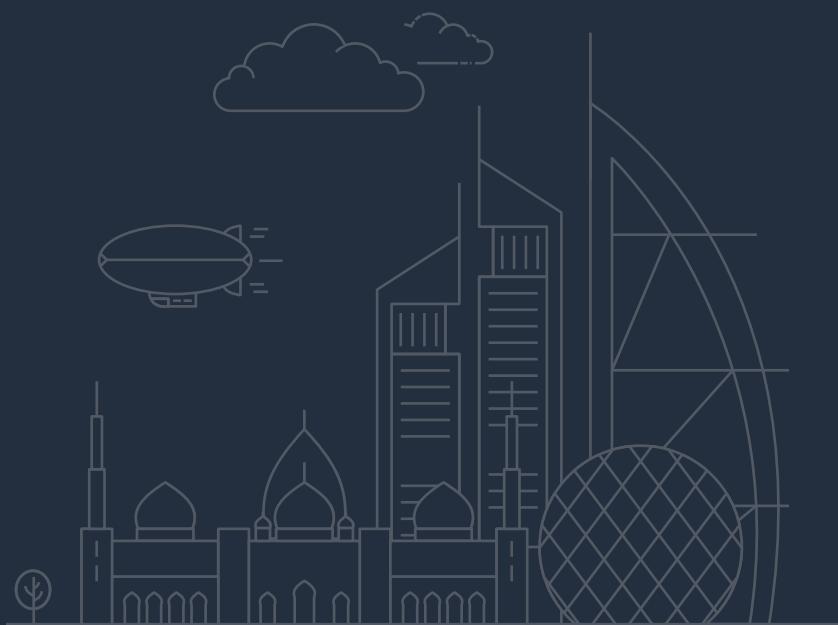
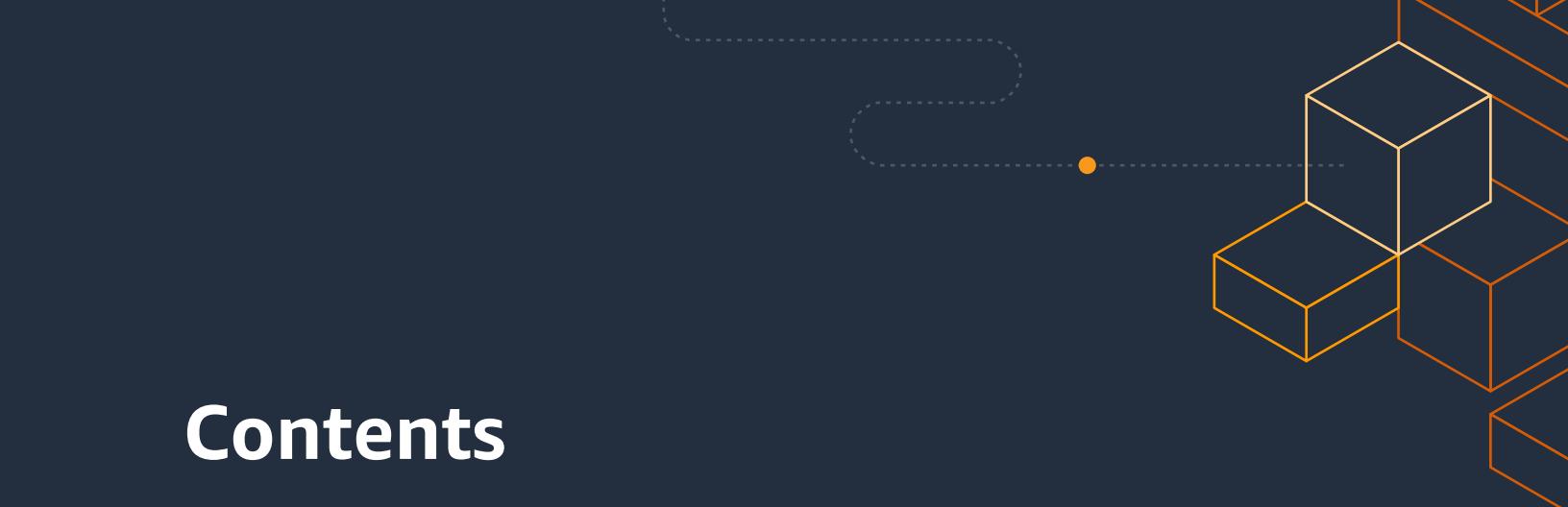


AWS Economic Impact Study

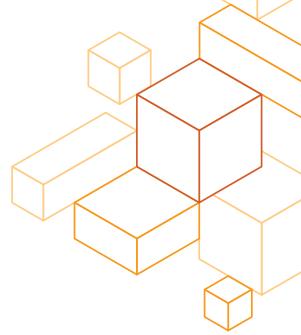
AWS Investment in the UAE





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Executive Summary

**AED 20.1
billion**

Total capital and operational investment associated with the AWS Middle East (UAE) Region during 2022–2036

**AED 41
billion**

Gross domestic product (GDP) contributed to the UAE by the AWS Middle East (UAE) Region during 2022–2036

**5,984
jobs**

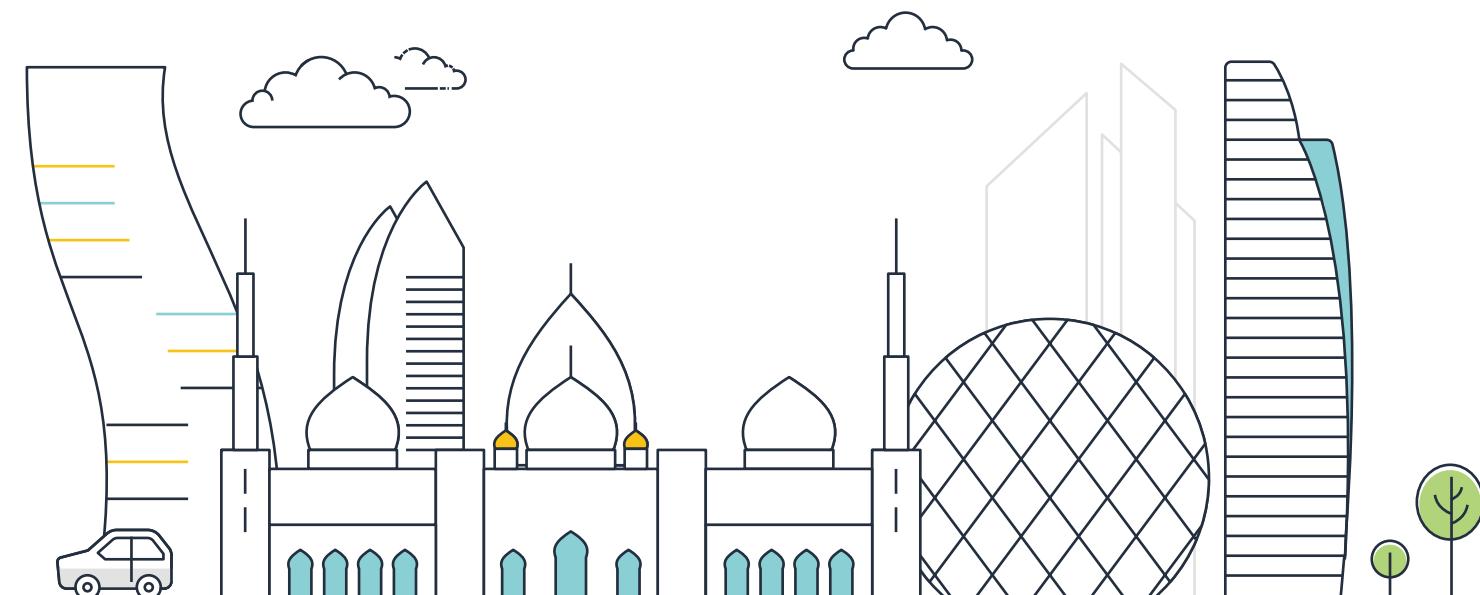
Average annual full-time jobs supported by the AWS Middle East (UAE) Region at external vendors during 2022–2036

Amazon Web Services (AWS) launched a new AWS Region in the United Arab Emirates (UAE) in 2022, along with a plan to expand related infrastructure and operations through 2036. The new AWS Middle East (UAE) Region consists of three Availability Zones (AZs) and is the second AWS Region in the Middle East, following the existing AWS Region in Bahrain, giving customers more choice and flexibility to use advanced technologies from the world's leading cloud. The new AWS Middle East (UAE) Region enables UAE-based customers with data residency requirements to store their data in the UAE while providing even lower latency across the country.

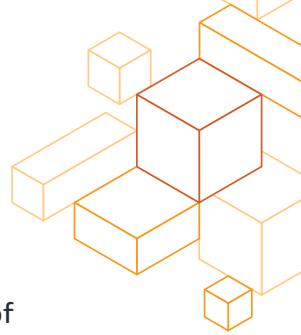
In addition to bringing cutting-edge cloud technology to AWS customers in the UAE, the construction and operation of AWS infrastructure in the country supports billions of dirhams (AED) in revenue at businesses in the AWS supply chain and resulting compensation paid to workers in skilled technical, and information and communications technology (ICT) roles. AWS investments in the UAE advance the priorities outlined in [UAE Vision 2021](#) by growing the knowledge economy through development of cloud skills, investing in world-leading sustainable digital infrastructure, and providing services that enable AWS customers to implement innovative solutions across all industries. This AWS Economic Impact Study (EIS) quantifies the following key benefits:

- AWS plans to **invest up to AED 20.1 billion in the AWS Middle East (UAE) Region by 2036**, including both capital and operating expenditures associated with establishing and operating the AWS Region in the UAE. This investment includes all cash expenses directly attributable to the project, such as imports of highly specialized and proprietary equipment and software, and in-country spending on construction and operations.
- This EIS estimates investment associated with the **AWS Region will contribute AED 41 billion to the UAE economy**, using Amazon data, the input-output methodology, and statistical tables provided by the [UAE Federal Competitiveness and Statistics Centre \(FCSC\)](#) and the [Dubai Statistics Center \(DSC\)](#). The GDP contribution includes value added by the sale of AWS services to the UAE's information and communications technology (ICT) sector and in-country spending on goods and services related to the construction and operation of AWS data centers.

- Using the same input-output methodology and data, this EIS estimates that **AWS investment associated with operating the AWS Region during 2022–2036 will support an average of 5,984 full-time jobs annually at external vendors in the UAE**. Investment associated with the AWS Region operations and activities supporting use and adoption by AWS customers and partners supports employment of skilled technical and ICT workers in sectors such as telecommunications, software development, facilities maintenance, electricity generation, and data center operations.
- AWS investment in education and training programs will provide millions of students, higher education learners, and ICT professionals in the UAE with access to free courses to start or advance their cloud career. To support the business community, **AWS will provide subsidized classroom-based cloud computing AWS training sessions for thousands of ICT professionals employed with any of the 400,000 small and medium enterprises (SMEs) registered with the UAE SME Council**. By investing in cloud education and training, AWS provides customers in the UAE with talent to accelerate their digital transformation.
- AWS is committed to running our business in the most environmentally friendly way possible by investing in energy-efficient and sustainable infrastructure. According to 451 Research, a part of S&P Global Market Intelligence, **moving workloads from the median US enterprise data center to AWS can lower customers' workload carbon footprint by 88%**. **AWS's infrastructure was found to be 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 utilization.



AWS Overview



Cloud computing is the on-demand delivery of ICT resources over the internet. Instead of buying, owning, and maintaining servers, customers access computing power, data storage, and other services 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 ICT model, where the expenses come as a fixed cost. Organizations of every type, size, and industry use the cloud for various use cases, such as data backup and recovery, software development and testing, data analytics, enterprise resource planning, email, virtual desktops, contact centers, and customer-facing web services.

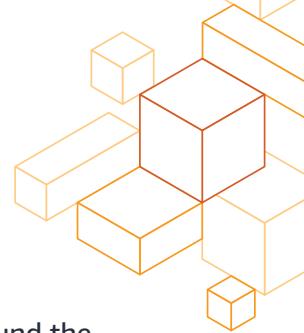
Cloud computing users have access to a broad range of the latest technologies, so they can innovate faster, experiment freely, and quickly access resources as needed. They do not have to over-provision resources upfront to handle peak levels of business activity in the future. Instead, they provision only the resources they need. AWS is the world's most comprehensive and broadly adopted cloud provider, offering over 200 fully featured products and 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 helps our customers launch and grow their businesses. Access to cloud computing lowers the cost of starting new businesses, encourages innovation, and 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%. 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.”¹

In addition to economic gains, replacing in-house computing with cloud technology is better for the environment. In 2019, Amazon co-founded The Climate Pledge. As part of [The Climate Pledge](#), Amazon and over 300 other signatory businesses have committed to be net-zero carbon across their business by 2040, 10 years ahead of the Paris Agreement. As a result, Amazon is on a path to powering AWS operations with 100% renewable energy by 2025—five years ahead of the AWS original target of 2030. AWS contributes toward these goals by constantly improving the energy efficiency of AWS computing resources and by increasing the share of renewable energy in total consumption by AWS data centers. As a result, the carbon footprint of cloud computing with AWS is much lower than that of in-house and most other data center providers. By adopting AWS technology, private and public sector organizations can take advantage of the energy efficiency and clean energy goals of AWS while meeting their own computing needs.

¹Ewens M., Nanda R., and Rhodes-Kropf M. Cost of Experimentation and the Evolution of Venture Capital. NBER Publications. National Bureau of Economic Research, 2018.

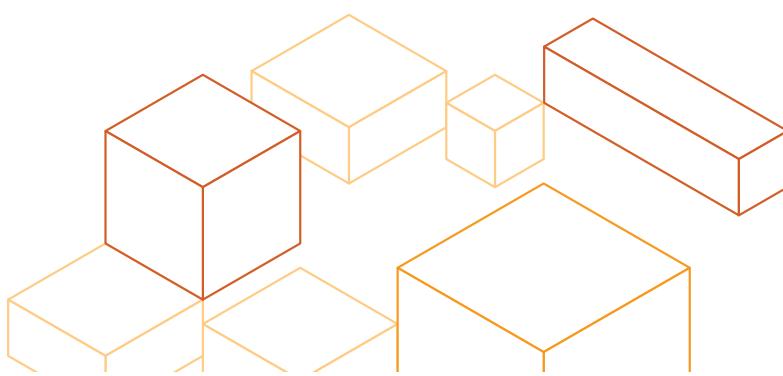
AWS in the UAE

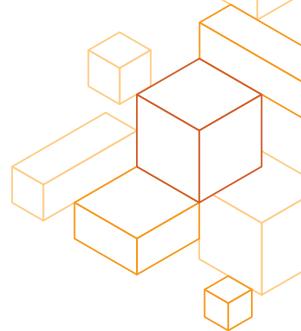


Millions of active customers use AWS technologies every month in over 190 countries around the world, including tens of thousands of customers in the Middle East and North Africa (MENA). UAE-based enterprises, startups, and public sector organizations use AWS to innovate products and services, accelerate their growth, and provide improved service to UAE-based customers and UAE residents.

AWS offers support to promote adoption and use of cloud technologies by startups in the UAE and around the globe through [AWS Activate](#). AWS Activate has helped hundreds of thousands of early stage startups grow their businesses on AWS with powerful tools and resources, including AWS credits. Startups that qualify for AWS Activate can use the credits for scalable, reliable, and secure services, such as compute, storage, database, analytics, Internet of Things (IoT), and artificial intelligence (AI) and machine learning (ML). During 2020 and 2021, AWS provided more than AED 7.35 billion in credits globally to help startups accelerate and build their businesses. In the UAE, AWS is partnering with technology accelerators, incubators, and venture capital funds including but not limited to Techstars, Hub 71, DIFC Fintech Hive, In5, DTEC, DisruptAD, MEVP,500 Falcons, BECO Capital, Shoroq Partners & Wamda Capital to maximize the benefits offered by AWS Activate. These partnerships include collaboration to identify eligible startup businesses and enable them to join the growing AWS startup community through technical mentorship and training that facilitates use of AWS Cloud services.

The [AWS Partner Network](#) (APN) helps AWS customers build, migrate, and accelerate their business in the cloud. The APN indirectly supports employment at over 100 AWS Partners actively offering services in the UAE, of which approximately a third are headquartered in the country. The APN helps AWS Partners build innovative solutions and services on AWS for their customers and end users, by providing partners with access to a dedicated portal, business and technical support and training, and benefits. Upon joining the APN, AWS Partners can enroll in the [Partner Path](#) best aligned with their organization to validate their offerings and demonstrate their AWS expertise. AWS Partner Paths provide support for organizations that develop software that runs 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 their partners to resell and develop AWS solutions. Examples of UAE-based AWS Partners include Bespin Global MEA, Citrus Consulting, Du, Etisalat, Integra Technologies, Keplerworx, Redington, and Zero & One.

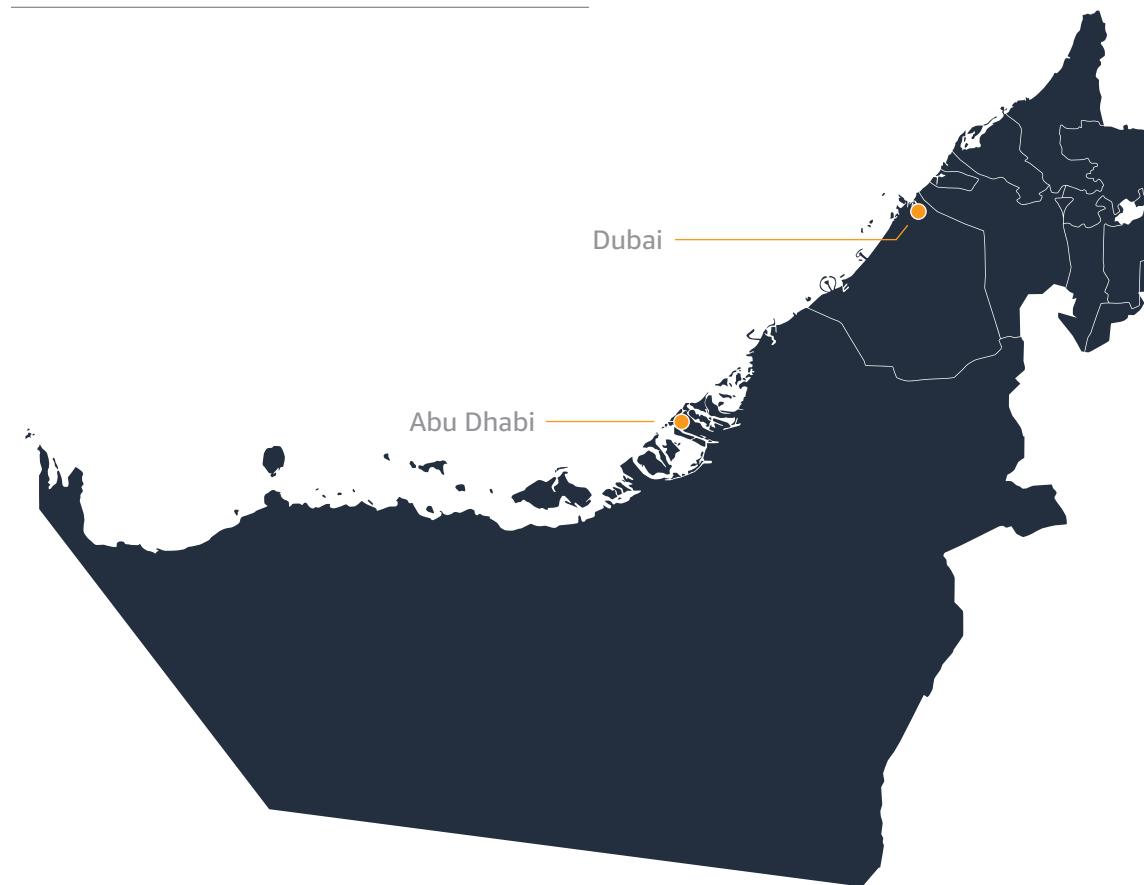


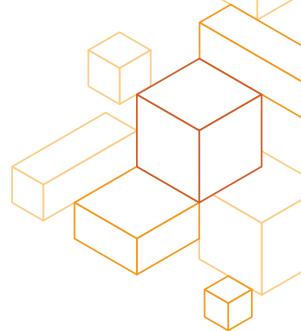


To further enable the AWS Partner community in the Middle East, in 2020, AWS launched AWS Marketplace and AWS Data Exchange in the UAE. AWS Partners based in the UAE can now transact in [AWS Marketplace](#) and [AWS Data Exchange](#), empowering them to access and market to AWS's millions of customers around the world. AWS's global customers can purchase directly from the UAE-based software and data providers through AWS Marketplace and AWS Data Exchange, selecting from a total of 10,000 software listings and data products from more than 2,500 sellers globally.

Over 350 Amazon employees in regular full- and part-time roles support UAE-based AWS customers and partners from offices and infrastructure located in the country. These workers include the operations technicians and engineers that support AWS infrastructure. They also include the solutions architects, sales representatives, software developers, professional services consultants, and business development professionals that develop AWS technologies and support AWS use and adoption by customers and partners. Using historical data, this EIS projects that Amazon will hire hundreds of new employees to support infrastructure and operations associated with the AWS Middle East (UAE) Region and to support growing demand for AWS by customers in the UAE and across the Middle East.

AWS Middle East (UAE) Region





AWS Network Services and Infrastructure in the UAE

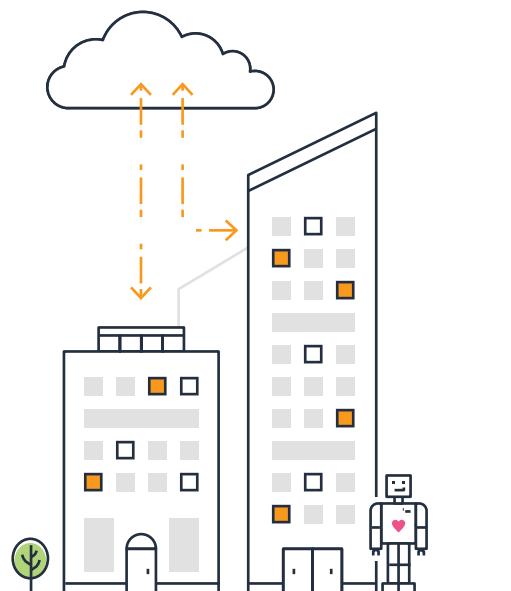
The launch of the AWS Middle East (UAE) Region adds to the history of continued AWS investment in infrastructure and corporate operations in the UAE and MENA. In 2018, AWS launched two [Amazon CloudFront](#) edge locations in the UAE. The edge network locations enable customers to access Amazon CloudFront and Route 53 services. CloudFront accelerates the delivery of data, videos, applications, and APIs to users worldwide through AWS edge locations, and Route 53 enables customers to reliably route end users to internet applications.

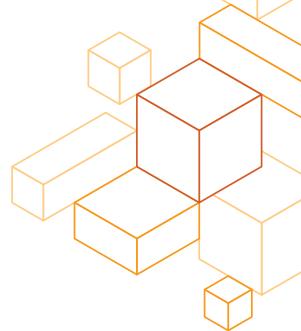
In 2018, AWS also launched two [AWS Direct Connect](#) locations in the UAE, which enable customers to establish private connectivity between AWS and their data center, office, or colocation environment. This can reduce network costs, increase bandwidth throughput, and provide a more consistent network experience. AWS operations technicians and engineers ensure continued operation of AWS infrastructure.

In 2020, AWS brought [AWS Outposts](#) to the UAE, providing customers based in the country with the ability to run AWS compute, storage, database, and other services on premises. AWS Outposts deliver fully managed and configurable compute and storage racks built with AWS-designed hardware that enable AWS customers to build and run applications using the same programming interfaces as in AWS Regions, while using local compute and storage resources for lower latency and local data processing needs.

The AWS Middle East (UAE) Region launched in 2022 has three Availability Zones (AZs). [AWS Regions](#) are physical locations around the world with multiple, isolated, and physically separate AZs, or clusters of logically connected data center infrastructure, in a geographic area.

Unlike other cloud providers, which 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 by redundant, ultra-low latency networks. AWS customers focused on high availability can design their applications to run across multiple AZs to achieve even greater reliability. AWS Regions meet the highest levels of security, compliance, data protection, and data privacy in their design and operations.





Economic Impact of Planned AWS Investment in the UAE

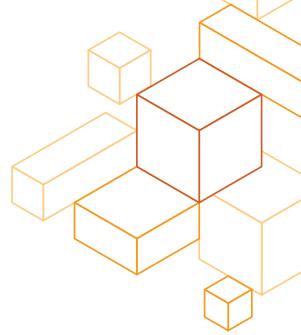
AWS plans on **investing up to AED 20.1 billion in the AWS Middle East (UAE) Region by 2036** as AWS expands related infrastructure and operations to support the projected growth in demand for AWS. This investment includes all cash expenses directly attributable to the AWS Region, such as imports of 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 billions of dirhams in recurring operating expenditures (OPEX), such as compensation for employees and contractors, utility fees, and facilities and rental costs. During 2022–2036, AWS plans on progressively expanding infrastructure and growing corporate operations to meet projected demand for AWS in the UAE and across the Middle East.

The AWS EIS estimates that the planned investment associated with **the AWS Middle East (UAE) Region will contribute AED 41 billion to the GDP of the UAE by 2036** using Amazon financial projections, the established input-output methodology, and statistical tables provided by the **FCSC** and the **DSC**.² GDP contributed by the AWS Region includes the value added by the sale of AWS technologies to the ICT sector in the UAE, as well as the direct, indirect, and induced effects of AWS purchases from the UAE data center supply chain. In-country purchases related to the operation of the AWS Region and activities supporting use and adoption by AWS customers and partners will **support an average of 5,984 full-time jobs annually at external vendors in the UAE during 2022–2036**. These jobs include the following:

- **2,049 jobs annually sustained by direct effects**—jobs at AWS suppliers directly supported by AWS investment. These include jobs in sectors such as telecommunications, software development, facilities maintenance, electricity generation, and data center operations.
- **1,286 jobs annually sustained by indirect effects**—jobs in the AWS supply-chain indirectly supported by business-to-business transactions resulting from AWS investment. These include jobs in sectors that supply the skilled labor and services needed to fulfill work for AWS.
- **2,649 jobs annually sustained by induced effects**—jobs in the broader UAE economy supported by the household consumption of workers receiving compensation from AWS and the AWS supply chain. These include jobs in sectors that supply consumer goods and services to UAE households.

²See Appendix A for details of the methodology



AWS Prioritizes **Data Security and Compliance**

Customer Security Is an AWS Priority

AWS is committed to helping customers meet and exceed UAE laws and standards, and achieve the highest levels of security, privacy, and resiliency using AWS technology. AWS offers the most secure cloud environment available, meaning AWS customers have the freedom to build services quickly and efficiently using world-leading technology. The large network of AWS Partners in the UAE specializes in delivering security-focused solutions and helping customers manage compliance and secure their workloads in every stage of cloud adoption, from initial migration through day-to-day management.

AWS Regions Enable Our Customers To Keep Their Content Local

AWS customers always retain ownership and control of their digital content, including where it is stored, how it is stored, and what access is granted to whom. Customers can also choose to encrypt their content at rest or in motion, using AWS tools or supported third-party security solutions, while maintaining full control of the encryption keys. With 27 launched Regions globally, AWS customers can store their content in any of the AWS Regions in the Middle East or around the world, including the AWS Middle East (UAE) Region. Customers' content will not move between AWS Regions without their consent.

AWS Achieves Internationally Recognized Certifications and Attestations

Achieving compliance with UAE data protection regulations is critical for AWS customers supporting end users in industries regulated by UAE laws. AWS complies with the most rigorous internationally recognized standards in data protection. In the UAE, AWS enables customers with regulated data to comply with federal and emirate regulations to take full advantage of AWS. This includes the Information Assurance Regulation, Central Bank Cybersecurity Framework, and the UAE Health Data Law federally, in addition to emirate-level regulations.

AWS Helps UAE Customers Navigate an Evolving Security Environment

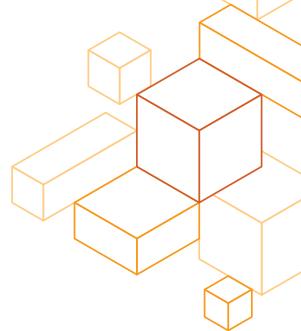
Earning and keeping the trust of AWS customers is the foundation of our business, and AWS knows protecting customer data is key to achieving this. AWS works closely with customers as they navigate new regulations around data security and privacy to understand their needs, and offers services, tools, and resources to secure their data.

AWS launched multiple online resources to help AWS customers more easily complete data transfer assessments and comply with UAE federal and emirate-level data privacy laws. These tools, developed in alignment with European Data Protection Board (EDPB) recommendations, help customers more intentionally transfer data between locations and disclose any transfer to end users. For example, the [privacy features for AWS table](#) helps customers determine whether their use of an AWS service involves the transfer of customer data (data uploaded to the customer's AWS account). These tools make it easier for AWS customers to incorporate AWS controls into their governance framework and applications.

AWS also offers a wide variety of tools to enhance the security of cross-border data transfers for customers with global services. For example, [AWS CloudHSM](#) and [AWS Key Management Service \(AWS KMS\)](#) allow customers to encrypt data in transit and at rest, and securely generate and manage control of encryption keys. As one answer to [confidential computing](#), the [AWS Nitro System](#) enables customers to secure their data during processing by using specialized hardware and associated firmware to protect customer code and content from outside access.

As AWS continues to enhance the capabilities of its on-demand services, customers can be confident that choosing AWS ensures that they have the tools necessary to meet the most stringent security, privacy, and compliance requirements.



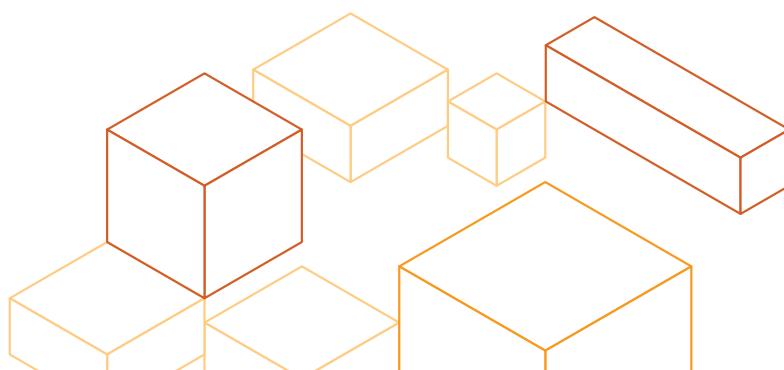


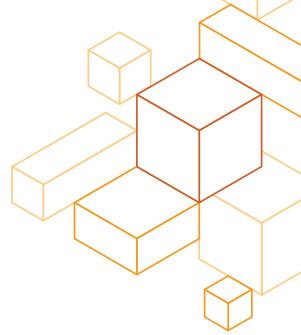
AWS Customers in the UAE: Private and Public Sector

Organizations Benefit from Cloud Technologies

Customers around the globe and in the UAE use AWS to run their mission-critical workloads to drive cost savings, accelerate innovation, and speed time-to-market. Enterprises in the UAE that choose AWS to become more agile and innovative include Majid Al Futtaim, Aramex, MBC Group, and First Abu Dhabi Bank (FAB), the UAE's largest bank. Startups building their businesses on top of AWS to scale rapidly include Anghami, the leading music platform in the Middle East; Sarwa, an investment bank and personal finance platform; and many more. In the UAE public sector, organizations using AWS to drive cost savings and acceleration innovation include Dubai Expo 2020, Hamdan Bin Mohammed Smart University (HBMSU), and the Mohammed Bin Rashid Space Centre (MBRSC).

The new AWS Middle East (UAE) Region provides an even larger number of local AWS customers in regulated industries with access to AWS technologies that enable their digital transformation. **First Abu Dhabi Bank (FAB)** established a cloud-first approach as one of the fundamental principles of their technology strategy. They use AWS Outposts for both development/test and production workloads, which has accelerated their digital transformation with 50% improved time-to-market. They have also seen 60% increased developer and infrastructure team productivity by using the same infrastructure, services, APIs, and tools across the cloud and on premises. The new AWS Region in the UAE will help them realize their cloud ambitions effectively and securely while being fully compliant with local regulations.



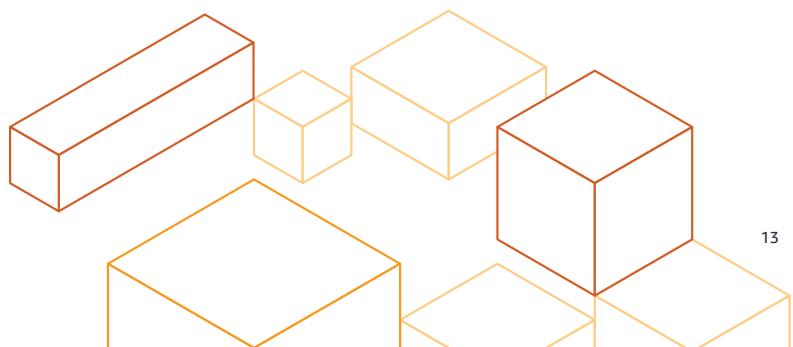


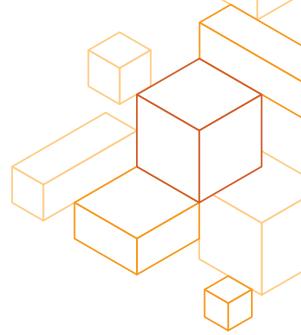
Startups benefit from the ability to use AWS technologies to reduce the costs and time associated with procuring and deploying ICT infrastructure, and rapidly scale up services to meet end user demand. **Careem**, the Dubai-based super-app offering ride-hailing, mass transportation, delivery, and payments services, used AWS to scale operations as it grew to become the Middle East's first unicorn, or startup with a value over one billion dollars, without sacrificing security. Using AWS to power and connect its backend applications enabled Careem to deploy end-to-end security solutions that limit fraud while it supported 10 times annual growth for three years in a row. Careem uses Amazon Neptune, a fully managed graph database, to track, flag, and automatically block user accounts using historical user data, with a 90% accuracy rate in identifying fraudsters. Careem can scale Amazon Neptune with its applications as the number of end users grows, and it plans on deploying an ML platform that can improve on the already high standard of fraud detection.

"Amazon Neptune is fully managed, which is a big advantage to us in terms of how many people we'd have to have working on this project, and the potential cost of infrastructure and maintenance," said Kevin O'Brien, senior data scientist at Careem. "Instead, that's all completely managed by AWS."

The benefits provided by AWS technologies extend beyond enabling business growth to providing organizations with the ability to deliver innovative solutions to stakeholders. **Alef Education** is all in on AWS with customers in the USA, UAE, and Indonesia serving more than 4,000 schools, 40,000 teachers, and 690,000 students. The global education technology company developed the Alef Platform on AWS, which provides a suite of digital products and services to support students' learning. The platform uses AWS machine learning services to personalize lesson plans and provide K-12 teachers with real-time feedback on students' progress. Alef Education uses AWS to help identify and resolve some of the most critical issues in the education sector while equipping future generations to succeed in a world driven by technology. With AWS, Alef Education can innovate faster, while also reducing ICT costs by 30%, data warehouse costs by 50%, and video stream size by 300%.

"We made the move to lower AWS costs and maximize AWS resources ... The ability to continue enhancing the AWS infrastructure is a key reason customers stay on the platform ... We don't have to be concerned about scaling. Because AWS manages the database for us, we stay focused on building software," said Amjad Khan, director of technology at Alef Education.





AWS technologies and global footprint of data centers enable AWS customers to scale globally and to the stars. In February 2021, the **Mohammed Bin Rashid Space Centre** (MBRSC) successfully launched the Hope Probe, the UAE's first interplanetary mission. AWS is powering the data journey of the mission, enabling data to be processed and analyzed from the probe's instruments, and accessed by the global scientific community in less than 20 minutes. The mission science data center is deployed on AWS and uses different available managed services and infrastructure to fully automate the mission's data management and processing.

Omran Al-Hammadi, senior manager of the science data section at MBRSC, said, "The Emirates Mars Mission 'Hope Probe' will be the first probe to provide a complete picture of the Martian atmosphere and its layers. It will help answer key questions about the global Martian atmosphere and the loss of hydrogen and oxygen gases into space over the span of one Martian year. The mission science data center is completely deployed on AWS and utilizes different available managed services and infrastructure to fully automate the mission's data management and processing."

AWS Training and **Workforce Development Programs** in the UAE



AWS technology makes innovation possible, but it's people who get the work done. [AWS Training and Certification](#) equips individuals and teams with the skills to innovate on AWS. With training designed by the experts at AWS, learners at all levels are empowered to build with confidence, enabling leaders to drive transformation and deliver results for their organization. AWS offers a variety of educational training and certification programs that help the UAE workforce develop digital skills and adopt cloud technologies.

In December 2020, Amazon announced it will provide free cloud skills training to 29 million people around the world by 2025. As part of this commitment, [AWS Skill Builder](#) launched in 2021, providing free digital cloud skills training to millions of people in more than 200 countries and territories, including the UAE. AWS Skill Builder enables anyone with an internet connection and a desire to learn to quickly and easily access 500+ free on-demand courses in up to 12 languages. Nearly 60 new cloud computing courses were added to the platform in the last year alone.

AWS partners with the UAE government to support its schools and students. Through [AWS Academy](#), educators at the Higher Colleges of Technology in Abu Dhabi and the Dubai campus of Murdoch University can receive a free, ready-to-teach cloud computing curriculum to stay at the forefront of AWS innovation and prepare students for cloud careers.

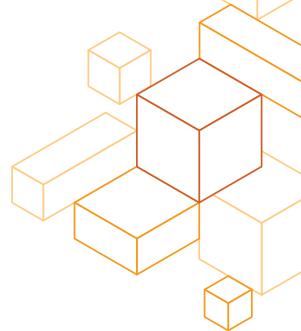




With **AWS Educate**, UAE students as young as 13 have free access to hundreds of hours of training and resources curated specifically for new-to-the-cloud learners. The easy-to-navigate and adaptive user experience guides learners to targeted training content based on their knowledge, goals, interests, and age. Course topics include analytics, cloud computing, development, AI/ML, network and infrastructure, security, and professional skills.

AWS is introducing programs to provide ICT professionals at SMEs with the cloud skills to accelerate their organization's digital transformation and growth. AWS will provide subsidized classroom-based cloud computing AWS training sessions for thousands of ICT professionals employed with any of the 400,000 SMEs registered with the UAE SME Council. Delivered by AWS instructors in person, learners will gain in-demand cloud knowledge and skills through presentations, discussions, and hands-on labs.

Additionally, AWS and the Abu Dhabi Investment Office (ADIO) are collaborating with local intermediaries and AWS training partners to provide SMEs with subsidized access to a customized cloud training program. The program will provide ICT professionals at Abu Dhabi-based SMEs with opportunities to train, upskill, and certify with in-demand cloud skills that will accelerate the digital transformation of their organizations.



AWS and Sustainability

Amazon Climate Pledge to Achieve Net-Zero Emissions

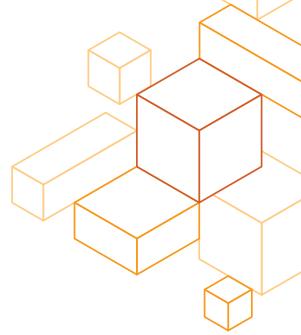
Amazon is committed to reaching net-zero carbon emissions across its business by 2040 as part of [The Climate Pledge](#), which it co-founded and became the first signatory in 2019, 10 years ahead of the Paris Agreement. Amazon is the world's largest corporate purchaser of renewable energy and is on a path to powering our operations with 100% renewable energy by 2025—five years ahead of our original target of 2030. See the [public methodology](#) on Amazon's website for more on our approach.

As of the end of 2021, Amazon reached 85% renewable energy across our business. Amazon has over [310 renewable energy projects](#) across the globe, with over 15.7 gigawatts (GW) of clean energy capacity, and once fully operational, the projects will deliver more than 42,000 gigawatt-hours (GWh) of energy annually—enough to prevent the emission of over 17.3 million tons of CO₂ a year. In the UAE, Amazon recently launched an on-site solar project to provide nearly 2.3 megawatts (MW) in renewable energy to Amazon facilities, the equivalent of powering 200 homes in the country.

Achieving Emissions Reductions With AWS

Moving to AWS is also much more sustainable as customers use AWS infrastructure that is designed to operate efficiently at scale and no longer have to provision for peaks. The AWS global infrastructure is built on custom hardware optimized for one set of requirements—workloads run by AWS customers. This results in efficiency advantages at both the server and facility levels in AWS infrastructure that translates into dramatically less energy used to perform the same unit of work as enterprise data centers. According to a study by 451 Research, a part of S&P Global Market Intelligence, **moving workloads from the median US enterprise data center to AWS can lower customers' workload carbon footprint by 88%. AWS's infrastructure was found to be 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 utilization.

AWS infrastructure can operate more efficiently than enterprise data centers because of a combination of more energy-efficient servers and higher server usage, and excellence in sustainable design achieved by AWS infrastructure. AWS designs server systems with great attention to power optimization, using the latest technology components. The AWS Graviton3 processor is an example of how AWS hardware is built with sustainability in mind. Graviton3-based Amazon Elastic Compute Cloud (Amazon EC2) instances use up to 60% less energy for the same performance than comparable Amazon EC2 instances. Additionally, AWS runs servers at higher usage levels than enterprise data centers, leveraging the ability to share and dynamically allocate resources in the cloud.

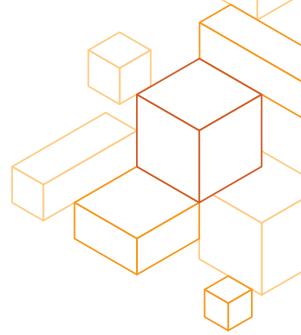


Facility-level improvements in efficiency include data center designs that use lower energy methods and a leaner electrical infrastructure, resulting in lower energy losses to power distribution. As UAE customers move their workloads from enterprise data centers to AWS, the carbon footprint of the workloads is reduced due to much lower energy consumption.

Helping Customers Become Sustainable Cloud Users

In December 2021, AWS introduced the [Sustainability Pillar in the AWS Well-Architected Framework](#). The framework, intended to help customers improve their cloud architecture, 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.

In March 2022, AWS launched a [customer carbon footprint tool](#) to help customers calculate the environmental impact of their AWS workloads. The new 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 its operations with 100% renewable energy by 2025 and drives toward net-zero carbon by 2040 as part of The Climate Pledge.



EIS Methodology

To compute the economic impact of AWS data center investments, the AWS EIS uses a value added approach and the input-output multiplier methodology. Input-output models measure the value added by the expansion or contraction of one economic activity on other economic activities and the local economy as a whole. This allows us to compute the gross domestic product contributed and jobs supported by investment made by AWS and the AWS supply chain. 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.

Using the value added approach, the AWS EIS calculates the jobs supported and gross domestic product contributed locally by AWS and the AWS supply chain. In AWS methodology, “local” typically describes 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). This method uses historical country data maintained by the OECD or the country’s government statistical agency. Input-output tables show the impact of each unit of currency 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. The AWS EIS also uses internal Amazon data on AWS operations and investment associated with constructing and operating data centers.³ The AWS EIS uses standard procedures for computing multipliers from input-output data. See, for example, Ronald Miller and Peter Blair, “Input-Output Analysis: Foundations and Extensions,” 2009, Cambridge University Press.

³ The monetary figures presented in this document are derived from Amazon company management financial systems and prepared in accordance to the above methodology for calculating economic impact. Accordingly, the figures may differ from in-country statutory financial statements and reporting.

