

# Data Centers Are Here to Stay: Technological Innovation Serves as a Tailwind for the Current Thriving Sector



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**Data centers have been one of the** most sought-after property sectors among real estate investors over the past year. The market is expected to see year-over-year growth of 9% for the rest of the decade, reaching \$124 billion by 2030—up from just \$55 billion in 2021.<sup>1</sup> It is also estimated that 90% of the world's data was generated in the past two years alone, and this is expected to double every two years.<sup>2</sup>

The global economy is increasingly more dependent on digital technologies, which in turn will fuel the growth of data storage and processing and the need for data centers. At the same time, however, the rapid pace of innovation amid the global semiconductor arms race raises concerns about whether the facilities may quickly become obsolete. Although innovative technologies such as artificial intelligence (AI) and machine learning will impact data centers, these risks are likely both limited and manageable.

The data center sector is poised to see a secular increase in demand; however, higher construction costs, a constrained lending market, and power supply bottlenecks will increase the barriers to entry. Data centers are not only real estate but also the infrastructure lifeblood of the modern economy.

Facilities with strong fundamentals and ongoing investment in sustainability will be positioned to endure technological evolutions. And as widespread adoption of new, trending technologies reaches new heights, innovation will likely serve as a tailwind to further propel this already-booming sector.

## Innovating IT Infrastructure: Bigger Data Means Rising Density—And Rising Density Calls for More Tech Innovation

Advancing information technology (IT) infrastructure is essential for data centers to deliver heightened value, as their main purpose is to power, cool, and connect IT equipment. As data needs have evolved, innovations made to advance IT infrastructure have been welcomed

and embraced to improve on existing data center design, rather than rendering existing data centers obsolete.

Rising density, or the amount of power used by a server rack, affects data center infrastructure in two ways: power and cooling. As big data keeps getting bigger, faster, and more valuable, the higher density required to enable the technology leads to innovations in both power and cooling infrastructure—all playing into the growing demand for data centers constructed with strong fundamentals to build on and evolve.

### Power Infrastructure

Naturally, the average server rack density has risen steadily, with applications such as AI running at much higher densities and requiring more power-intensive computations. In fact, the amount of digital data expected to be created over the next five years is more than double the amount of data created from the dawn of digital storage in 1956 through today.<sup>3</sup>

A data center's ability to support higher-density deployments depends on the amount of utility power capacity it has and the capacity of its existing power infrastructure. Thus, innovations that enhance data center performance by powering larger quantities of data more quickly and efficiently are necessary to keep pace with the growing demand for big data.

Given this demand for power capacity, Principal Real Estate is focused on sites that have or allow for the development of dedicated power substations, as they generally provide for more flexibility in terms of power access and delivery.

### Cooling Infrastructure

Because increasing density means more power in, it also means more heat out—so many data centers are

1. Indraneel Karlekar, et al., "Inside Real Estate Outlook," Principal Real Estate, Sept. 2023.

2. Kevin Bartley, "Big Data Statistics: How Much Data Is There in the World?" Rivery, March 27, 2020.

3. Business Wire, "Data Creation and Replication Will Grow at a Faster Rate Than Installed Storage Capacity," March 24, 2021.

equally, if not more, challenged with having adequate cooling technologies. Each cooling technology has limits on how much heat it can remove from the environment, and technologies have evolved over the years to reuse more heat.

Innovations in cooling infrastructure, in turn, need to keep pace with innovations in power infrastructure. This calls for a continuous innovation cycle to ensure data centers have the right infrastructure to keep up with the accelerating demand for data.

Over the past 20 years, data centers that were originally designed with relatively inefficient air-conditioning-like systems have evolved to increase their density tenfold with systems that use fans to draw heat away from servers to be cooled with water or a refrigerant.

### Innovating for Sustainability

Scrutiny on environmental, social, and governance (ESG) considerations remains prevalent across all aspects of the investment industry. For data centers in particular, sustainability considerations have proved to be particularly vital, and they too remain under high scrutiny in this regard.

Until recently, sustainability in the sector often meant optimizing energy efficiency. Now, however, optimizing water efficiency has also come into focus. Energy efficiency and water efficiency are both of concern, but there are inevitable trade-offs between the two.

Water-based evaporative cooling systems are the most energy efficient but more water intensive. Closed-loop air-cooled chillers, on the other hand, are the most water efficient but more energy intensive. As such, leading data center developers are increasingly relying on air-cooled chillers in both water-constrained markets and markets where renewable energy is readily available.

As data center design evolves to keep pace with innovations in sustainability and IT infrastructure, developers will take one of two approaches:

**1. Older data centers will be reconfigured.** Retrofitting data centers to support innovations such as higher density and a focus on water efficiency is a much more likely course of action than decommissioning a data center entirely—primarily because the industry needs all the capacity it can get. In fact, the demand for data centers

vastly outpaces providers' ability to deliver new capacity; the average vacancy rate of the top ten North American data center markets is just under 3%.

**2. Yin and yang: old and new will coexist.** To support higher density and evolving approaches to sustainability, data center developers are innovating the design of new facilities. Some companies that lease and develop their own facilities, for example, have been innovating a new generation of data centers that will be liquid cooled, to support AI workloads at scale. However, even as more data centers run AI or other workloads that require higher density, old workloads will continue to run and will need existing data centers to support them.

Technology appears to change very quickly, but changes at the data center infrastructure level are gradual. Big advancements in technology will indeed impact data centers—innovation is necessary to enhance performance, but these risks are both limited and manageable.

The global economy's increasing reliance on data has only made these facilities more attractive real estate investments. Tech advancements will further boost the value of existing assets and drive heightened demand for data center capacity.

And as technology innovations continue to advance data center processing, the old and the new will continue to coexist—ensuring the usability of today's data centers for many years to come. ■

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4. David Liggitt, "1Q 2023 Data Center Market Recap," datacenterHawk, April 27, 2023.