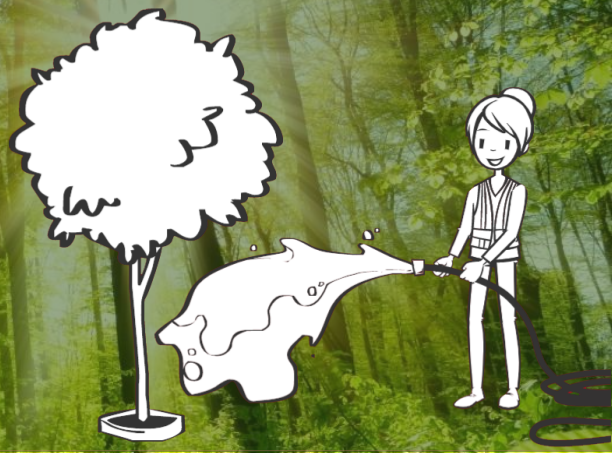


## AWS Sustainability FAQ



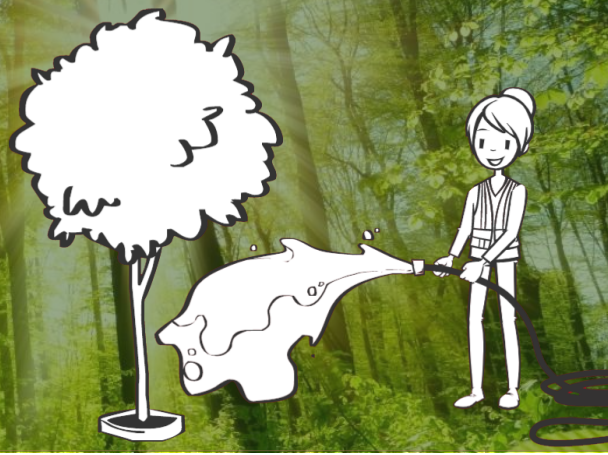
Here are some of the frequently asked questions when it comes to sustainability, and the AWS responses.

### 1 Is AWS's global infrastructure more energy efficient than enterprise data centers?

According to the [451 Research report](#), 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. While most enterprises reported being pragmatic or aggressive with their workload consolidation practices, 451 Research found that the average server utilization rate was only about 18%, leaving a significant amount of capacity completely unused. AWS also has early access to the latest server technology and adopts new, energy-efficient server platforms faster than enterprise data centers.

The report also found that more than 75% of respondents said the electrical efficiency of their data center was below 80%, citing outdated or underutilized equipment that does not work well at low load. With comprehensive efficiency programs that cover every aspect of our data centers, AWS's global infrastructure is also more energy efficient than enterprise data centers, leveraging more robust electrical infrastructure and advanced design techniques to reduce overall energy requirements.

## AWS Sustainability FAQ



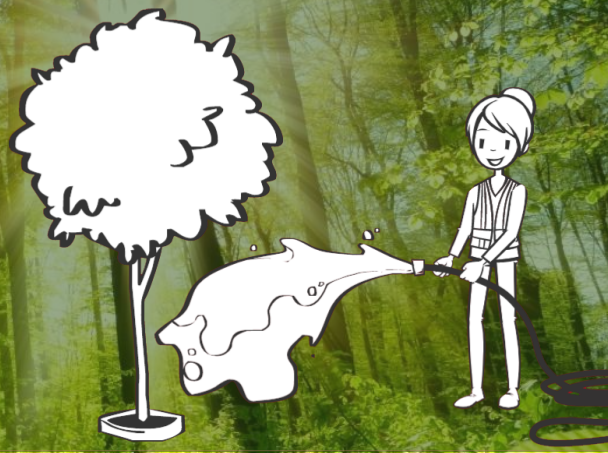
### 2 How is AWS reducing water in data centers?

AWS has multiple initiatives [to improve our water use efficiency](#) and reduce the use of potable (drinking) water for cooling data centers. AWS develops our water use strategy by evaluating climate patterns for each AWS Region, local water management and availability, and the opportunity to conserve drinking water sources. Taking a holistic approach, we assess both the water and energy usage of each potential cooling solution to select the most efficient method. Our initiatives include:

- **Evaporative Cooling:** When possible, AWS incorporates direct evaporative technology for cooling our data centers, significantly reducing energy and water consumption. During cooler months, outside air is directly supplied to the data center without using any water. During the hottest months of the year, outside air is cooled through an evaporative process using water before being pushed into the server rooms, and we have optimized our cooling systems to use minimal water. AWS is constantly innovating the design of our cooling systems to further reduce water use, and we utilize real-time sensor data to adapt to changing weather conditions.
- **Recycled Water:** AWS is expanding its use of non-potable water for cooling purposes to help conserve local drinking water sources. The process for utilizing recycled water begins when wastewater from residential and industrial customers is treated at a local facility and redistributed through its own piping infrastructure. Recycled water has to meet stringent health standards and safe surface discharge standards. AWS is working with local utilities to expand distribution infrastructure and drive faster implementation and adoption of recycled water for data center cooling applications, in order to reduce our usage of potable water.
- **On-Site Water Treatment:** AWS is implementing on-site modular water treatment systems in multiple regions. As water is cycled through evaporative cooling units, minerals build up as water evaporates, eventually reaching a level of concentration that requires replacement with fresh water. On-site water treatment allows us to remove scale-forming minerals and reuse water for more cycles. Increasing our “cycles of concentration” allows us to continue to reduce water intake for cooling our data centers.
- **Water Efficiency Metrics:** In the infrastructure regions where we use water for cooling, AWS has developed water efficiency metrics to determine and monitor optimal water use for each AWS Region, and we employ a data-driven approach to select the most effective water reduction technologies. Water metrics from each of our Regions help AWS evaluate technologies and understand the long-term impacts on our water usage, in order to increase efficiency as our infrastructure grows and we expand to new regions. We are partnering with utilities to connect directly to utility water meters, and we are also installing our own meters to track real-time water usage to provide consistent data for our operations and sustainability teams. By analyzing this data, AWS can identify opportunities to reduce water usage and rapidly make operational changes, rather than waiting for bills or usage reports.



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### 3 How is Amazon contributing to sustainability research and innovation?

The Amazon Sustainability Data Initiative (ASDI) seeks to accelerate sustainability research and innovation by minimizing 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.

- **Publicly available data sets:** ASDI currently works with scientific organizations like NOAA, NASA, the UK Met Office and Government of Queensland to identify, host, and deploy key datasets on the AWS Cloud, 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.
- **Cloud grants:** The Group on Earth Observations (GEO) and AWS have announced the Earth Observation Cloud Credits Program, a joint collaboration to offer GEO members and research organizations access to AWS Cloud services to help countries realize the potential of Earth observations for sustainable development. To learn more see our [blog post](#).
- **Supporting Digital Earth Africa:** AWS is supporting Digital Earth Africa (DE Africa) an organization that is enabling African nations to track changes across the continent in unprecedented detail by making Earth observation (EO) data more easily accessible. This will provide valuable insights for better decision-making around prevention and planning in areas including flooding, droughts, soil and coastal erosion, agriculture, forest-cover, land use and land cover change, water availability and quality, and changes to human settlements.

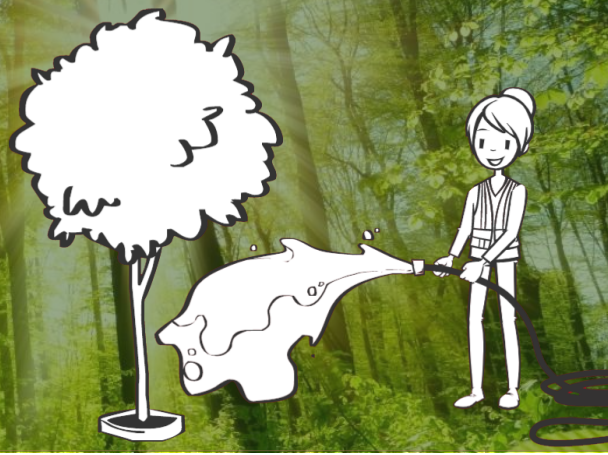
To learn more about ASDI have a look at our [website](#) and if you need additional information about ASDI, contact them by email at [sustainability-data-initiative@amazon.com](mailto:sustainability-data-initiative@amazon.com).

### 4 Does AWS support renewable energy?

Yes. Renewable energy plays a significant role in reducing our overall carbon emissions, and Amazon will continue to enable new renewable projects as we work towards our goals of achieving 80% renewable energy by 2024 and 100% by 2030. For example, Amazon has launched energy projects in Europe and the largest wind corporate power purchase agreement (PPA) in the UK – located in Kintyre Peninsula, Scotland. Once complete, the new Amazon Wind Farm will provide 50 megawatts (MW) of new renewable capacity with expected generation of 168,000 megawatt hours (MWh) of clean energy annually. That's enough to power 46,000 UK homes every year.

To learn more about how AWS supports renewable energy read our [blog post](#).

## AWS Sustainability FAQ



### 5 How does migrating to AWS help customers reduce their carbon emissions?

According to [451 Research report](#), by migrating the average 1-megawatt enterprise data center with 30% utilization to AWS, a customer could reduce their carbon emissions by 400 to 1,000 metric tons per year. 451 Research predicts this carbon benefit to grow in the coming years as AWS continues to take advantage of the latest hardware advancements and further increases our use of renewable energy.

### 6 How should a customer analyze the climate impact of a data center?

Any analysis on the climate impact of a data center should consider resource utilization and energy efficiency, in addition to power mix. Carbon emissions are a factor of three things: the number of servers running, the total energy required to power each server, and the carbon intensity of energy sources used to power these servers.

Customers should also factor in that the average corporate data center has a dirtier power mix than the typical large-scale CSP. Large-scale CSPs use a power mix that is 28% less carbon intense than the global average. Combining the fraction of energy required with a less carbon-intense power mix, customers could end up with a reduction in carbon emissions of 88% by moving to the cloud.

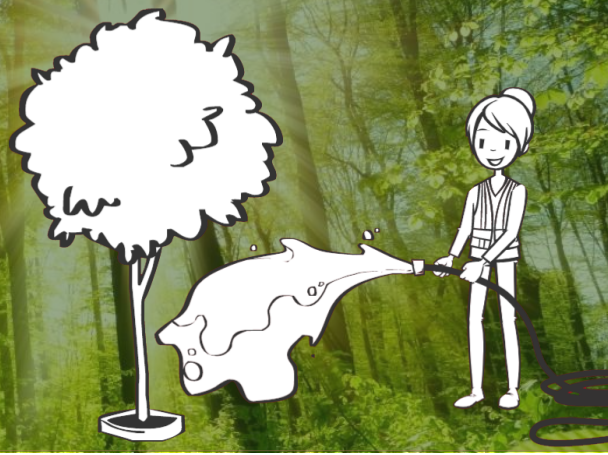
### 7 How is Amazon reducing its climate impact?

To reduce our climate impact, in September 2019 Amazon and Global Optimism co-founded The Climate Pledge, which sets goals for signatories to be net zero carbon across their businesses by 2040, a decade ahead of the Paris Accord's goal of 2050. Amazon was the first signatory of this pledge. Companies that sign The Climate Pledge agree to:

- Implement decarbonisation strategies in line with the Paris Agreement through real business changes and innovations, including efficiency improvements, renewable energy, materials reductions, and other carbon emission elimination strategies.
- Neutralize any remaining emissions with additional, quantifiable, real, permanent, and socially-beneficial offsets to achieve net zero annual carbon emissions by 2040.
- Measure and report greenhouse gas emissions on a regular basis.



## AWS Sustainability FAQ



### Under the Climate Pledge, Amazon will:

- Commit to net zero carbon by 2040 and 100% renewable energy by 2030. Two years ago, Amazon made a long-term commitment to power its global infrastructure with 100% renewable energy. Under the Climate Pledge Amazon is now committed to reach 80% renewable energy by 2024 and 100% renewable energy by 2030 on its path to net zero carbon by 2040. To date, Amazon has launched 15 utility-scale wind and solar renewable energy projects that will generate over 1,300 MW of renewable capacity and deliver more than 3.8 million MWh of clean energy annually – enough to power 368,000 U.S. homes. Amazon has also installed more than 50 solar rooftops on fulfilment and sort centres around the globe that generate 98 MW of renewable capacity and deliver 130,000 MWh of clean energy annually.
- Order 100,000 fully-electric delivery vehicles, the largest order ever for electric delivery vehicles, with vans starting to deliver packages to customers in 2021. Amazon plans to have 10,000 of the new electric vehicles on the road as early as 2022 and all 100,000 vehicles on the road by 2030, saving 4 million metric tons of carbon per year by 2030.
- Invest \$100 million in reforestation projects around the world to begin removing carbon from the atmosphere. Under the Climate Pledge Amazon is launching the Right Now Climate Fund, committing \$100 million to restore and protect forests, wetlands, and peatlands around the world in partnership with The Nature Conservancy. The Right Now Climate Fund will help remove millions of metric tons of carbon from the atmosphere over the lifetime of the project, and create economic opportunity for thousands of people.
- Launch a new sustainability website to report progress on commitments. Under the Climate Pledge Amazon has launched a new sustainability website to report on its commitments, initiatives, and performance. The site includes information on Amazon's carbon footprint and other sustainability metrics that share the progress the company is making towards reaching The Climate Pledge.

These new goals, commitments, investments, and programmes build on Amazon's long-term commitment to sustainability through existing innovative programmes, including:

- **Shipment Zero:** Amazon's vision to make all shipments net zero carbon, with 50% net zero carbon by 2030.
- **Frustration-Free Packaging and Ship in Own Container:** Sustainable packaging initiatives that have reduced packaging waste by 25% since 2015.