

IT best practices for accelerating the journey to carbon neutrality

Considerations and pragmatic solutions
for IT executives driving sustainable IT



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Executive summary

Executives face more pressure than ever to accelerate their journey to carbon neutrality. As organizations commit to reducing their environmental impact, investors, consumers, governments, and regulatory agencies expect transparency and measurable results as it relates to sustainability.

Executing on strategies for environmental sustainability often includes a mix of approaches. IT has the opportunity to reduce impact immediately through optimization of cloud and data center resource consumption and to minimize it continuously. Prioritizing sustainable resource consumption offers quick wins that last, as you also initiate longer-term investments in renewable energy, more efficient hardware, and the like.

Sustainable IT can start now.

Organizations are under pressure to operate sustainably

Climate change is no longer a distant threat only discussed in the context of tomorrow. In 2022, we are experiencing the consequences of climate change: average global temperatures have risen, leading to the extreme weather—including flooding, intense droughts, and violent storms—that has been observed around the world. Current estimates predict that global carbon emissions must be halved by 2030 to limit warming to 1.5°C and avoid catastrophic climate impacts.¹

The urgency of this crisis has made it a priority across all sectors and functions, both private and public, largely fueled by the rise of the sustainability-conscious consumer. A recent study by IBM found that 80 percent of consumers indicate sustainability is important to them and 60 percent are willing to change their shopping habits to reduce environmental impact.² In response to these increasing pressures, today more than half of global asset owners are currently implementing or evaluating environmental, social, and governance (ESG) considerations in their investment strategy.³ Blackrock, the largest money manager in the world, even announced that “sustainability should be our new standard for investing.”⁴

In addition to business and sustainability strategies aligning in 2022, there is a growing expectation that the SEC will impose mandatory climate disclosures by 2023.⁵ Emerging sustainability regulations related to operations and transparency will compel enterprises to create ambitious goals and have detailed planning for long-term sustainability efforts across infrastructure and operations. Simply put, the business risk of ignoring climate change far outweighs any benefit in the short term. In fact, 62 percent of executives consider having a sustainability strategy essential to be competitive in the future.⁶

IT faces a multifaceted and complex problem

In 2022, there is no universally agreed-upon standard for reporting IT sustainability, nor are there any solidified key performance indicators. This lack of standard reporting and KPIs is in part due to the complexity of accurately measuring an organization’s environmental impact/carbon footprint. There are three classifications of emissions that organizations can track:

Scope 1 emissions

Associated with company operations

Scope 2 emissions

Upstream activities (supply chain)

Scope 3 emissions

Downstream activities (consumer)

For organizations with a traditional on-premises data center, Scope 1 emissions are direct emissions from diesel generators or a similar on-site generation capacity and some refrigerants.⁷ Scope 1 emissions usually account for less than 10 percent of total emissions for a data center.⁸ Scope 2 emissions are from electricity generation for data center operation, including air conditioning and power distribution. Scope 3 emissions are supply chain emissions associated with data center equipment, as well as packaging and end-of-life disposal. Many enterprises that claim to be net-zero usually are only referring to Scopes 1 and 2, but net-zero requires neutrality across all three scopes.⁹

Sustainable IT opportunities on premises

For organizations that are running workloads on-prem, there are a multitude of ways to reduce your carbon footprint, some of which are more challenging than others. Organizations that are on-prem should focus primarily on reducing emissions from powering servers and cooling. These Scope 2 emissions account for over 80% of a typical data center's electricity usage.¹⁰



Cooling servers

Servers generate a significant amount of heat that organizations need to counter with cooling techniques. In addition to higher-efficiency cooling techniques such as filtered free air cooling and liquid cooling, some organizations are (re-)locating data centers to climates that require less energy for cooling. The location of the data center is critical, however, and not all organizations have the means to make this move.



Renewable energy

Servers require a significant amount of power, which is why some organizations are turning to renewable sources of electricity to reduce their emissions. Location again plays a key role as not every data center has access to economically priced low-carbon or renewable electricity.¹²

Organizations that are investing in their own solar or wind generation face the challenge of variability in production because wind speeds fluctuate and solar energy can only be produced when the sun is shining, though technological advancements in battery storage continue to improve.

Leveraging renewable energy as part of a sustainability strategy requires significant investment, careful planning, and a diverse set of energy sources.¹³ It takes time to realize results; it is an important part of the mix but cannot be the only approach given the urgent need to reduce impact now.



Circular economy strategies

In terms of Scope 3 emissions, organizations can implement a circular economy strategy. This strategy aims to reduce carbon emissions and overall environmental impact by using recyclable materials, refurbishing hardware to extend the life of assets, and responsibly disposing of environmentally sensitive materials.¹¹

Sustainable IT opportunities in the cloud

The public cloud offers IT organizations another means of reducing their carbon footprint. These services create emissions classified as Scope 3. Public cloud providers have the advantage of higher efficiency in economies of scale against on-premises infrastructure. As Gartner puts it, a bus uses more carbon than a car, but a packed bus is more carbon-friendly than 20 cars.¹⁴

Similarly, a pool of servers shared by thousands of applications is likely to be more cost- and carbon-efficient than thousands of servers in thousands of data centers.¹⁵ The major cloud providers are also investing heavily in environmental sustainability, further increasing their sustainability advantage over on-premises data centers.

While some organizations cannot take advantage of the public cloud due to unique business constraints, most organizations do.

80% of enterprises will shut down their traditional data centers by 2025, shifting to service providers.¹⁶

Top public cloud providers have become leaders in sustainability. But it's still on organizations to accurately report emissions from the public cloud, which is why there is growing pressure to make carbon impact information more readily available. While there are many opportunities for improvement, the investments that cloud providers have made to date are a major step forward for the IT industry as a whole. Since 76% of enterprises in public cloud use more than one cloud platform, we will highlight the three main providers, Google Cloud, Microsoft Azure, and Amazon Web Services.¹⁷

Google Cloud

Through reliance on renewable and low-carbon energy sources, Google achieved net carbon neutral status in 2007. Google currently aims to fully decarbonize by 2030 through continued reliance on renewable energy sources and load optimization.¹⁸ For enterprises tracking their own emissions, Google Cloud has also introduced greater data transparency and a region picker that allows operations teams to make ecologically informed decisions when deploying workloads.

Microsoft Azure

In 2020, Microsoft pledged to reach carbon-negative status by 2030 through a series of measures to cut new carbon emissions and remove emitted carbon from the environment. More specifically, Microsoft's 100/100/0 commitment pledges that by 2030, Microsoft will have 100 percent of their electricity consumption, 100 percent of the time, matched by zero-carbon energy purchases. For its data centers, Microsoft has invested in various methods of sustainable energy and cooling, such as the creation of project Natick, an underwater data center that is powered by renewable energy and cooled by seawater.¹⁹

Furthermore, in 2021 Microsoft announced Microsoft's Cloud for Sustainability. This option allows ESG stakeholders to track carbon emissions from different applications and breaks it down into a variety of reports including a sustainability scoreboard that can track carbon emissions against organizational goals.²⁰

Amazon Web Services

In 2019, Amazon committed to reaching net-zero carbon emissions by 2040 and 100% renewable energy by 2030. Amazon reports its annual energy consumption across its entire business and does not report AWS consumption specifically.²¹ AWS does not currently have any tools to track carbon emissions.²² Other sustainability initiatives AWS uses include goals for increased renewable energy utilization, sustainable cooling methods for data centers, and custom, renewable silicon for its hardware.²³ AWS also recently announced a new Sustainability Pillar that will "help organizations learn, measure, and improve their workloads using environmental best practices for cloud computing."²⁴ More data transparency for AWS customers should follow as sustainability continues to be a priority in the future.



Ensuring that your IT wastes fewer resources can reduce both your costs and carbon footprint, a true “win-win” scenario.

A pragmatic first step

There are many different paths an organization can take when starting its journey to sustainable IT and achieving carbon neutrality. One of the most immediate and impactful methods is to achieve operational excellence where IT simply uses less. As Gartner notes, improving server utilization levels without impacting operational performance requirements is a significant way to reduce an enterprise’s carbon footprint.²⁵ Optimizing cloud and data center resources, however, is difficult, especially as applications and the environments they run on become more complex and distributed. Fundamentally, IT must ensure that applications only get the resources they need when they need them.

Eliminating resource waste in your environment without sacrificing performance represents the ideal intersection of performance, cost, and carbon footprint. The “win-win” opportunity to reduce both cost and carbon emissions should not be overlooked.

For organizations that have the advantage of operating horizontally scalable microservice applications in a public cloud, the opportunity is even greater.

Leveraging ephemeral workloads in applications and infrastructure can help you achieve elasticity that benefits your bottom-line and your sustainability goals, as well as improve customer experience.

To learn more, read [The Executive’s Guide to SLOs](#).

Whatever the mix of strategies, reducing carbon emissions and overall environmental impact is not a one-off exercise and must be done continuously to be successful.

Continuously sustainable IT is the goal.

Accelerate your journey to carbon neutrality now

With IBM® Turbonomic®, organizations do not need to compromise between carbon neutrality and application performance. IBM Turbonomic software continuously ensures customers' applications consume just what they need to perform, materially reducing IT's carbon footprint. IBM Turbonomic understands the resource relationships at every layer of the application stack and dynamically resources applications according to demand in real-time. IBM Turbonomic actions are trustworthy, and our automation can be operationalized, delivering measurable results as customers reduce cost and carbon footprint immediately and continuously. IBM Turbonomic can run in any environment. Through a commissioned Total Economic Impact™ (TEI) study, Forrester Consulting projected that IBM Turbonomic Application Resource Management customers reduced their cloud and data center consumption by 30% within 6 months, significantly improving long-term energy consumption profiles.²⁶ In addition to material savings, IBM Turbonomic automation saved customers more than 50 hours of IT personnel time each month.²⁷

With IBM Turbonomic IT executives can be leaders in sustainability with transparency and measurable results.

About IBM Turbonomic

IBM Turbonomic created Application Resource Management (ARM) to assure customers' application performance by dynamically resourcing applications across multicloud environments. Together with its strategic partners, IBM Turbonomic serves more than 3,000 customers. We believe every application should always get the resources it needs, and end-users should never have to wait for an application to respond.

To learn more, visit ibm.com/cloud/turbonomic.

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Armonk, NY 10504

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¹ 2035 Report

^{2, 3, 4, 6} The Rise of the Sustainable Enterprise

⁵ Forbes

^{7, 8, 9, 11, 12, 14, 25} The Road to a Net Zero Data Center, 2021, G00750762

¹⁰ Energy Innovation

^{13, 15, 17, 18, 21, 22, 23} The Sustainable Cloud: A Real Business Imperative, 2021, 451 Research

¹⁶ Gartner: The Data Center is Almost Dead

¹⁹ Microsoft Innovation Stories: Project Natick

²⁰ Microsoft Cloud for Sustainability

²⁴ Amazon blog

²⁶ Forrester TEI Report

²⁷ A Forrester Total Economic Impact™ of IBM Turbonomic Application Resource Management, 2022

