



## Data Centers

**“Striving Within a Narrow Range”**

**Market Analysis and Outlook**

May 2022



## M Capital Group

[www.mcapital-group.com](http://www.mcapital-group.com)

NEW YORK	LONDON	DUBAI
<p>1330 Av of the Americas Suite 23 New York, NY 10019 U.SA United States Phone: +1 212 634 683 Fax: +1 212 634 7474</p>	<p>Level 17 Dashwood House 69 Old Broad Street London EC2M 1QS United Kingdom Phone: +44 207 256 4246 Fax: +44 207 256 4050</p>	<p>Level 41 Emirates Towers P.O. Box 31303 Dubai United Arab Emirates Phone: +971 4 319 7460 Fax: +971 4 330 3365</p>

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## EXECUTIVE SUMMARY

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Since our last report in mid 2020, the data center industry has continued to see lasting evolution, driven by cultural and market shifts catalyzed by the COVID-19 pandemic. The shifts have been characterized by mass adoption of cloud-based technologies and services, and the resulting increase in global internet traffic and data creation has been staggering, emphasizing the reliance on data centers and the telecommunications infrastructure. Previously, supply had narrowed its' focus towards the major global cities, where the economic and infrastructural foundations were robust, but we have seen a mounting attraction towards second tier areas to reduce build costs and improve geographical access, offering exciting supply side possibilities. As well as this, the industry has seen an influx of private investment, from an array of institutions, helping the global market reach an expected value of over US\$288.3 billion by 2027 at a healthy CAGR of over 4%, upholding estimates of our last report.

Whilst competitive headwinds remain, represented through the recent second bankruptcy filing of Sungard, which blames "COVID-19 and other macroeconomic trends including delayed customer spending decisions, insourcing and reductions in IT spending, energy inflation and reduction in demand for certain services", the industry has seen key adjustments, where MCG believes that engineering cost management and technological innovation will be paramount to success.

Driving economic factors, both industry specific and macro, are fueling innovative advances in technology, such as the focus on sustainability, highlighted through the rise of ESG, as well rising global internet access, expected to reach 5.3 billion by 2023. These influences are helping the data center industry provide the world with its ever-increasing demand for information, whilst simultaneously improving efficiency, in terms of both cost and consumption, resulting in a satisfactorily optimistic outlook.

## Report Roadmap

This research report aims to examine the prevalent data center industry trends, drivers, and dynamics seen over the 2020-2022 period. Starting with a dive into the data center markets' background, we move onto the most impactful trends and key considerations, then exploring the drivers which have fueled market innovation, thereafter, assessing the geographical background and outlook of the industry.

This discussion highlights the industry's reaction to growing global connectivity and demand for data storage, whilst noting developments in technological and business practices, as well as changes in consumer preferences.

Despite the positive outlook, challenges, both industry specific and general, remain.

## INDUSTRY ANALYSIS

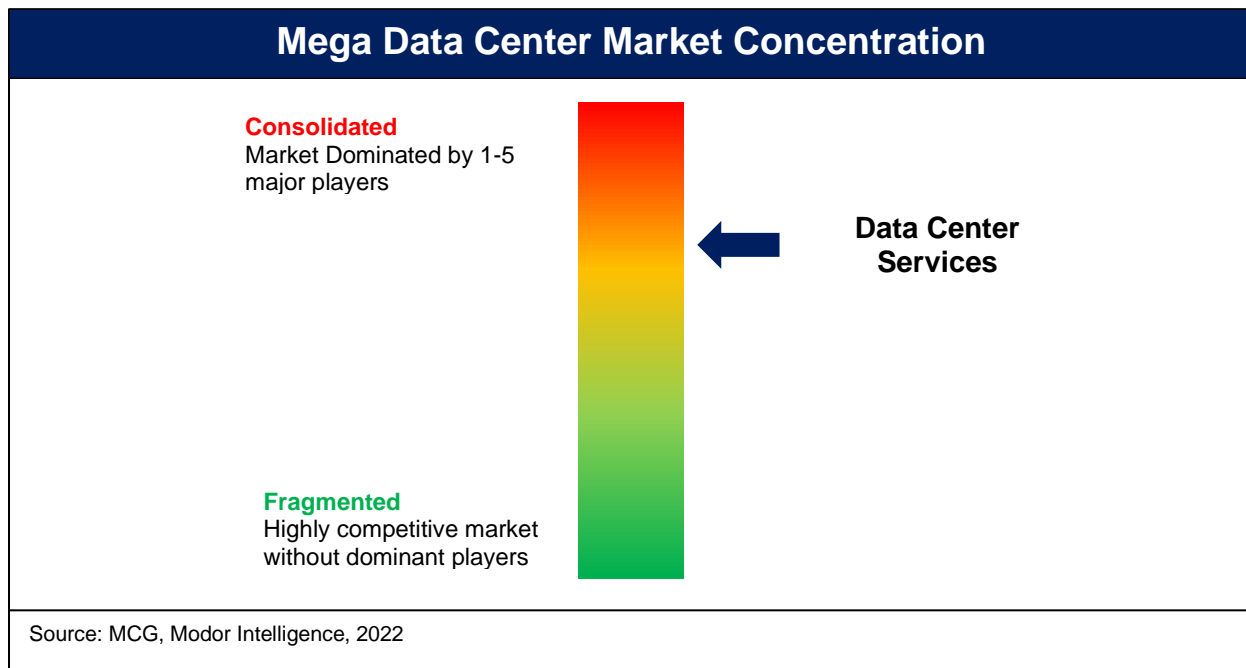
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## BACKGROUND

The last two years have produced incomprehensible change in all aspects of our world, both in and outside the home, and the data center industry has been no exception. A rise in internet usage during the height of the pandemic was spurred by the need for businesses and employees alike to move operations online, as restrictions and lockdowns were implemented worldwide, facilitating an increased production of data and demand for storage. Although the restrictions COVID-19 triggered have since subsided, a lasting imprint has been left on the world's business practices, with 25% more adults over the 2019-2022 period opting for a work from home (“WFH”) approach in the UK alone.

Alongside this, we have seen a prominent change in how the data centers themselves have developed. Historically, data center infrastructure emerged when telecommunication companies, and later, colocation operators, built the first facilities and established enduring footholds. But today, many of the hyperscale's that dominate cloud, network, and internet services can enter a new, or relatively immature market, and simply begin a major build, likely with the entry of private investment. This shift has led to rapid increases in market size, with the European market alone expected to see a valuation of US\$65.7 billion by 2027 at a CAGR of 5% from 2022. Alongside this, the US market is forecast to see 2027 valuation of US\$101.5 billion, at a slightly lower CAGR of 3% over the next 5 years. Although markets across the globe are expected to see healthy growth, the mega data center market, characterized as single facilities with 15,000 or more servers, have historically high barriers to entry, and so are expected to remain relatively concentrated.

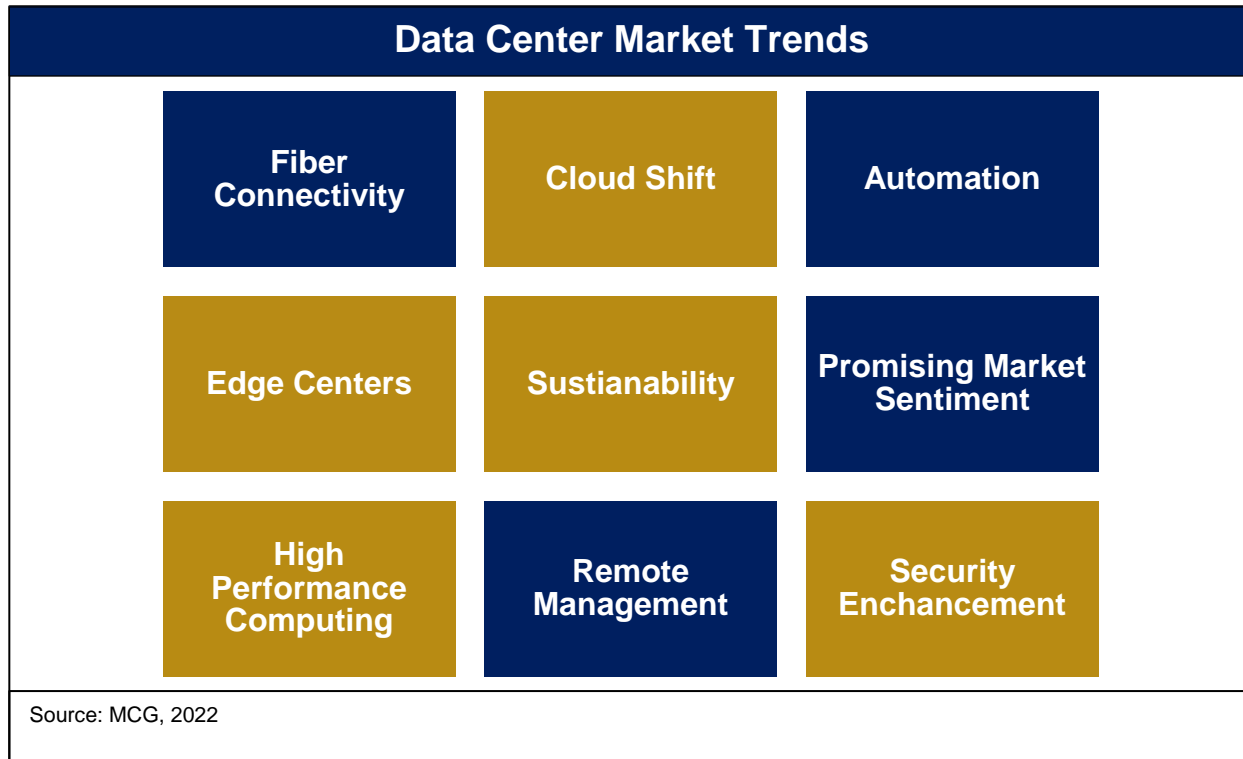


This notable change in market size highlights several key factors which will prove crucial to the industry, as well as individual companies', ability to scale production to meet ever growing demand, not only for the expansion of the developed markets ("DM"), but also for the emerging markets ("EM"). Technical factors such as fibre connectivity and cloud computing need to be considered, together with trends of the current market that will affect future growth.

## TRENDS

Since the first half of 2020, the data centre industry has seen lasting change driven by many factors, such evolving consumer preferences, technological advancements, and a growing focus on sustainability. Here, we will explore the key trends that MCG believe have underpinned the industry's progression and will continue to do so moving forward, with a focus on the technological developments seen over the last few years. These trends, such as automation and remote management, allow providers to reduce expenditure through minimisation of labour costs associated with centre maintenance, and thus allow businesses to maintain margins in an ever-competitive market, combating rising input costs, such as the price of energy, which has sky rocketed in recent months.



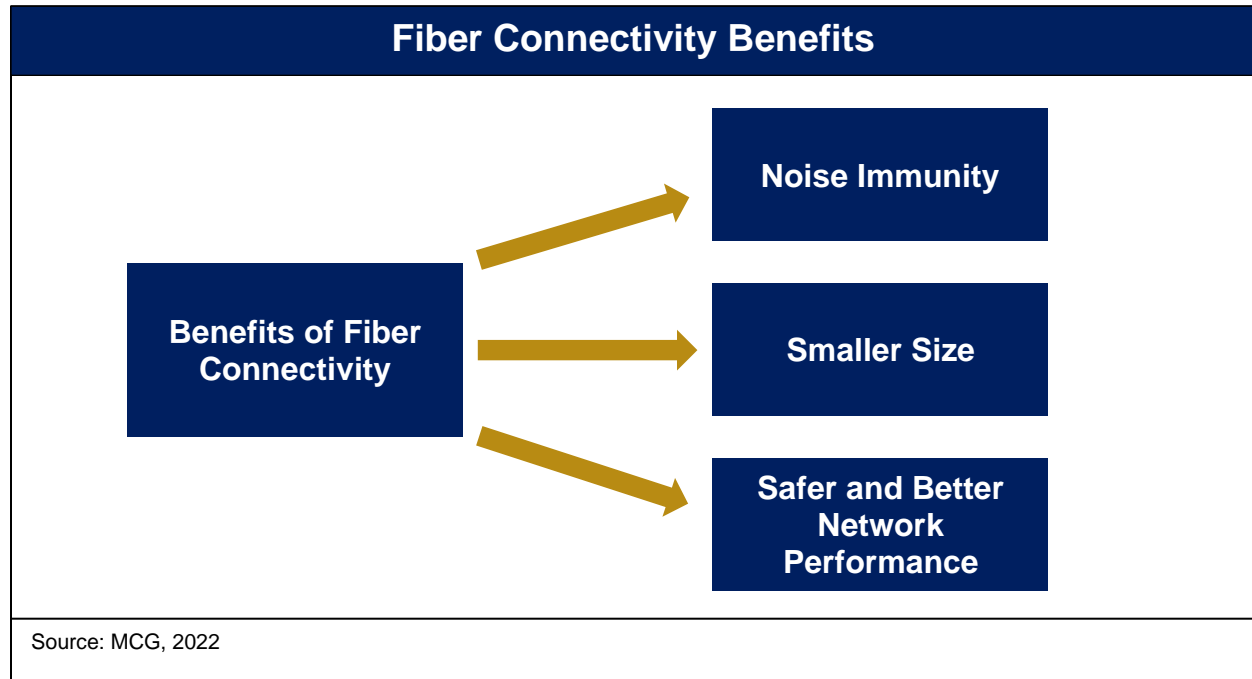


## Fibre Connectivity

Fibre connectivity is quickly becoming the industry standard for connecting end users with the desired data, notably because of its noise immunity and smaller size in comparison to its copper, allowing for an increase in square footage maximisation. The smaller size further helps improve network creation, and when combined with fibre’s latency reduction, users benefit from safer and higher performance networks. Similarly, the aforementioned growth in WFH conditions, notably the mounting usage of video conferencing platforms, has put an emphasis on bandwidth, highlighting fibre communication’s advantage due its’ superior capabilities over long distances.

These networks are constructed in an array of formats, with short-haul fibre predominantly linking metropolitan areas, and long-haul fibre connecting multiple regions and countries, with undersea cables adding to the mix, directly connecting landing points across oceans to transmit information. Whilst our last report featured a count of fibre networks to each data center profiled, the few maps available in emerging markets across the globe led to a lack of clarity in the data, particularly in developing areas. As a methodology shift for this edition, Speedtest data has been utilized from Ookla, with the Speedtest Global Index™ ranking countries for overall speed and performance. Results of the Speedtest Global Index™ analysis show that Singapore is the fastest performer globally, with the business-friendly city-state long known as a connectivity point across South East Asia. Similar entrepot Hong Kong follows, with an abundance of undersea cables linking the

city to the region, as well as new entrant Santiago, suggesting that industry expectations regarding latency across South America were mostly fictitious. These leaders are followed by a swath of United States locations, with core U.S. markets again finishing high for connectivity.

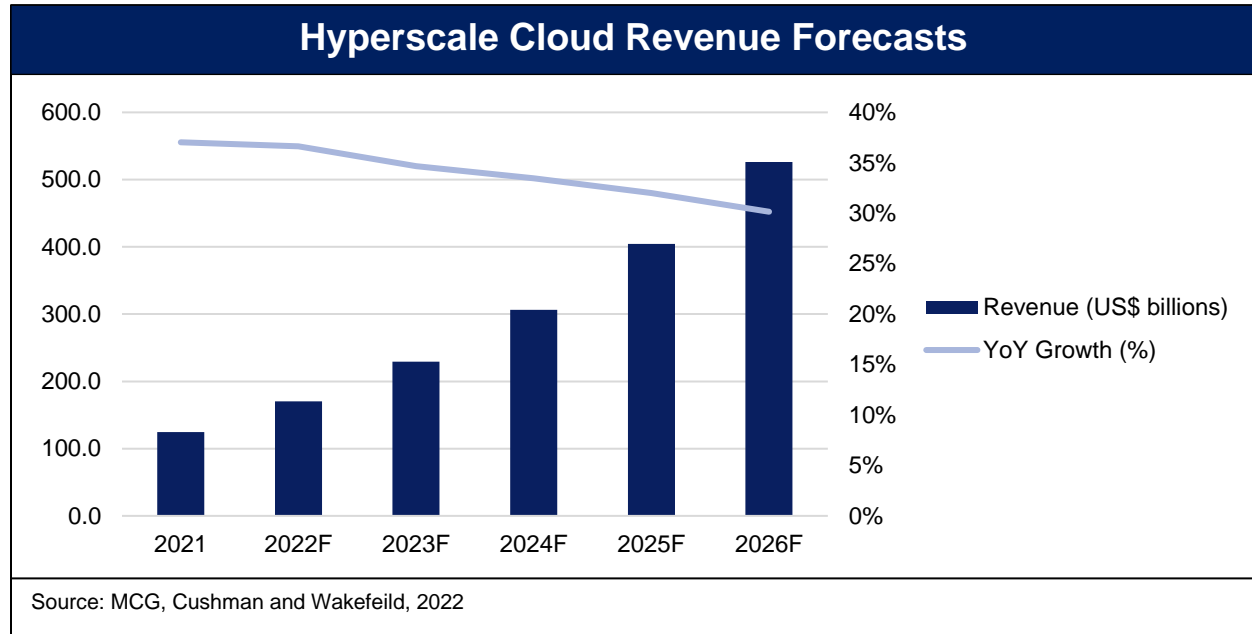


## Cloud Shift

The move toward the cloud accelerated in the pre-pandemic era, ramping up in 2020, having since seen rapidly accelerating growth. In nearly every market around the world, hyperscale cloud services represent 70% to 80% of all leasing in any given quarter, as all-out battle for market share continues. The three largest players by market size, Amazon Web Services, Microsoft Azure, and Google Cloud, continue to innovate swiftly, adding an array of services at the perimeter to unite with core hosting, storage, and database options, entrenching usage inside the largest enterprises and government organizations. As further entities choose to move more of their workloads to the public cloud, employing its scalability and ease of access, a variety of markets will reap the benefits of these services as the hyperscale's work to bring further clients online.

Markets that offer multiple cloud services have become increasingly important, as early adopters are now diversifying their workloads to create true hybrid IT strategies. These will often include multiple public cloud products for a wide variety of users, along with a lesser supply of private cloud services in a colocation environment. Markets that offer peering opportunities among services and sufficient on-ramps to these products will likely snag sales from the more sophisticated organizations who are looking to access a wider

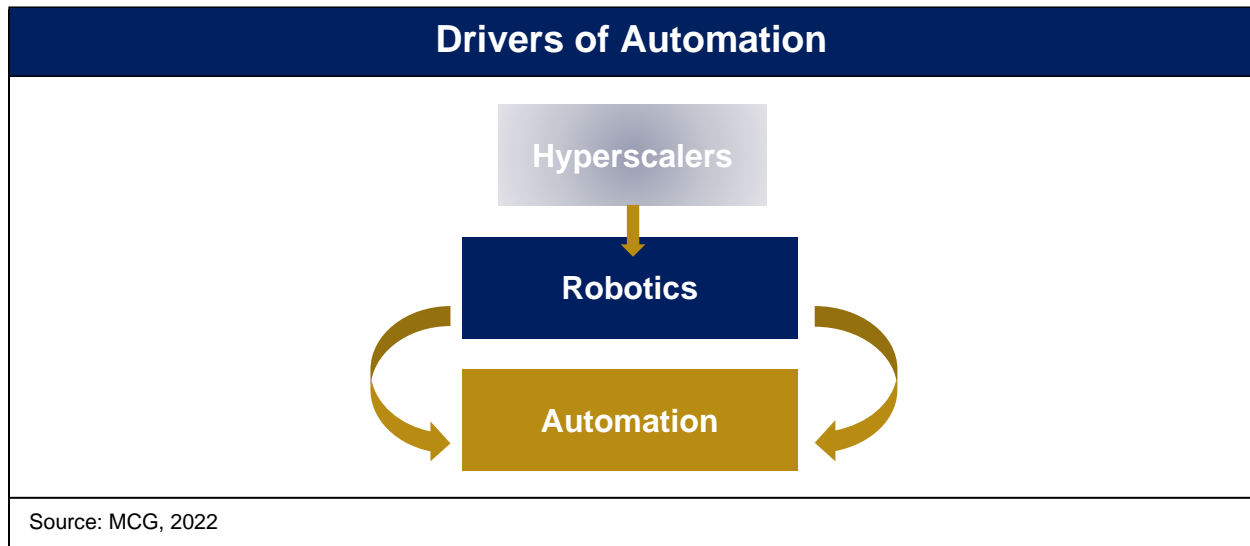
array of options in the future and will likely utilize further specialized applications moving forward. The exciting opportunities for cloud storage are reflected in market forecasts, with Cushman and Wakefield expecting global revenues to grow at a CAGR of 27% to US\$526.2 billion in 2026.



## Automation

The rapid adoption of data center automation is entering a new stage of innovation, where robotics is playing a greater role in facility management. Over the past few years, the industry has been driven by using robots in multiple aspects of facility management, from employing them to rack servers and replace failed servers, to managing disk storage and connections, as well as administering site security. Without surprise, the pandemic raised the need for systems to become less dependent on human intervention, due to the unavailability of the majority of the human labour force for the 2020 to 2021 period as COVID-19 brought commuting to a halt. With the cost of robotics expected to fall as efficiency in both production and use improve and wages, conversely, on the rise, it is likely that we will see global implementation of zero contact centers soon.

This trend is being driven by the hyperscalers, with Facebook having formed a site engineering robotics team to "design and develop robotics solutions for automating and extending the operations of Facebook's data center infrastructure." The system includes motors and actuators, cameras and sensors, computer packages, and custom electronics, with the scope of construction ranging from internal prototypes to low volume production with contract manufacturers, likely in the 100s.



However, this trend goes beyond the hyperscale area. According to the 2020 Uptime Institute survey, 73% of data center managers expect increased use of automation as a result of a pandemic, with one third of them expecting recruitment challenges to shrink their operations teams, even as server volumes continue to grow. Uptime believe the result will be a "smarter and darker data center", with almost no human interaction needed. After the struggle to effectively staff the centers during the worst of the pandemic period, many cautious managers are beginning to look more positively at remote monitoring and automation systems, as well as AI applications.

## On the Edge

Edge data centers are smaller than traditional data centers, but are located close to the populations they serve, delivering cloud computing resources and cached content to end users. Typically, they connect to a larger central data center or multiple smaller centers, allowing for reduced latency, overcoming of intermittent connections, and storage of data far closer to the end user. This computing brings a new level of sophistication to data center software automation, as seen in remote unmanned facilities powered by EdgeConneX, as well as similar software automation platforms included in VaporIO and other Edge data center start-up business models.

The edge data center market is almost expected to triple by 2024 to a colossal amount of US\$14 billion from US\$4.0 billion in 2017. The increase is primarily driven by multiple worldwide technology innovations. The arrival of 5G into mainstream telecommunication will likely utilize the low cost, low latency support of edge centers, as well as the Internet of Things ("IoT") proliferation gaining from the latency benefits in order to help manage

growing volumes of data. Similarly, the 'close to the source' and low-cost nature of these centers will aid the closure of the 'data gap', currently at a potential 64 zettabyte between global data center traffic and useable data created. The increasing consumer adoption of video streaming and augmented and virtual reality will also likely help drive demand for edge data centers, as they help mitigate streaming latency and provide the high levels performance that both consumers and businesses demand.

### **Sustainability Demand**

Similar to all other industries, data centers have found the need to integrate sustainability into their strategies as both companies and consumers become more aware of the environmental impacts of business practices. Innovations in energy efficiency and renewable energy adoption, like in many other industries, has been driven by the industry's largest customers, namely Microsoft, Google, Facebook, and Amazon Web Services, with the major multi-tenant developers acting as 'fast followers'. With sustainability now an important concern for the majority of corporate customers, the 'sustainability bar' has been raised in the industry. According to the Journal of Science 5, data centers account for around 1% of the world's total energy consumption in 2021. However, while data center workloads have increased six-fold between 2010 and 2020, energy consumption has not increased proportionally to these numbers. This demonstrates the advances in data center technology, taking the form of new CPU technologies and more energy efficient storage solutions, such as Non-Volatile Memory Express ('NVMe'). Although this figure seems promising, it is likely that data centers of the future will need to be even more environmentally friendly, especially as evermore industries become electrified.

The demand for data storage has been consistent, incentivizing data centers to expand and improve upon their use of data compression, deduplication, and other more efficient methods. In addition, a growing number of modern data centers are implementing liquid cooling techniques, or so-called 'passive systems', replacing more traditional air cooling, which consumes far more resources. Liquid cooling allows for rapid reductions in temperature and energy consumption, and is often designed as a closed ecological cycle, operating with state-of-the-art technology components that consume significantly less power and withstand higher temperatures, resulting in greater longevity.

The market has seen a preference for efficiency within data centers, with Google, Facebook, and Amazon, buying land in Sweden on which to build, so as to benefit from the cooler climate which in turn reduces the need for cooling units. Microsoft is taking a more unusual, but promising, approach with regard to the Natick project, which is exploring the possibilities of using underwater data centers, again to reduce the need for cooling. Whilst data centers located on the ocean floor are surrounded by corrosive oxygen and moisture, Natick, which housed at least 864 servers and 27.6 petabytes of hard drives, about 27.6 million gigabytes, showed an impressive failure rate of 1/8 of the

terrestrial control group, whilst also utilising the free, and environmentally friendly, natural cooling agent of the ocean.

## Promising Market Sentiment

According to the latest spending forecast by M Capital Group, worldwide data centre spending is expected to reach an enthralling US\$207.4 billion by the end of 2022, an increase of US\$28.6 billion as compared to 2020. In 2020, at the height of COVID-19 pandemic, many companies focused on keeping their businesses running and were unable to provide the necessary capital to invest in expansion and evolution, which is critical in order to keep up with industry demand. With this trend sticking over the next year or so, the industry has seen an influx of private equity (“PE”) investment as these firms provide the necessary investment support innovation and technology evolution, bridging the gap between growth and capital provision. Over the 2021 to 2025 period, PE is expected to drive data center investment, with forecasts expecting to see US\$13.3 billion by 2025, an increase of 66% in 4 years. This highlights the positive institutional backing of the industry, suggesting its infrastructural support of many future IT trends, from delivering data-driven outcomes, to movements towards the digital economy.

Alongside PE interest, the three cloud giants, Amazon, Microsoft, and Google, who made up more than 50% of the world's largest data centers in 2021, have invested heavily in cloud infrastructure, with first quarter 2021 spending reaching \$41.8 billion, enabling their rapid expansion of services. Centers operated by providers such as AWS, Microsoft, and Google increased to nearly 600 at the end of 2020, doubling since 2015, with their spending reaching US\$37.0 billion in the third quarter of 2020 alone. Alongside this, in one of the boldest data center moves in history, Microsoft announced plans to build 50 to 100 new data centers each year since April 2021, including a US\$1.0 billion investment to build multiple hyperscale data center regions in Malaysia, as well as Amazon announcing 32 new ‘Local Zones’ in February 2022.

## High Performance Computing

High performance computing (“HPC”) gives users the ability to process data and perform complex calculations at very high speeds. Compared to a standard laptop or desktop with a 3 GHz processor that can perform ~3 billion calculations per second, a HPC far outperforms, calculating in the quadrillions per second. Therefore, enabling users to help solve major scientific, engineering, or business problems. Which leads to the expected growth in the market to grow from US\$37.8 billion in 2020 to US\$49.4 billion by 2025, at a CAGR between 5-6%. Additionally, with the number of connected IoT devices now 50% larger than the human population, there are ever increasing opportunities for its implementation. In 2021, 50% of data centers used solid state arrays (“SSAs”) for high

performance computing and big data workloads, showing a notable increase from 2020's level. The implemented hybrid model combines the HPC environment with traditional on-premises data centers, aiding accelerated data workloads.

### **Managing Remotely**

In the pre-pandemic environment, technicians, and data center administrators were required to be on site in order to maintain the technology, and thus when lockdown restrictions were put in place by governments, Remote Infrastructure Management ("RIM") was a key solution to the lack of human capital. One of the most important developments in RIM was allowing enterprises to remotely manage some, or all, of their IT infrastructure, as well as remote monitoring of security and network services, desktop management, database and server management. Zoom, and similar platforms, unified communications technologies, helping virtually manage repairs and maintenance, requiring only server replacement to be physically present. However, as the technology is relatively new, providers are yet to see the margin benefits from this new implementation, as the need for ongoing operational support, and the rising price of human capital, which grew 26% between 2020 and 2021 according to Uptime, will prevent net operational costs falling in the short term.

### **Security Enhancements**

With the ascendent momentum of ransomware and protection breaches, it is unsurprising that the worldwide data protection market is anticipated to flourish from US\$6.9 billion in 2019 to a remarkable US\$21.8 billion by 2026. Currently, investments in computerized protection gear that use gadget mastering to fast pick out assault styles and respond immediately to indications of attack are forming the industry standard first line of defence. As well as this, as businesses face an increasing need to protect their remote staff and hybrid IT solutions, there is growing demand for investment in optimal protection structures to help safeguard data, which data centers employ to preserve security.

## **KEY CONSIDERATIONS**

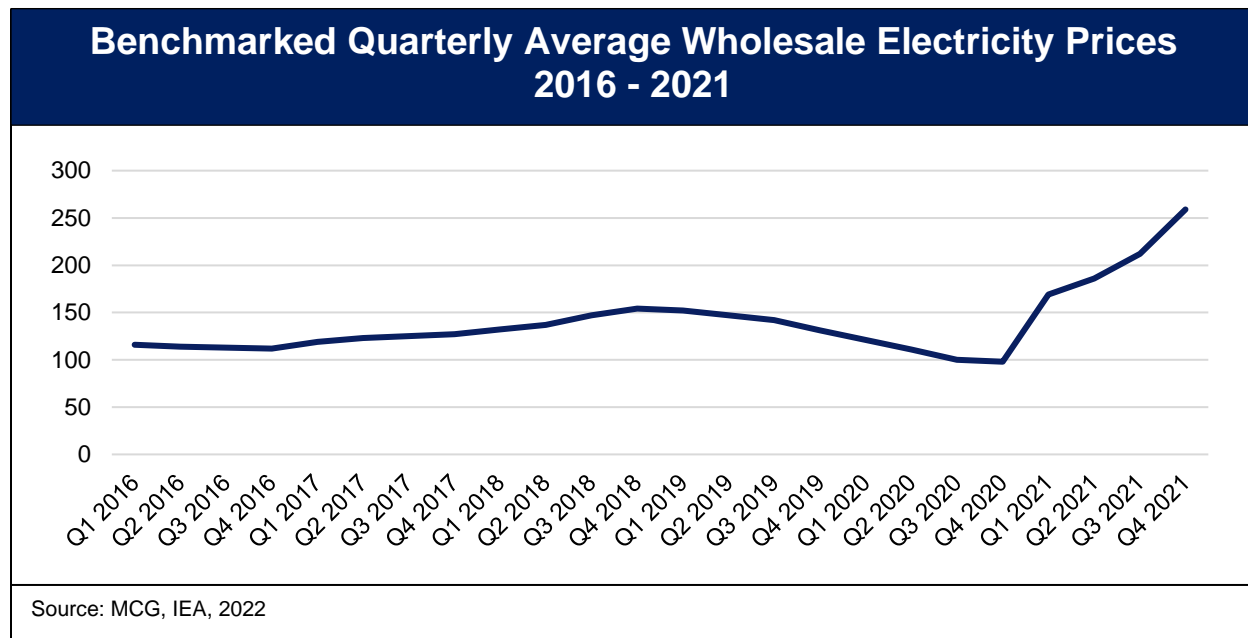
### **Capital Investment**

Unlike many other subsectors of the technology industry, data centers require heavy capital investment, a potential growth risk moving forward. The aforementioned industry changes brought on by the pandemic pushed these businesses to adapt to new measures

to maintain operations, which involved heavy investment into new technologies. The 2021 Uptime Institute found that 40% of operators had increased spending on infrastructure, monitoring, and staff, seeing a rise of 36% in infrastructure investment and 29% in monitoring as a direct result of the pandemic. Capital technology investments, whether in increased automation and monitoring or in site resiliency, are likely to continue to grow as industry innovation endures, highlighting the significance of infrastructure spending for data centers. With the pace of technological advancements likely to be sustained, there should be a key concern for operators to maintain and improve upon operational and technological capabilities in order to sustain a competitive edge.

## Energy Costs

As in our last report, energy cost and availability remain a key factor in the profitability of data centers. Highlighted through Sungard’s recent bankruptcy filing, both building and running these centers requires heavy energy consumption, and, although more efficient practices are being developed, it is, and will likely remain, the largest cost for operators. This, however, can be minimized through aiming for a low power usage effectiveness (“PUE”). Many techniques can be used to achieve a low PUE, but it is also key to consider availability of both power and water resources when determining the location of the data center facility. For example, locations in cooler climates require less use of energy intensive cooling systems, thus reducing cost.



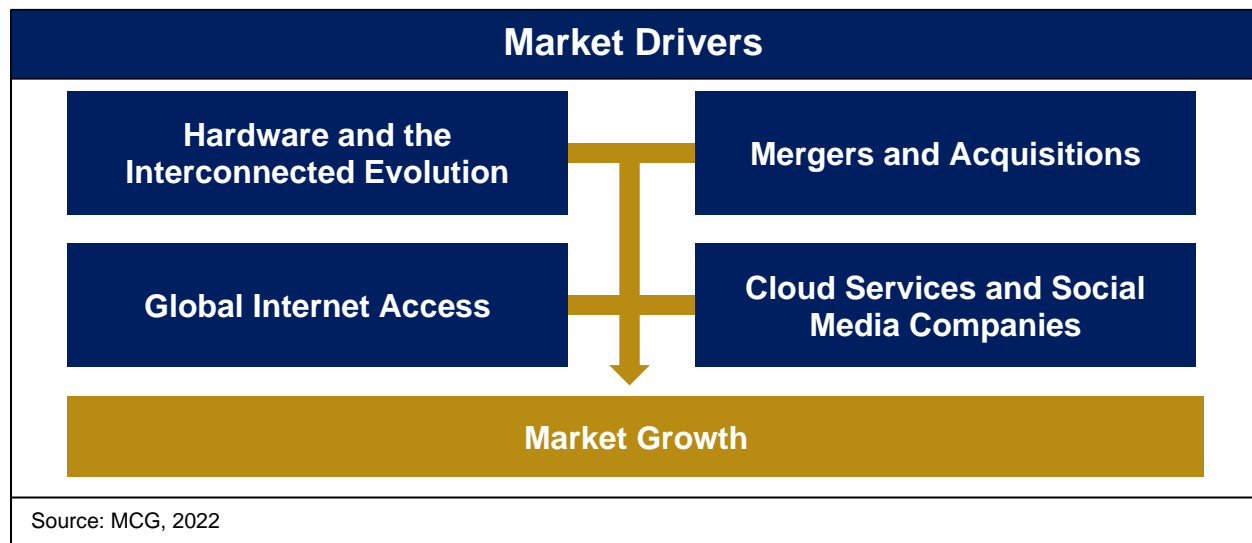
Over the last few months, energy prices have soared as a result of supply concerns as a result of the Russia-Ukraine crisis. However, energy prices have been on the rise since



Q4 2020, and thus data center owners should be wary of potentially shrinking margins as a result.

## DRIVERS

The hyperscale data center market by investment is expected to grow at a CAGR of 4% during the period 2021-2026, and as we near the end of the COVID-19 era and WFH levels become entrenched, alongside ever-growing data storage demand, the industry outlook seems positive. With a notable portion of the workforce likely remaining online, hyperscale and smaller facilities are gaining high traction. The increasing digitalization of global markets, rising investments from telecommunication & service providers, as well as PE, and government initiatives towards the digital economy provide significant drivers for market growth.



## Hardware and the Interconnected Evolution

Hundreds of thousands of interconnected servers, each processing and transferring large amounts of data, is fast becoming a reality. Continuous innovations in switching, routing, server, and interconnected hardware have enabled unprecedented levels of data transfer, improvements in computing efficiency, and have brought new and exciting cloud-based applications and services all of which is primarily facilitated by data centers' network architecture, optimally centered around the most efficient way to deliver the desired service, with the push towards growing efficiency assisting improvements in services exponentially.

## Mergers & Acquisitions

The data center retail estate investment trust (“REIT”) sector has seen a recent surge in market interest, with the three largest data center portfolio acquisitions in history having been completed in late 2021, with CyrusOne being acquired by KKR, CoreSite Realty by American Tower Corporation, and QTS Realty by Blackstone Funds, totaling over US\$35.0 billion. Mergers and acquisition (“M&A”) activity continues to be strong as large colocation providers look to expand domestic offerings to access major global markets in a race to provide global connection to underpin mounting demand. As interest in hyperscale data center consumption from stakeholders such as public cloud providers and large internet businesses continues to grow, it is likely M&A activity will follow suit, whether through PE companies or other investors. Similarly, the industry has seen an increase in demand from Chinese hyperscalers and telecommunications companies as they look to expand their network globally, which could prove to be a source of industry growth over the coming years.

## Global Internet Access

Recent research suggests that nearly two-thirds of the global population, approximately 5.3 billion, will have internet access by 2023, compared with 3.9 billion just three years ago. The growing number of people connecting to the internet will continue to drive demand for data center-based usage, with analysts projecting that there will be more than 29 billions IoT connected devices, such as wearables, smart appliances, autonomous vehicles, among many others, that connect to networks by 2023, with half of these connections being machine-to-machine (“M2M”). The substantial development in global internet traffic, expected to grow at an annualized 55% between 2020-2030, will likely continue to be the primary catalyst for data center demand for the foreseeable future.

## Cloud Service and Social Media Companies

The North American Data Center Trends Report published by CBRE regarding H2 of 2021 found that cloud service providers such as Google Cloud and AWS, as well as social media companies like Facebook and Twitter, are currently driving the demand for data centers, with their revenues expected to reach US\$526.2 billion in 2026. Furthermore, cloud service providers brought around 214.3 megawatts of new wholesale colocation supply online in seven of the US data center market’s primary locations in the first half of the 2021, which represents a 7% increase from the year before. Pat Lynch, CBRE Executive Managing Director, Global Head of Advisory & Transaction Services, Data Center Solutions, said: “We’ve seen no indication that the amount of data created and utilized is leveling out, so demand for data centers likely will continue increasing across both primary and secondary markets”.

This increase was spurred as apps and websites strive to pack in more features and better functionality, promoting users to spend more time using them, even as the average

number of apps a user downloads continues to decrease. Many users spent as much as 90% of their time on their preferred mobile platforms during 2021, and, as the more time global users spend online, the more servers and low-latency connection options service providers will need, it is inevitable that demand for hyperscale centers will increase, as they provide the necessary scale and connectivity.



## GLOBAL OUTLOOK

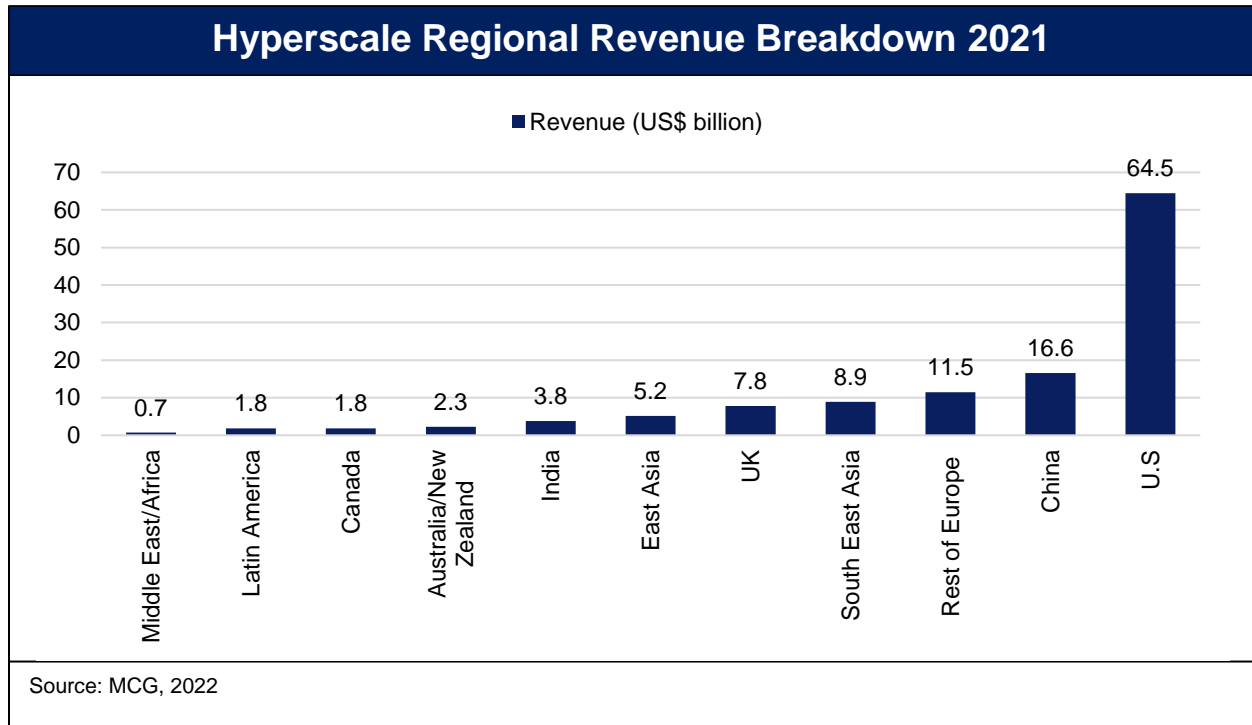
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The data center service market remains globally fragmented, and the competitive rivalry is high, with sustainable competitive advantage difficult to maintain without continual innovation, owing to the growing need for differentiated solutions for various, dynamic applications. As well as this, further innovation is needed to reduce cost in both operations and engineering, as for operators to be competitive, they must first be able to create sustainable business models.

## STIMULATING MARKETS

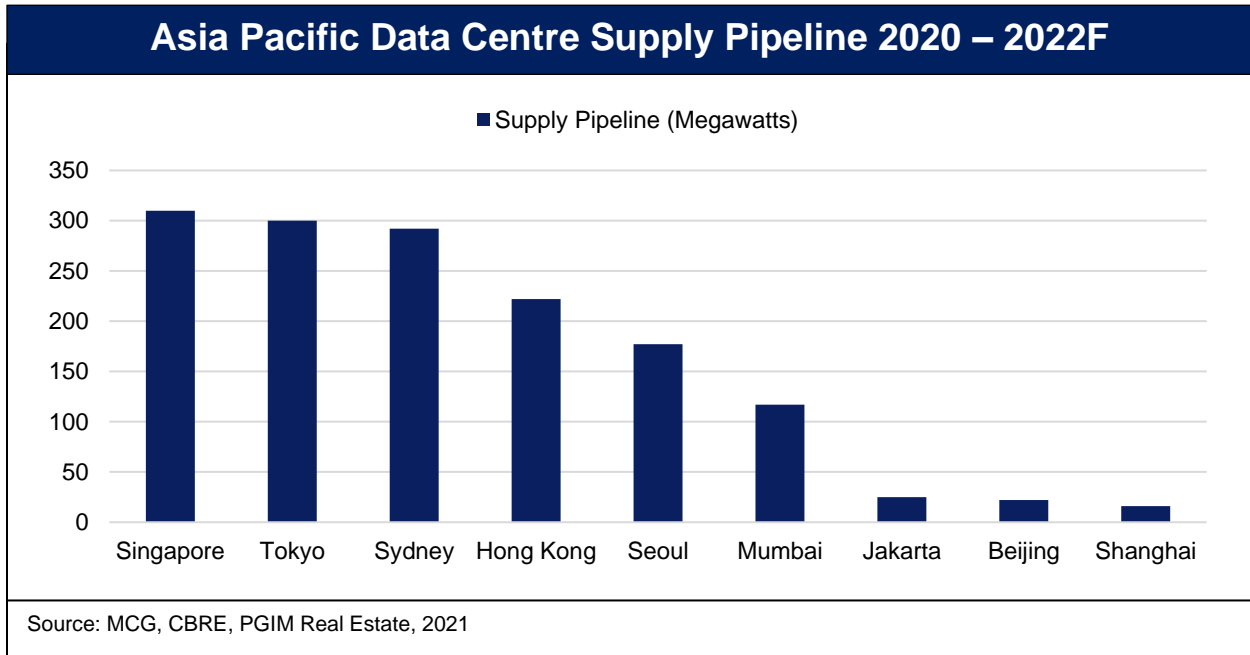
### Asia Pacific

Like the U.S. and European markets, the data center sector in Asia Pacific region has been benefiting from the growth of internet traffic and data volume as the numbers of and usage by both individual and corporate users rose. In line with global trends, the cloud services industry is currently leading the next wave of data center demand in the region, with the COVID-19 pandemic having accelerated consumer demand in areas such as e-commerce, with the penetration leading to changes in infrastructure for home working and distance learning. With those strong demand drivers in place, occupancy rates are high, ranging from 75% to 95%, with a number of markets expected to significantly increase supply, as capital continues to flow toward development in the provision of these centers. The top four markets of the segment are Singapore, Tokyo, Sydney, and Hong Kong, having attracted the most development interest, with capacity expected to have doubled by the end of the year compared to 2021. Furthermore, occupancy rates are likely to remain high, namely due to the robust demand from hyperscale cloud service providers, with their 2021 revenues in Asia Pacific at US\$32.8 billion, making up over 26% of the global market.

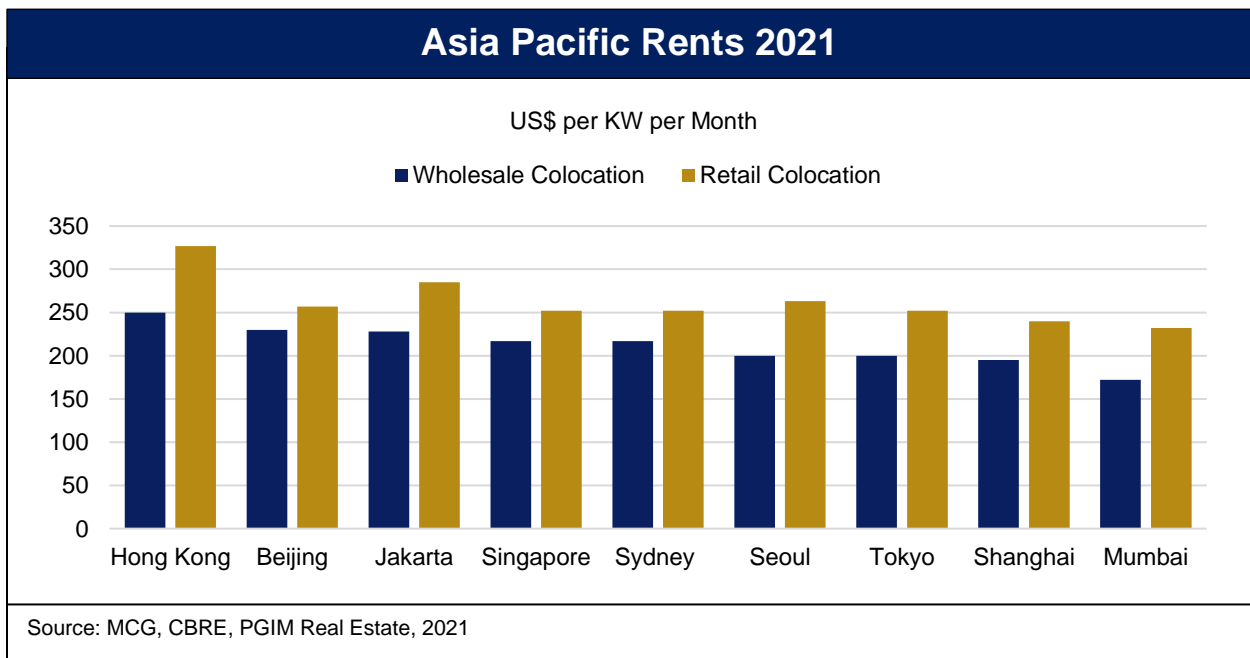


While China and Hong Kong are expected to create the most revenue in the Asia Pacific market, the Indian data center market is expected to grow at a promising CAGR of over 8% between 2020 and 2026. The prominent boom in internet users, the growth of the gaming sector, the popularity of the e-commerce industry, and the investment in digitalization of business are significant drivers within all these regions, India’s comparatively low rents suggest there is greater scope for growth than one may initially assume. Although rental costs vary from region to region, with retail collocation rents ranging from US\$200.0 to US\$320.0 per kW per month, hyperscale occupants often receive a significant 30-40% discount on wholesale rents, implying strong markets interest in securing lasting relationships with multinational firms.

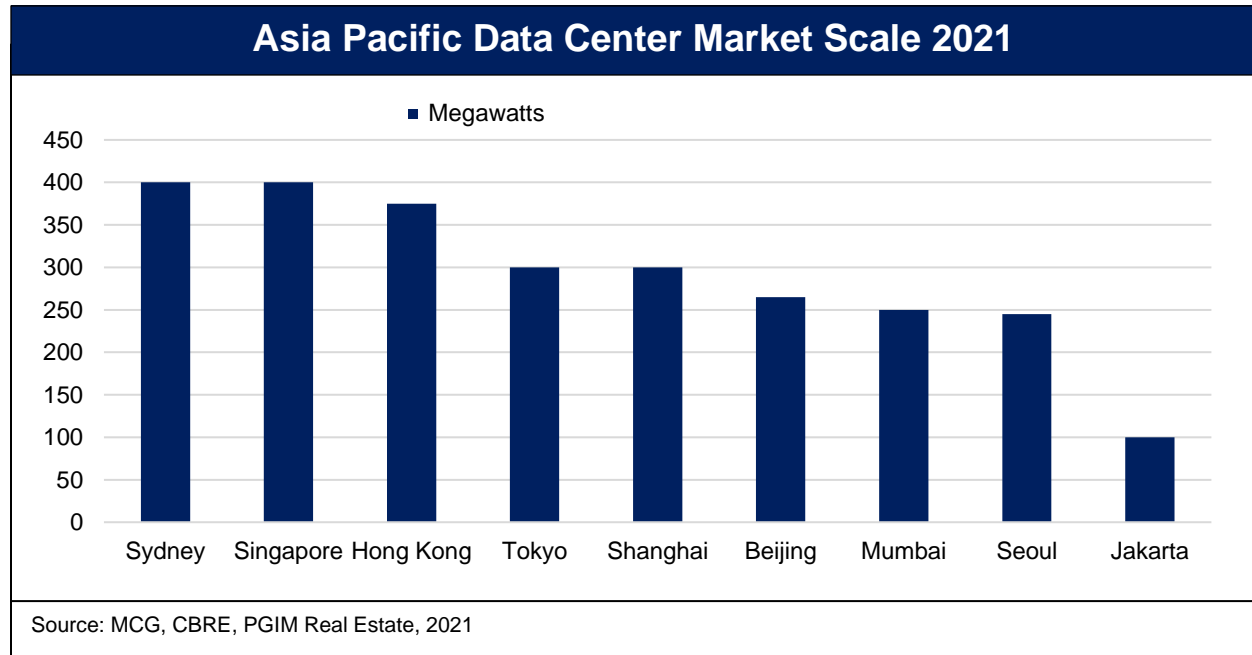
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In the future, the rental market is expected to be generally stable, if not slightly weakened in the short term, as the influx of supply into market offsets the aforementioned strong demand drivers. However, challenges in Singapore with regard to the government's moratorium on approval of new data center sites or hurdles in securing power supply in Tokyo, could lead to supply shortages in Asia Pacific, leading to stronger rental growth prospects in the medium term, leaving the exact future state of the market indeterminate.

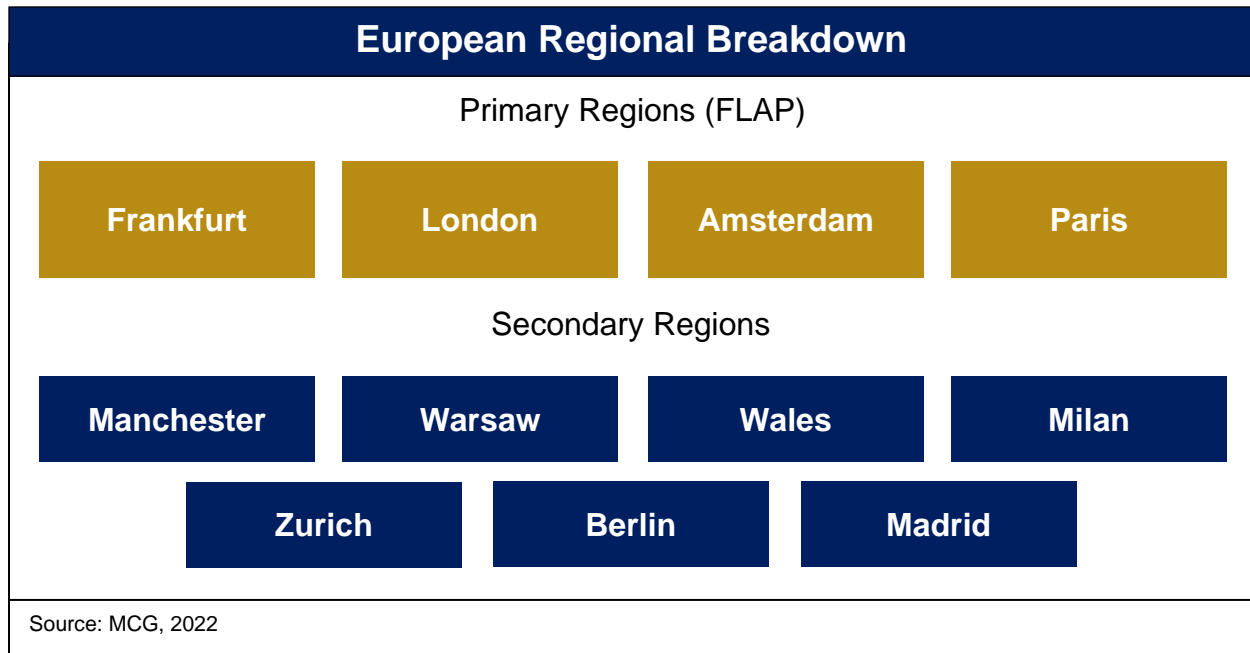


In January 2021, the Asia Pacific market was estimated to offer 2,600 MW of third-party data center capacity, accounting for a healthy approximation of 28% of the global data center market. The vast majority of this capacity resides in the four largest city-markets in this geographical segment: Sydney, Singapore, Hong Kong, and Tokyo. In addition to being key regional economic and financial hubs, these locations are considered gateway cities to major landing points for submarine fiber cables, making them the most suitable for the development of local and regional data centers, resulting in these cities currently housing a combined third-party capacity of 1,100 MW, over 42% of the Asia Pacific total.



## Europe

Over the 2020 to 2022 period, the European data center market has witnessed substantial expansion. With surging demand fueling growth, data center investment in Europe reached record highs, with the most recent data reporting the value of the European data center colocation market at US\$12.8 billion in 2020, with strong expectations for it to expand at a healthy CAGR of over 13% from 2021 to 2028, reaching US\$33.7 billion by 2028. The top data center markets continue to be the FLAP regions: Frankfurt, London, Amsterdam, and Paris, where the vast majority of the demand is produced, with the third quarter of 2021 seeing 134MW of take-up recorded, a new quarterly high for the market after a quieter second quarter, beating the previous record set during Q1. In FLAP, Frankfurt is currently the superior market in terms of growth, although London has been performing exceptionally well over recent years.



The European market, notably London and Frankfurt, has seen a rapid influx of global capital investment, with much of the demand coming from the aforementioned hyperscale data center consumers, accounting for 86% of third quarter take up, whilst also seeing development from the enterprise segment. While demand is remarkably positive, a common theme within the market is the pre-selling of data center capacity, which has particularly impacted Frankfurt's supply, leading to a degree of scarcity that is proving difficult to overcome, with any data center provider able to sell any megawatt of capacity that they have at the drop of a hat. Understandably, this has had upward pressure on prices, as huge demand has been coupled with a fall in production of new capacity, having been exacerbated by the pandemic's global economic slowdown, as well as increased energy costs, which have soared in recent months.

With slower than expected levels of growth in the Paris and Amsterdam markets in early 2021, Europe has seen a shift of capital allocation towards secondary cities, such as Warsaw, Milan, Zurich, Berlin, and Madrid, as we moved into 2022. In the UK, Manchester and Wales are also growing as secondary hubs for data centers, but it remains to be seen how these locations will perform.

An exciting driver for secondary European markets is growing demand for high-capacity networks, highlighted through the emergence of edge computing solutions. Technologies such as autonomous vehicles, IoT, machine learning, and artificial intelligence have created more demand for edge computing solutions as end-users clamor for seamless on-demand experiences.

Although Europe has seen positive development since our last report, growing domestic regulatory pressure, as well as supply diversity outside of FLAP, are notable headwinds.



## LOOKING FORWARD

As the world begins its venture into the post COVID era, with the world announcing the abolition of quarantine rules, global vaccination rates continuing to rise, and businesses now moving into less defensive practices, we will likely see the aforementioned innovations and core trends push the industry to achieve the estimated 13% CAGR throughout the next 5 years. The injection of capital through PE shops, as well as the growing infrastructural investment from multinational technology firms such as Amazon, Google, and Microsoft, will likely help propel the above drivers into the future, painting a promising picture for data center industry. However, rising input costs, such as energy and human capital, as well as supply pressure, may be risks to this growth, and should be carefully considered.

As storage of data is expected to continue on its' cloud-based trajectory, alongside edge data centers sustained growth in popularity, M Capital Group expects to see firms benefiting from competitive advantage held through their positioning to accommodate industry demand, whether through wholesale or more traditional colocation services. Similarly, the rise of remote managing may offer long run cost saving opportunities for eligible companies through investment into more efficient technologies, aiding the profitability of individual firms, as well as supporting value growth for the industry as a whole. Coupled with the impressive forecasts of two thirds of the global population having internet access in 2023, MCG expect to see positive development through pricing changes and ever-growing demand for data storage. Geographically, the industry has seen sustained investment in global cities within the developed markets over the past decades, but the emerging interest in second-tier locations, such as Manchester or Warsaw, offers an exciting prospect for data center companies to seize share of nascent markets. The prospect of new, budding locations alongside technological developments holds the data center industry in good stead to reach its' estimated 2027 value of US\$288.3 billion, although headwinds must be noted.

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<sup>1</sup>Sources: from various sources - M Capital Group Research, including data from The Future of Data Centers – Trends and Industry Overview, November 2021; Global Data Center Market Comparison, January 2021; Data Center Services Market- Growth, Trends and Forecasts, October 2021; The Eight Trends That Will Shape the Data Center Industry, February 2021; 10 Hot Data Center Technologies And Trends To Watch, May 2021; growth Drivers for Data Center Networks, August 2020; Worldwide Hyperscale Data Center Industry to 2026 - Rising Investment in Hyperscale Data Centers is Driving Growth, July 2021; Asia-Pacific Data Center Colocation Markets 2021-2026, May 2021; Data Center REITs, November 2021; State of the European Data Center Market, December 2020; Cloud services and social media drive data center demand, September 2021; Global Data Centers – PGIM, February 2021; State of the European Data Center Market in 2022, January 2022; Percentage of working adults that have worked from home or travelled to work at some point in the previous seven days in Great Britain from March 2020 to January 2022 – Statista, April 2022; Europe Data Center Market Report – Arizton, February 2022; Edge data centers: how to participate in the coming boom – pwc, July 2019; The Future of Data Center Investment – businesswire, December 2021; AWS brings Local Zones data centers to 32 new cities – ITPro, February 2022; Global Mobile Data Traffic Forecast – ITU, February 2019; Global Internet Data Centers Market Report 2021 – Business Wire, September 2021; U.S. Data Center Market - Industry Outlook & Forecast 2022-2027 – Arizton, March 2022; Pandemic has driven up data center costs – Uptime Institute, May 2021; Quarterly average wholesale prices in selected regions, 2016-2021 – IEA, January 2022.



<b>NEW YORK</b>	<b>LONDON</b>	<b>DUBAI</b>
<p>1330 Av of the Americas Suite 23 New York, NY 10019 U.SA United States Phone: +1 212 634 683 Fax: +1 212 634 7474</p>	<p>Level 17 Dashwood House 69 Old Broad Street London EC2M 1QS United Kingdom Phone: +44 207 256 4246 Fax: +44 207 256 4050</p>	<p>Level 41 Emirates Towers P.O. Box 31303 Dubai United Arab Emirates Phone: +971 4 319 7460 Fax: +971 4 330 3365</p>

