilometers apart to protect against natural and man-made disasters that could affect the data centers.

The **multiple AZ design of every AWS Region** offers significant advantages to customers. Each AZ has independent power, cooling, and physical security and is interconnected through redundant, ultra-low latency networking. AWS customers focused on high availability can design their applications to run in multiple AZs to achieve even greater fault tolerance. Similar to other AWS Regions globally, the AZs in the AWS Israel (Tel Aviv) Region are equipped with backup power to ensure continuous operation during potential electrical failures.
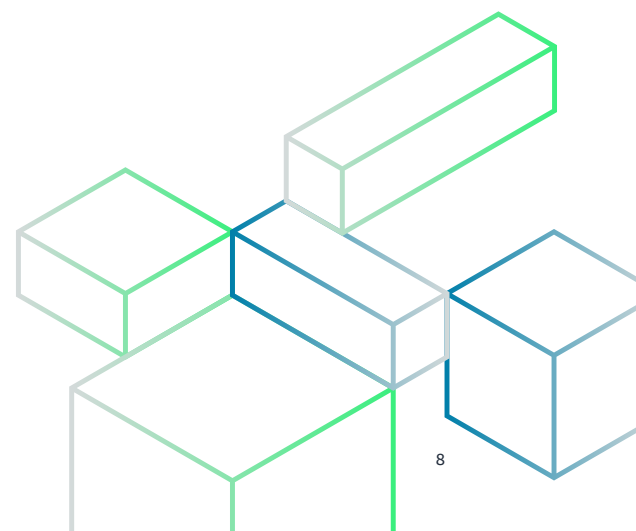
Economic Impact of AWS Investment in Israel

AWS investments create a measurable economic impact on communities through the construction, connection, maintenance, and operation of AWS data centers. This includes supporting the creation and retention of jobs that provide longer-term financial stability for Israelis. A**WS plans to invest ILS 26.6 billion in the AWS Israel Region from 2023 through 2037** in infrastructure that will support the projected growth in demand for AWS technologies by customers. This investment encompasses all cash expenses directly attributable to the AWS Region, such as imports of highly specialized and proprietary equipment and software, and in-country (local) spending.

Local spending includes capital expenditures (CAPEX) on construction labor, materials, and services, as well as recurring operating expenditures (OPEX) on employee and contractor compensation, utility fees, and facilities and rental costs. AWS plans to progressively expand infrastructure and grow corporate operations to meet projected demand for AWS cloud computing in Israel. To demonstrate our commitment to Israel, AWS agreed to re-invest 20% of the Nimbus contract's total value in local vendors through a partnership with the Israeli Industrial Cooperation Authority. Our construction activities rely on over 30 Israeli suppliers, including Readymix concrete, Or-Taas site-fencing, and S.L. Hovalot mobile cranes.

This study estimates that the planned investment associated with **the AWS Israel Region will contribute ILS 51.7 billion to the GDP of Israel from 2023 through 2037**, based on Amazon company data, the established input-output methodology,[3] and statistical tables provided by the OECD. The GDP contributed by the AWS Israel Region includes the value added by the sale of AWS technologies to the ICT sector in Israel as well as the direct, indirect, and induced effects of AWS's purchases from the Israeli data center supply chain. This study estimates that **the in-country portion of AWS investment will support an average of more than 7,700 FTE jobs annually at local businesses in Israel from 2023 through 2037**. Estimates of the average number of these jobs include the following:

- **More than 2,600 FTE jobs annually sustained by direct effects** — These are jobs at AWS suppliers that are directly supported by AWS investment, which are in sectors such as non-residential construction, software development, facilities maintenance, electricity generation, and telecommunications.

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[3] See the section "Input Output Methodology" for more details.

- **More than 1,900 FTE jobs annually sustained by indirect effects** — These jobs are in the AWS supply chain and are indirectly supported by business-to-business transactions resulting from AWS investment. These include jobs in sectors that supply the labor, services, and materials needed to fulfill work for AWS.

- M**ore than 3,200 FTE jobs annually sustained by induced effects** — These are jobs in the broader Israeli economy supported by the household consumption of workers receiving compensation from AWS and our supply chain. They include jobs in sectors that supply consumer goods and services to Israeli households.

The following illustration provides a conceptual breakdown of the supply chain impacts into direct, indirect, and induced effects.

Direct effects
Investments in construction and expenditures for operations

Indirect effects
Inter-industry and supply chain spending

Induced effects
Household income spending in the local economy

Amazon Support for R&D and Startup Ventures in Israel

Amazon's investments in research and development (R&D) opportunities have contributed to the growth of the Israeli economy and the hiring of engineers, developers, and research scientists. In 2014, Amazon established an R&D center in Israel. Since then, our presence in the country has expanded in terms of R&D directly performed by Amazon companies in Israel, and acquisitions, partnerships, and support for the local startup ecosystem.

Teams across Amazon in Israel are at the forefront of developing new technologies that will help AWS customers achieve even greater flexibility with the cloud. Amazon actively fosters the growth of startups that develop the hardware that powers AWS. In 2015, Amazon acquired **Annapurna Labs**, a computer chip designer and semiconductor company. Annapurna's charter of driving innovation and relative durable advantage for AWS through the development of custom silicon, software, and hardware has resulted in the creation of two AWS silicon product lines: AWS K2/Nitro Controllers (networking, storage, virtualization) and AWS Graviton (Arm server CPU chips). These product lines deliver unique features and functionality that enable several new AWS use cases while providing higher performance and lowest cost/performance versus off-the-shelf silicon.

The **Amazon Elastic Block Store** team in Israel is supporting the development of a next-generation server architecture that can scale AWS customers' storage capacity by petabytes in minutes. These new technologies provide customers with similar or improved block storage performance when compared with leading storage area network (SAN) products, without the cost or hassle of having to procure, scale, operate, and maintain on-premises computing infrastructure.

Amazon is committed to developing innovative applications for AWS technologies. In 2021, AWS, in collaboration with pharmaceutical industry leaders, including AstraZeneca, Merck KGaA, Pfizer, Teva, and the Israel Biotech Fund, formed a consortium with the backing of the Israeli Innovation Authority to launch **AION Labs**, an innovation hub that combines biomedical research with computational discovery acceleration. Powered by AWS and the lab's partners, AION Labs is creating and supporting groundbreaking artificial intelligence (AI) and computational ventures that will transform the discovery and development of new therapies. AION Labs will create and invest in early-stage startup teams that are developing new technologies, treatments, and approaches to solve the most pressing problems in pharmaceutical research and development. Each AION Labs startup will receive resources and mentorship—experts from the organizations that form the consortium will work closely with startups on their chosen projects. Each project will harness the power of AI to identify new treatments faster, reduce clinical development timelines, and advance healthcare toward patient-centric precision medicine. AWS hosts the data infrastructure for the lab, provides technical and business development training and support, and offers up to ILS 370,000 in Activate credits for each eligible startup.

AWS's office in Tel Aviv includes **AWS Floor28**, a space where anyone interested in AWS can attend a wide variety of activities offered through **AWS Experience Tel Aviv**, including virtual and in-person technical sessions, workshops, and meetups, and receive free, in-person technical and business guidance from AWS experts.

Supporting the AWS Partner Network in Israel

The **AWS Partner Network (APN)** includes tens of thousands of independent software vendors (ISVs) and systems integrators (SIs) around the world. AWS Partners build innovative solutions and services on AWS, and the APN helps by providing business, technical, marketing, and go-to-market support to customers. The APN indirectly supports employment at over 170 **AWS Partners in Israel**. Of these AWS Partners, 145 are headquartered in Israel, making their services easily accessible for AWS customers in the country. The APN provides various benefits to AWS Partners, including a dedicated portal and business and technical training, enabling them to build innovative solutions and services on AWS for their customers and their end users.

Upon joining the APN, AWS Partners can enroll in the **Partner Path** that best aligns with their organization to validate their offerings and demonstrate their AWS expertise. AWS Partner Paths provide support for organizations that develop software running on AWS; develop hardware devices that work with AWS; deliver consulting and professional services; sell, deliver, or incorporate AWS training; and recruit, onboard, and support other AWS Partners to resell and develop AWS technologies.

AWS Partners help customers of all sizes, ranging from startups to enterprises, migrate to AWS, deploy applications, and provide a full range of support for their AWS environments. Examples of Israel-based AWS Partners include ABNET, AllCloud, AppsFlyer, Automat-IT, BigPanda, BrightData, Bynet, Checkmarx, Cloudinary, CloudRide, Commit, Compie, DoIT International, Deloitte, Firebolt, Granulate (An Intel Company), Incredibuild, Kaltura, Kyndryl, Matrix CloudZone, NAYA Technologies (part of EPAM Systems), Ness, One1, Orca Security, Salt Security, TCS, TeraSky, Sela, E&M Computing, Elad Software Systems, Wiz, and Yael Software.

The Nimbus framework has generated opportunities for AWS Partners in Israel to generate new revenue streams supporting government IT organizations' cloud migration and modernization, and adoption of advanced uses for cloud computing. For example, **Malam Team** provides IT solutions that enable other AWS Partners to offer their own solutions to government ministries under the existing Nimbus framework. System integrators and AWS Partners like **Ness** have also partnered with AWS under the Nimbus framework to offer their digital transformation services to Israeli government ministries.

AWS Customers in Israel

Millions of active customers in over 190 countries use AWS every month, and in Israel, over 10,000 businesses are estimated to use AWS. Organizations choose AWS to run their mission-critical workloads to drive cost savings, accelerate innovation, and increase speed time-to-market. Customers in Israel that have built their businesses on AWS include Amdocs, Ayalon Insurance, Bank Leumi, Bizzabo, CyberArk, Fiverr, Gamoshi, Gett, Gong, Harel Insurance, Hashavshevet, Innovid, ironSource, JFrog, Kaltura, Lumigo, Migdal, monday.com, Netafim, Operative, Perion, Rami Levy, Sentinel One, SimilarWeb, Tnuva, Wiz, and Yad2. AWS technologies enable our customers to rapidly scale and expand their geographic reach in minutes. In the Israeli public sector, organizations that use AWS to transform the services they deliver to citizens include the government of Israel, the Center for Educational Technology, the Ministry of Health, Technion–Israel Institute of Technology, Tel Aviv University, Tel Aviv Sourasky Medical Center, and the Weizmann Institute of Science.

The following case studies illustrate the diverse ways in which AWS enables companies and public sector organizations in Israel to innovate, grow their impact, and, in recent times, help Israeli citizens adapt and persevere throughout major global events.

Enabling Private Sector Solutions

Teva Pharmaceutical Industries Ltd., a major worldwide pharmaceutical company, uses AWS to inform the management of respiratory conditions by providing patients and healthcare professionals with objective data on inhaler usage. Teva used a group of AWS services—including **AWS Lambda** and **Amazon Simple Storage Service** (Amazon S3)—and worked alongside AWS Premier Consulting Partner Onica, a Rackspace Technology company, to construct its serverless architecture for its family of digital inhalers. Using AWS services, Teva established a digital health platform (DHP) for the digital inhalers in less than a year—a cloud system that meets regulatory, privacy, and security requirements.

"The maturity of the AWS infrastructure and the level of security audits that AWS performs on its data centers and services gave us peace of mind," said Mark Maalouf, VP of Global Digital Health at Teva. "We knew that the privacy and security of patient and customer data would be the top priority."

"Because the system holds both protected health information and personally identifiable information, we needed to give the patient control over who can access their data, such as their physician," said Yaron Nir, head of the Digital Health Platform. "In less than a year, we developed and deployed a digital health platform on top of AWS."

Kaltura, the video experience cloud for virtual events, webinars, video sites, and cloud TV, powers its cutting-edge video solutions for educational institutions, media and telecom companies, and businesses of all industries, with AWS. Kaltura began migrating its workloads to AWS in 2014 and has adopted over 30 AWS technologies, including **Amazon EC2**, **Amazon S3**, **Amazon CloudFront**, **AWS Elemental MediaLive**, and **AWS Elemental MediaPackage**. Running on AWS, Kaltura powers video for over 50% of the top U.S. research universities, 15 major cloud TV services, and 28% of the Fortune 100 companies, including Amazon. Amazon hosted multiple AWS virtual events worldwide using the Kaltura platform, including AWS re:Invent 2020 and select AWS Summits, engaging hundreds of thousands of individuals.

"Our longstanding work with AWS has enabled us to launch ground-breaking, cloud-based video products and solutions for live, simulive, real-time, and on-demand use cases in record time, as well as massively scale up our workloads, and significantly expand our global reach," said Liad Eshkar, EVP Business Development at Kaltura. "Due to the reliability, flexibility, security, and scalability of one of the world's leading clouds, as well as the breadth and depth of AWS services like analytics and media services, we are able to drive innovation and develop engaging user experiences for millions of end users powered by our video experience cloud. We will continue to innovate with AWS, as a trusted cloud provider, to enable customers to harness the power of video to boost collaboration, productivity, and engagement."

Accelerating Public Sector Innovation

AWS is committed to **advancing the field of quantum computing in Israel** through the benefits provided by AWS and our financial support for academic research. Quantum computing allows for more efficient processing of data than classical computing—with potential benefits extending beyond the IT sector to the entire global economy. The **AWS Center for Quantum Computing** funds research performed by the **Hebrew University of Jerusalem's Racah Institute of Physics** to advance the design of quantum gates—the building blocks of quantum computing circuits—which will increase the scalability of quantum computing solutions through gains in efficiency and reduced costs.

The **AWS Cloud Credit for Research Program** provides independent researchers at the **Hebrew University of Jerusalem, Bar-Ilan University, the Technion Israel Institute of Technology, and the Weizmann Institute of Science** with access to **Amazon Braket**. Amazon Braket is a fully managed quantum computing service that enables users to build, test, run, and analyze the results of quantum algorithms. Participating researchers can use Amazon Braket and AWS technologies to securely access and test applications using quantum, classical high performance, and quantum-inspired computing technologies, all from the same console. These are just some examples of AWS-supported research in the field of **quantum computing**.

AWS provided crucial support to the **Center for Education Technology (CET)**, as it developed a **remote learning solution** for 1.8 million students in Hebrew and Arabic during the COVID-19 pandemic. In less than 48 hours, developers tested a live, end-to-end video production workflow built with AWS media services and Amazon CloudFront that students could access through a variety of digital devices and cable TV providers. The solution uses **Amazon CloudWatch** and **Amazon Simple Notification Service** (Amazon SNS) to track viewership and engagement metrics used by the Ministry of Education to evaluate content effectiveness and learner progress. Within a week of launching the service, CET reported hundreds of thousands of unique users across all platforms.

"Working with AWS teams 24×7 and leveraging AWS expertise in media, networking, security, and analytics, we were able to deliver a solution in this extraordinary time," said Haim Hershko Yavor, CIO of CET. "This experience opened our eyes to the tremendous capabilities that can be accomplished by using AWS."

The **Ramat Gan Municipality** has a population of over 150,000 and is located near Tel Aviv in central Israel. Ramat Gan is a major hub for business and commerce and is home to many high-tech companies and financial institutions, as well as one of the world's largest diamond exchanges. Ramat Gan uses AWS to run its local website, which provides the public with free access to register for events, securely make payments to the municipality, and locate points of interest in the city. Using **Amazon EC2**, **Amazon Relational Database Service**, and **Elastic Load Balancing**, Ramat Gan can build scalable, automated systems quickly, at a fraction of the cost. This capacity enables the municipality to continue offering an agile, seamless customer experience during peaks of the year when thousands of citizens enter the website at once for registration purposes.

"The support provided by AWS personnel is exceptional while putting the customer at the center," *said Kobi Noah, Ramat Gan Municipality CIO. "AWS technology improves our availability and has enabled us to build the security infrastructure needed to serve the public, while realizing significant savings in costs and resources and deepening business continuity. The team helps us with the technological challenges we encounter as we move forward to becoming a smart and advanced city."*
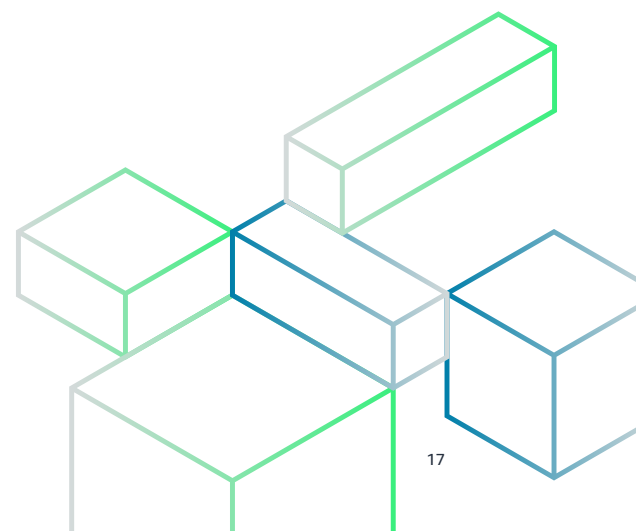
AWS Training and Workforce Development Programs in Israel

AWS technology makes innovation possible, but it's people who get the work done. AWS offers a variety of training and certification programs that help the Israeli workforce develop digital skills and adopt cloud technologies.

AWS Training and Certification **(T&C)** equips individuals and teams with the skills to use AWS to innovate in the digital world. With training designed by experts at AWS, we empower learners at all levels to build with confidence and enable leaders to drive transformation and deliver results in their organizations.

Since establishing local training operations in Israel, AWS T&C has delivered training and certification programs to individual learners, customers, and AWS Partners to rapidly build cloud skills and close the skills gap. In December 2020, **Amazon announced that it will help 29 million people around the world grow their tech skills with free cloud computing skills training by 2025**. To accelerate this, in 2021, we launched AWS Skill Builder, a digital learning experience available in more than 200 countries and territories, which provides free skills training to millions of people globally. Anyone with an internet connection and a desire to learn can quickly and easily access over 600 free on-demand courses in up to 14 languages. AWS continues to play a key role in making machine learning (ML) more accessible to anyone who wants to use it. We offer more than 70 courses and learning resources on ML and artificial intelligence (AI) through AWS Skill Builder and AWS Educate for learners of varying backgrounds and experiences.

With **AWS Skill Builder Individual and Team subscriptions**, customers unlock new features like gamified and challenge-based learning, access to more than 125 **AWS Builder Labs**, unlimited practice within the **AWS Console**, official **AWS Certification** practice exams and prep courses, and administrative benefits like assigned learning and progress reports to scale learning and inform learning plans with data. We are continuing to add new features and training experiences to deepen the learning. We also offer live, classroom-based training (delivered virtually or in person) taught by AWS experts, using presentations, discussions, and hands-on labs. In Israel, in addition to AWS-delivered training, we work with local AWS Training Partners, including AllCloud, Sela, and John Bryce Training.
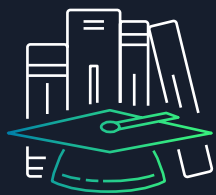
AWS Academy provides higher education institutions with a free, ready-to-teach cloud computing curriculum to prepare students for careers in the cloud, including earning industry-recognized AWS Certifications. AWS Academy curriculum helps educators stay at the forefront of AWS cloud computing innovation, equipping them to teach courses such AWS Academy Cloud Foundations, AWS Academy Cloud Architecting, AWS Academy Machine Learning, and AWS Academy Data Analytics. Several universities in Israel have delivered AWS Academy courses as part of their curriculum, including Bar Ilan University, Ben-Gurion University of the Negev, Interdisciplinary Center Herzliya, Jerusalem College of Technology, the Academic College of Tel Aviv-Yaffo, and University of Haifa.
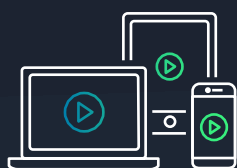
AWS Educate offers free, self-paced digital training to individual learners who are self-motivated to learn about the cloud. Through AWS Educate, students who are 14 years old or older can access hundreds of hours of training and resources curated specifically for new-to-the-cloud learners. Training content is organized into six groups, including Most Popular Courses and Labs, Cloud Skill Basics, Cloud Skill Advanced, Prepare for Workplaces, Learn on Twitch, and Young Learner. AWS Educate also offers 10 free hands-on labs to learn, practice, and evaluate cloud skills in the AWS Management Console.

AWS re/Start is a free, cohort-based workforce-development program that prepares individuals for careers in the cloud and connects them to potential employers. The program aims to build local talent and is designed for unemployed and underemployed individuals who have little to no technical experience. In 2021, AWS launched AWS re/Start in Israel in collaboration with Appleseeds Academy, a nonprofit that promotes digital equality in Israel by developing and implementing programs in the areas of technology, employment, and life skills in underserved communities in Israel's social and geographic periphery.

AWS GetIT is an initiative designed by AWS to encourage 12-14-year-old girls to consider a career in tech—challenging long-standing gender stereotypes. The objective is to help young people build practical digital skills and relevant work experience. AWS GetIT invites teams from different schools to an app-building competition to solve real issues faced by their school or community. Along the way, participants learn practical digital and IT skills, get experience working as a team, and gain self-confidence by presenting ideas to wider audiences – all while being exposed to IT as a potential career. AWS GetIT became available in Israel in November 2021, and now operates in 68 schools across the country, mainly in disadvantaged and rural communities. The program is being delivered in English via English school teachers with support in Hebrew and Arabic.

AWS and Sustainability
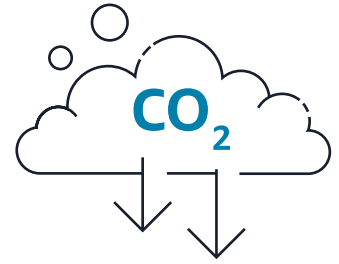
Our Climate Pledge to Achieve Net-Zero Emissions

Amazon is committed to becoming a more sustainable business. As co-founder and first signatory of **The Climate Pledge** in 2019, Amazon is now among the more than 400 other signatories that are committed to reaching net-zero carbon by 2040—10 years ahead of the **Paris Agreement**.

Amazon is the world's largest corporate purchaser of renewable energy and is on a path to powering our operations with 100% renewable energy by 2025—five years ahead of our original target of 2030. AWS moves toward 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.

In 2023, Amazon announced **401 renewable energy projects in 22 countries globally**. This brings Amazon's total portfolio to more than 20 gigawatts (GW) of clean energy capacity, an amount that could generate enough electricity to power 5.3 million U.S. homes. With these continued investments, Amazon set a new corporate record in 2022 for the most renewable energy usage announced by a single company in one year. The company remains the largest corporate buyer of renewable energy—a position it has held since 2020, according to **Bloomberg New Energy Finance**.

Achieving Emissions Reductions With AWS

Analysis by 451 Research shows AWS's infrastructure is **3.6 times more energy efficient than the median of the surveyed U.S. enterprise data centers**, and **up to five times more efficient than the average of surveyed European enterprise data centers**. This is a result of efficiency advantages at both the server and facility levels in our cloud infrastructure and translates into dramatically less energy used to perform the same unit of work.

AWS designs server systems with great attention to power optimization, using the latest technology components. It runs servers at higher-usage levels than enterprise data centers, leveraging the ability to share and dynamically allocate resources in the cloud. The **AWS Graviton3** processor designed by Annapurna Labs is an example of how the company builds hardware with sustainability in mind. Graviton3-based Amazon EC2 instances use up to 60% less energy for the same performance than comparable Amazon EC2 instances. In addition to energy reduction, Graviton3 offers 25% faster speeds, providing boosted performance for science, cryptographic, and ML workloads.

Facility-level improvements in efficiency include data-center designs that use lower-energy methods and a leaner electrical infrastructure, resulting in lower-energy losses to power distribution. As Israeli customers migrate their workloads from enterprise data centers to AWS, the carbon footprint of these workloads is reduced due to much lower energy consumption. Other initiatives to ensure energy efficiency include live displays of energy consumption on screens in buildings, the use of energy-efficient lightbulbs and lighting controls (occupancy sensors and daylight sensors), and energy-efficient equipment based on energy star labels.

Reducing Water Usage in AWS Data Centers

In addition to our efforts on energy efficiency and commitment to renewable energy, AWS is committed to conserving and reusing water—both in our on-site operations and by working with private and public entities to support water availability in communities where it operates data centers. On the hottest days when AWS needs water for cooling, our data centers have optimized their systems to use minimal water. Outside air is cooled through an evaporative process and pushed into the server rooms to keep hardware at stable operating temperatures. During cooler months, where possible, outside air is supplied directly to the data center without needing to be cooled. AWS is constantly innovating the design of our data center's cooling systems, and uses real-time sensor data to adapt to changing weather conditions to further reduce water use.

AWS also evaluates the opportunity to reduce our consumption of potable water and is actively expanding the company's use of non-potable and recycled water for cooling purposes. In certain regions, the company works directly with utilities and regulators to obtain approval for the use of recycled water in direct evaporative cooling technology. AWS is continuing to work with water utilities in various regions to expand this recycled water infrastructure. Through these actions, AWS actively contributes to sustainable water solutions by reducing our impact on the local potable water supply for the communities where we operate. AWS also uses on-site, modular water-treatment systems in multiple regions, which allow the company to remove scale-forming minerals and reuse water for more cycles. Increasing the "cycles of concentration" contributes to reducing the water intake needed to cool data centers. Along with reducing water usage, AWS also looks for opportunities to return water to the communities where we operate.

Returning More Water to Communities Than AWS Uses

Addressing the issue of water scarcity for residents living in water-stressed areas, AWS has committed to becoming **water positive (water+) by 2030**. As part of this commitment, AWS will return more water to communities than we use in our direct operations. The company announced our 2021 global water use efficiency (WUE) metric of 0.25 liters of water per kilowatt-hour, demonstrating AWS's leadership in water efficiency among cloud providers. AWS is already well on the path to becoming water+ and, as part of this new commitment, will report annually on our WUE metric, new water reuse and recycling efforts, new activities to reduce water consumption in our facilities, and advancements in new and existing replenishment projects.

This initiative adds to Amazon's **ILS 370 million commitment** to **Water.org** to support the launch of the Water & Climate Fund, which will deliver climate-resilient water and sanitation solutions to 100 million people across Africa, Asia, and Latin America. This donation will directly empower 1 million people with water access by 2025, providing 3 billion liters of water each year to people in water-scarce areas.

Helping Customers Become Sustainable Cloud Users

The **Sustainability Pillar in the AWS Well-Architected Framework** helps customers improve their cloud architecture, which consists of design principles, questions, and best practices across six pillars—Operational Excellence, Security, Reliability, Performance Efficiency, Cost Optimization, and Sustainability. The Sustainability Pillar helps AWS customers structure their cloud architecture to reduce energy consumption and improve efficiency. The framework helps customers reduce their carbon footprint by integrating sustainability goals, impact measurements, maximized workloads, managed services, and actions to reduce downstream energy usage.

AWS also offers the **customer carbon footprint tool** to help customers calculate the environmental impact of their AWS workloads. The tool uses easy-to-understand data visualizations to provide customers with their historical carbon emissions, evaluate emission trends as their AWS use evolves, estimate the tonnage of carbon emissions avoided by using AWS instead of an on-premises data center, and review forecasted emissions based on current use. The forecasted emissions are based on current usage and show how a customer's carbon footprint will change as Amazon stays on path to powering our operations with 100% renewable energy by 2025 and drives toward net-zero carbon by 2040 as part of The Climate Pledge.

Accelerating Innovation in Climate Analysis

The **Amazon Sustainability Data Initiative (ASDI)** seeks to accelerate sustainability research and innovation by helping customers minimize the cost and time required to acquire and analyze large sustainability datasets. ASDI supports innovators and researchers with the data, tools, and technical expertise they need to move sustainability to the next level. ASDI currently works with scientific organizations including the National Oceanic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA) to identify, host, and deploy key datasets in AWS, including weather observations, weather forecasts, climate projection data, satellite imagery, hydrological data, air quality data, and ocean forecast data. These datasets are publicly available to anyone.

Economic Impact Study Methodology

To measure the economic impact of data center investments, AWS uses a Nobel Prize– winning model developed by Harvard economist Wassily Leontief: the input-output (I-O) model. The institutions that use this model include G20 governments and most blue-chip businesses.[6] In processing the model, AWS uses a conservative framework to define investment and calculate economic multipliers, which represents the "as built" world. AWS Economic Impact Studies can be directly correlated with what it took, or what AWS is actively planning to do, to construct, connect, operate, and maintain the data centers in a given region.

I-O models are used to measure the impact of the expansion or contraction of one economic activity on other economic activities, and on the local economy as a whole. In the I-O model, "local" is typically a country, but could also be a smaller region, e.g., a county in the U.S., a region in the EU (e.g., Lombardy in Italy), or a state in Australia (e.g., Victoria). This method uses historical country data maintained by the country's government statistical agency or the OECD.

Input-output tables show the impact of each unit of currency spent in one industry on all other industries. For example, one U.S. dollar spent on construction might typically be associated with 20 cents spent on electricity and other utilities.

AWS also uses Amazon company data on AWS operations and investments tied to constructing and operating data centers. The methodology uses standard procedures for calculating multipliers from the input-output data published by the OECD. See, for example, Ronald Miller and Peter Blair, "**Input-Output Analysis: Foundations and Extensions,**" 2009, Cambridge University Press. The estimated economic impacts are the cumulative effects of:

- Direct effect, which is the change in employment, earnings, and GDP created by AWS's direct suppliers in a country as a result of the AWS investment, such as construction firms, colocation providers, or power companies.

- Indirect effect, which is the change in employment, earnings, and GDP created by the indirect suppliers, which supply to AWS's direct suppliers as a result of the AWS investment, such as construction labor and materials.

- Induced effect, which is the change in employment, earnings, and GDP created by the firms that supply household goods to workers at Amazon companies and AWS's direct and indirect suppliers.

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[6] A blue chip is a nationally recognized, well-established, and financially sound company.