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## Data Center Sustainability: Going Beyond Energy Efficiency

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When considering the recent strides the data center industry has made to become more sustainable, the iceberg theory is an apt illustration. The tip of the iceberg represents energy efficiency—often the most talked-about measure in greening data centers. But the submerged 90 percent of the iceberg is comprised of essential elements that have a significant impact.

While there is no doubt that energy efficiency is an important metric, it doesn't tell the whole story. For long-term change to occur, the entire sustainability chain—from embodied carbon to IT components to renewable energy sources—needs to be part of the equation. A comprehensive strategy can lead to greater sustainability gains and provide companies with a competitive advantage that is critical to helping them reach net-zero commitments.

This requires a shift in mentality to one that values sustainable practices and responsible resource consumption at every step. To truly make a difference in data center sustainability, a holistic approach that considers every aspect of the data center, from design to supply chain to building through to end-of-life equipment disposal, is required. The result can have a positive impact on not only the environment but the community, businesses, innovation, and a culture of responsible consumption. Ultimately, this shift toward holistic sustainability is necessary for the long-term viability of the data center industry—and for the health of the planet as a whole.



## The business case for sustainability

The prevalence of big data, IoT device usage, advancements in AI, and general digitalization in the wake of the COVID-19 pandemic has led to explosive data center industry growth in recent years. As more data is generated, stored, and processed, the footprint of data centers continues to grow at an unprecedented rate. Data centers are now responsible for [more than one percent of the world's total energy consumption](#), a figure that is projected to double by 2030. As a result, calls are growing for more transparency about direct environmental impacts and how data centers will reduce their carbon footprints. For example, Google data centers—which [consumed 164 million gallons of water in 2021](#)—pledged in 2021 [to replenish 120 percent of the water they use](#), on average, in their data centers and offices. It is becoming imperative for the data center industry to embrace sustainability, not only for the environment but for the long-term viability and profitability of operations.

Vendor selection criteria are also shifting to incorporate sustainability concerns. [The World Economic Forum report](#) reveals that more than two-thirds of consumers consider sustainability when purchasing products, and the trend is even more pronounced among millennials. As businesses are starting to see sustainability as an investment opportunity and realize that good sustainability practices can contribute to their financial performance, the concept of [ESG Alpha](#) continues to gain traction. The idea is that those adopting strong ESG policies and practices will perform better financially over the long term than those that don't, partly due to the thought that companies that prioritize sustainability are often better positioned to adapt to changing market conditions, as well as attract top talent, build stronger relationships with customers and stakeholders, and manage risks more effectively.

While the relationship between ESG performance and financial gains has been the subject of much debate and research, there is growing evidence to suggest that there is a positive correlation between the two. A [study by EY](#) found that organizations that are able to drive down costs through more sustainable production and operations will not only survive but will also emerge as leaders in top-line growth and bottom-line results. Other research [by Harvard Business School](#) found that companies that voluntarily adopted sustainability practices outperformed their peers in terms of both stock price and accounting measures of financial performance.

## Two major considerations to embrace holistic sustainability

Looming net-zero commitments and the positive correlation between ESG performance and financial gains are both motivating drivers for data centers to adopt sustainability practices. Two major areas that stand to have the biggest immediate impact include close examination of Scope 3 emissions and the study of precision

liquid cooling technologies. Scope 3 emissions account for the indirect emissions generated by a company's entire value chain, such as purchased goods and services, transportation and distribution, and waste disposal. According to guidance from the U.S. Environmental Protection Agency, [Scope 3 emissions frequently constitute the bulk of an organization's overall greenhouse gas](#). As data centers assess their Scope 3 emissions to better understand the carbon lifecycle of their entire footprint from cradle to grave, they are realizing the cost of space isn't just the price of rent—it's also the embedded costs, both monetary and carbon. It's easy to build a square meter of concrete somewhere cheap, but the stored carbon costs of that square meter of concrete are completely unsustainable.

Reducing Scope 3 emissions can be challenging as it requires collaboration and transparency from suppliers, customers, and other stakeholders. However, it is important for data centers to identify opportunities to reduce emissions and implement strategies to achieve sustainability goals, because carbon, if not already, will soon be a fundamental piece of data needed to win new business.

In addition to Scope 3, another area of increasing focus for data centers is cooling. Today's servers are designed to be air-cooled, but given that often [approximately 40 percent of a data center's energy](#) (and more in some climates) is being used for cooling, it raises the question of whether air-cooling is the most efficient option. Most data center customers are not aware that when they purchase a megawatt of computing power, they may only run 600 kilowatts of actual, value adding compute due to cooling energy consumption—not a great deal, especially when taking servicing and restricted compute performance into account.

For this reason, we need to look to the future of cooling technologies and the opportunities that they bring. Precision liquid cooling is one of the most innovative on the market today as it eliminates the need for traditional air-cooling infrastructure. A small amount of dielectric coolant is precisely targeted to remove heat from the hottest components of the server, ensuring maximum efficiency and reliability. There are no hotspots that can slow down performance, no wasted physical space on unnecessary cooling infrastructure, and minimal need for water consumption. This results in significant savings—up to 40 percent on energy consumption alone—with zero compromise on performance.

Reducing energy consumption is rapidly becoming one of the top priorities at the edge for telcos. Much of the power usage in a telco network comes from the radio access network (RAN) sites as these locations are powered on 24/7 regardless of customer demand. Open RAN, with its open platform and vendor-neutral hardware standards, is seen as an enabler for more energy-efficient networks. Super-efficient precision liquid cooling-based solutions can mitigate these power constraints while simplifying and significantly driving down maintenance costs.

## Overcoming resistance to change

While the benefits of sustainable data center practices are clear, the question remains: are we ready to embrace the necessary changes? It is natural for human beings to be resistant to change,

but now is not the time for incremental steps. The climate crisis demands quick action and hard choices. It is not only necessary but essential to approach these problems holistically.

Don't just think about the monetary costs; think about the opportunity costs. It takes two years to build a data center today, but if that could be abbreviated into six months, is that better for the industry? Or consider the cost of failure—if the true cost of downtime is millions of dollars an hour, is that worth not exploring new technologies?

Change can be daunting, and the data center industry is no exception. Historically, data centers have been designed for performance and reliability, rather than sustainability. The industry must overcome its resistance to change in order to embrace more sustainable approaches to data center operations. The benefits of adopting sustainable practices and investing in new technologies go far beyond reducing carbon emissions and stand to improve data centers' client attraction and retention strategies. Moving beyond incrementalism is necessary to address the climate crisis, and data center providers that take swift action toward sustainability will be better positioned to compete and thrive in the long run.