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The Arcadis Data Center Location Index 2021
Singapore Spotlight

Introduction

Asia-Pacific is very well represented in the Data Center Location Index. 13 Asian markets made the list and nine of them are in the top half, with strong performances by Singapore, Japan, Taiwan, and Hong Kong. Asia-Pacific is amongst the fastest growing regions of the global economy but there are large differences between markets in terms of GDP per capita and energy security. Historically a destination for major IT outsourcing projects, Asia has increasingly become a leader across many cutting-edge industries. A significant share of the largest technology companies is now based in China, not surprising given the size of the market and its highly skilled workforce. In addition to domestic providers, Asia-Pacific is undergoing significant data center growth driven by large-scale international cloud providers, as they expand aggressively across the major hubs in the region.

Singapore as a Premier Data Center Hub

A major financial center and one of the largest shipping ports in the world, Singapore ranks sixth in GDP per capita. With its well-educated workforce, stable government, solid infrastructure, and low risk environment, Singapore continues to attract major investments from the technology industry, making it a natural hub for serving markets across Southeast Asia and the wider Asia-Pacific region.

Singapore is ranked 2nd in the Arcadis Data Center Location Index 2021, making it a premier data center location. This is due to the country's leading position in internet connectivity and low energy prices. The country has traditionally been a landing point for global data center providers making their first investments in Asia and it is currently well positioned as a regional Data Center hub. Robust local infrastructure and a conducive business environment, including high data protection standards, underpin Singapore's position. The challenge however will be for Singapore to maintain this position in the medium to long term if high power consumption, availability of renewable energy sources and limited land availability cannot be effectively addressed.

The Challenge of Sustainability and Renewables

Data Centers currently account for approximately 1% of global energy consumption whilst in Singapore the percentage of energy consumption is likely to be much higher, given that there are more than 50 data centers in Singapore. These data centers account for 60% of Southeast Asia's total data center supply and regional energy consumption is expected to rise as data consumption and the resultant demand for data center provision continues to grow. This contrasts with societal expectations around sustainability and for cities and businesses to move toward

carbon neutrality beyond addressing embedded carbon, there is now increased government focus on how the local data center market is powered. As such, there is likely to be limited new data center development in Singapore until all parties can establish a coherent renewable energy plan.

This plan will need to be aligned to the recently published Singapore Green Plan 2030 which aims to use cleaner energy and increase energy efficiency to lower our carbon footprint. The sustainability standards of buildings are expected to rise, and carbon tax will be reviewed in 2030. In addition, a key pillar in the Green Plan – the Green economy aims to ensure that carbon intensive investments brought into Singapore are among best in class in terms of carbon and energy efficiency.

Data Center providers, both locally in Singapore, and globally, are actively looking to address the pressing sustainability challenge. Local solutions being evaluated include floating and submersed Data Centers (utilising seawater cooling and addressing land availability), the use of floating photovoltaic installations, cold energy release from LNG, as well as hydrogen cells for on-site power generation. The ability to implement robust renewable energy solutions will be key to Singapore maintaining its regional hub position and to meeting the ongoing surge in demand.
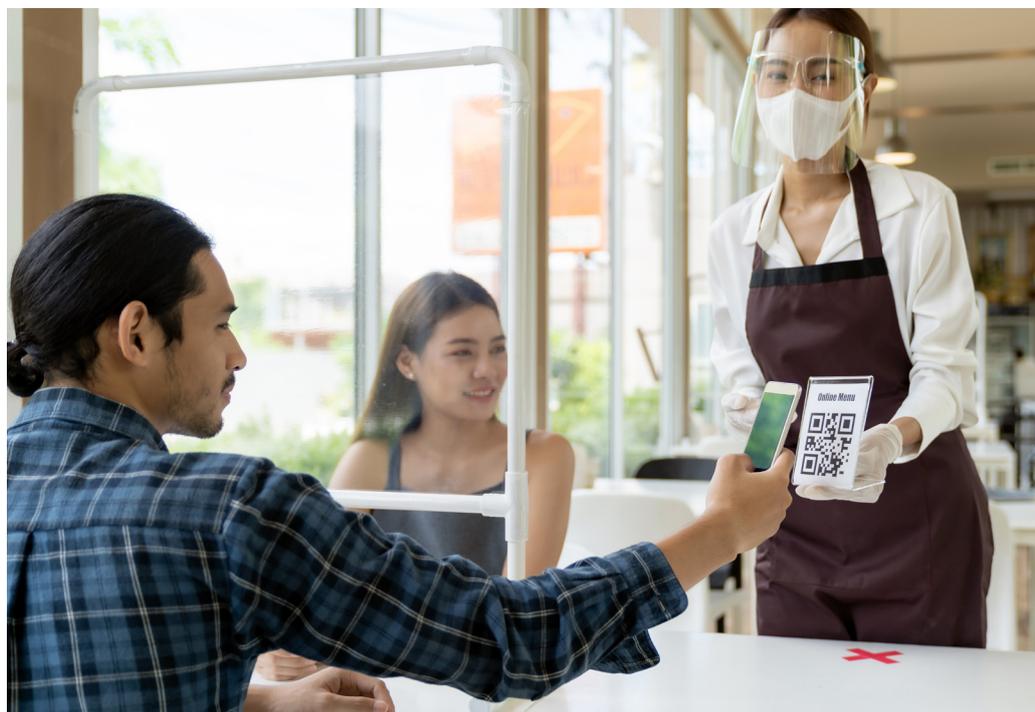
In addition to a focus on renewable energy, lowering the actual energy consumption of data centers is a key consideration. This could be achieved through re-evaluating the traditional design approach, introducing more innovation and use of alternative materials, through to further lowering the Power Usage Effectiveness (PUE) through systems optimisation and application of artificial intelligence in the operation of the asset.
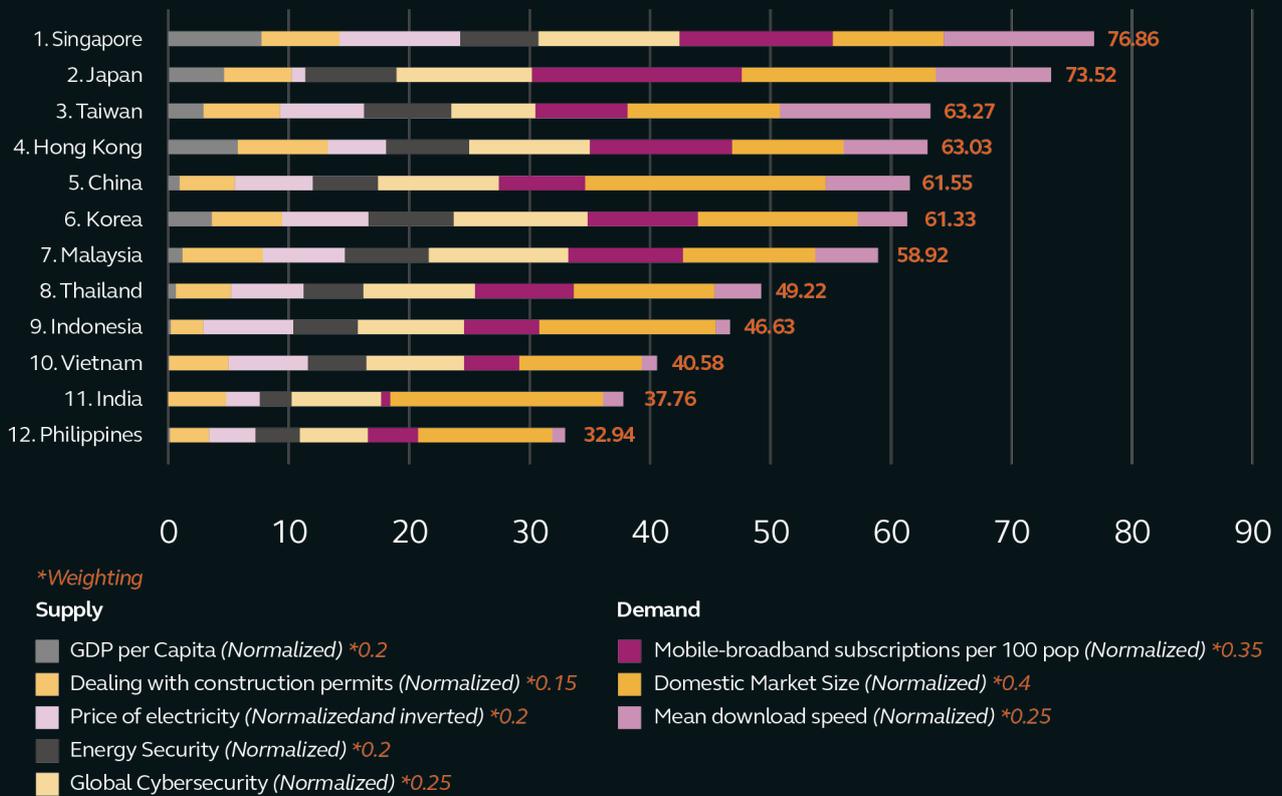
Looking Forward

The global surge in demand for data centers is expected to continue strongly over the medium term, especially in Asia, driven by the unrelenting increased consumption and use of data.

The pressing challenge for Data Center providers is to meet this demand whilst addressing the environmental impact of Data Centers, with leading providers having already made public commitments around their sustainability targets. Finding the solutions to the sustainability challenge sits jointly across all parties, including with the countries where the Data Centers are located. Those countries that can proactively support and help resolve the sustainability challenge will be the beneficiaries of future demand.
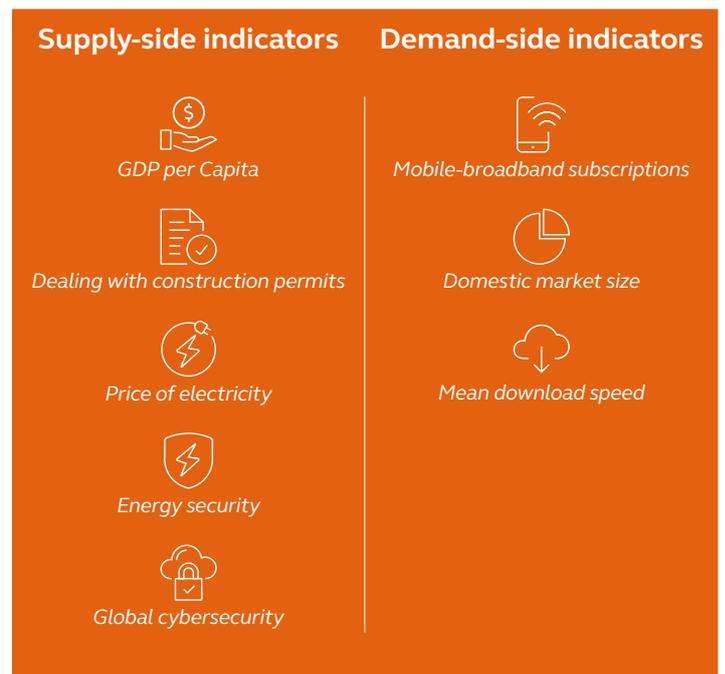
Asia Data Center Location Index 2021

Rank	Country	Score
1.	Singapore	76.86
2.	Japan	73.52
3.	Taiwan	63.27
4.	Hong Kong	63.03
5.	China	61.55
6.	Korea	61.33
7.	Malaysia	58.92
8.	Thailand	49.22
9.	Indonesia	46.63
10.	Vietnam	40.58
11.	India	37.76
12.	Philippines	32.94

Weighting

Supply

- GDP per Capita *(Normalized) *0.2*
- Dealing with construction permits *(Normalized) *0.15*
- Price of electricity *(Normalizedand inverted) *0.2*
- Energy Security *(Normalized) *0.2*
- Global Cybersecurity *(Normalized) *0.25*

Demand

- Mobile-broadband subscriptions per 100 pop *(Normalized) *0.35*
- Domestic Market Size *(Normalized) *0.4*
- Mean download speed *(Normalized) *0.25*

(For the Index full version, please refer to the Global Report - The Arcadis Data Center Location Index 2021)

At Arcadis, we leverage our global capabilities and deep knowledge of local markets to help our clients optimize location decisions against operating costs, resilience, environmental impact, government incentives or any of the wide range of issues that a client might choose. We support data center operators with the extensive stakeholder engagement efforts associated with gaining the community buy-in that is often needed to build a large structure of any type, especially ones that use so much energy.

The Arcadis Data Center Location Index provides an indicative ranking of suitability for data center investment, based on the aggregation of eight data sets for 50 markets across the Americas, Asia Pacific, Europe, and the Middle East. These markets are ranked based on their performance across five supply-side and three demand-side criteria.

Supply-side indicators	Demand-side indicators
GDP per Capita	Mobile-broadband subscriptions
Dealing with construction permits	Domestic market size
Price of electricity	Mean download speed
Energy security	
Global cybersecurity	

Factors Influencing City Rankings

Finding the best location for a new data center is a critical part of how companies can maximize the performance of their investment in a new facility.

There are multiple factors to analyze when deciding where to place a new data center. Companies should consider both the supply and demand-side forces at play in the relevant c markets. At a high level, this means that in each market under consideration, the company must develop a comprehensive understanding of the support in place for building and operating data centers, as well as the demand for services underpinned by data. This is no simple task.

We developed the Arcadis Data Center Location Index for companies that are considering where in the world they should build their next data center. The Index can serve to validate or call into question initial discussions about the optimal location for a new facility. We examined 50 national markets, a mix of established and emerging economies, and ranked them based on their performance across eight key criteria, that include both supply and demand-side factors.

The Arcadis Data Center Construction Roadmap

At a macro level, data center operators travel through five steps on the road, from deciding to build a new data center to reaping the benefits of that investment. At each step, Arcadis offers services and solutions for clients that maximize the performance of their investment. We partner with clients throughout the entire journey and help them avoid the pitfalls of hidden costs, delays in acquiring permits or construction, and by designing and delivering sustainability and resilience features that will protect their investment over the longer-term.

STEP 1

Location

The first step is deciding where to place the proposed new data center. This is where companies need to understand countries' markets as well as regional differences within countries in terms of the availability and reliability of electricity, the status and availability of fiber optic networks, the regulatory and permitting regime, and many other factors. Ultimately, this includes the consideration of individual sites, where the data center can be constructed.

Savvy due diligence conducted at this stage is essential in terms of making informed decisions that can maximize return on investment across the entire journey.

STEP 2

Planning

Once a data center operator has decided where to place the new facility, they enter the planning phase. At this point they must decide how, and on what time schedule, they will design the new facility, secure all of the necessary permits and permissions, engage with a multitude of suppliers and service providers, have the facility built and outfitted and begin operating the data center. During this stage, companies will have to decide on the basic parameters of the new data center: roughly how large it should be, based on the desired use and other business objectives. It is important to note that this stage is also critical in terms of designing the long-term sustainability and resilience of the new data center. This is where companies can make decisions that can reduce the embodied carbon of the new building and outfit the asset with sustainability features that can greatly reduce the amount of embedded carbon as well as energy that will be used over the life of the facility.

It is critically important data center operators maintain highly competent due diligence efforts throughout this phase to help avoid unforeseen costs or delays in the ensuing steps. This is also the stage at which project, cost management and long-lead item procurement efforts work together in unison.

STEP 3

Permitting

Every jurisdiction in the world has its own unique regulatory regime, which dictates myriad aspects of the design, construction, and operation of any type of building, including data centers. During the permitting phase, data center operators settle on the detailed design of the proposed, new facility. Based on that design, companies then have to secure all of the necessary permits and other permissions needed to actually build the data center and switch it on.

Sustainable and resilient design of the building(s) can significantly enhance the value of the asset(s) and greatly reduce negative impacts on the environment and the communities near a site. Good design, project management and cost management expertise can help companies better navigate their way through this phase.

STEP 4

Construction and delivery

The construction and delivery of the new facilities is undoubtedly the most critical step of this process. Deficiencies in due diligence or the earlier stages of project and cost management, all too often, become evident during the build. Add to that the fact that construction cost overruns and delays in delivery are not just frequent, in some places, they are the norm. Whether it's 1 or 2% more expensive than planned or 10 to 20%, every unexpected cost or delay in this stage decreases return on investment in the facility. In other words, the difference between a successful project to build a new data center and a really successful one, is how well the operator can pull off the build and get things up and running as quickly and smoothly as possible, through clarity, strong management, and cooperation throughout the supply chain.

This is where data center operators can reap the full benefits of skillful project and cost management services.

STEP 5

Operations

After the facilities have been built, the networking and storage equipment is installed, it's connected to the fiber optic network, and the new data center is brought online. Operators will need to ensure energy supply and maintain back-up generators as a last resort. They will also run and service the cooling systems and arrange for the upkeep and maintenance of the building.

Sustainability and resilience features (designed into the plan earlier on and delivered during the build phase) can generate tremendous savings over the long-term. They allow data center operators to reduce or supplement energy consumption from the grid or harden the building against shocks like storms and flooding.
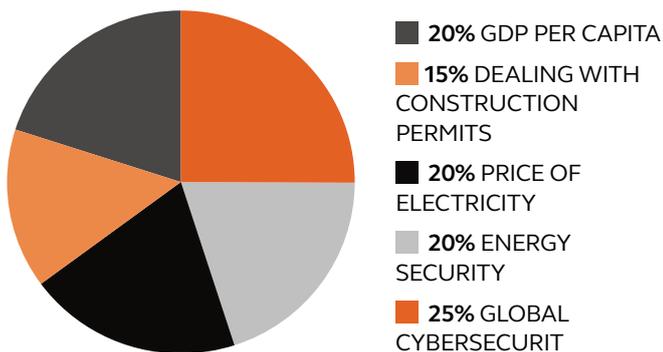
Smart analytics solutions can help operators optimize their maintenance schedules to prevent breakdowns and diminished asset performance from delays in discovering faulty equipment or infrastructure.
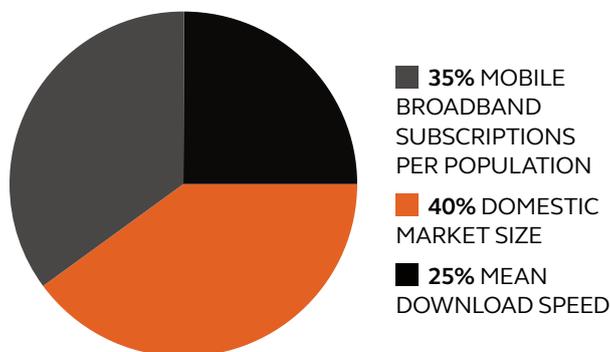
Methodology

The index ranks 50 of the world's key established and emerging markets based on their performance across eight criteria: GDP per capita, dealing with construction permits, price of electricity, energy security, cybersecurity, domestic market size, the number of mobile broadband subscriptions and mean download speed. The final index value is a sum of weighted scores which have been collated from publicly available sources. Scores for each of the eight metrics are normalized on a scale of 0 to 100 using World Bank methodology. This ensures that the very large differences in scale and performance highlighted by our data are reflected in the overall assessment. All markets are ranked on a scale of 0 to 100 in a way that ensures that distance between two markets in the underlying data is scaled proportionally and remains consistent across all 50 markets.

Using the above-mentioned criteria, we have created one ranking for the supply criteria and one for the demand criteria and then combined those with equal weighting (50/50).

Within the supply side, we have used the following weighting:

- **20%** GDP PER CAPITA
- **15%** DEALING WITH CONSTRUCTION PERMITS
- **20%** PRICE OF ELECTRICITY
- **20%** ENERGY SECURITY
- **25%** GLOBAL CYBERSECURIT

Within the demand side, we have used the following weighting:

- **35%** MOBILE BROADBAND SUBSCRIPTIONS PER POPULATION
- **40%** DOMESTIC MARKET SIZE
- **25%** MEAN DOWNLOAD SPEED

Criteria description and source of data

GDP per capita

Indicator used to analyze the prosperity of a country and its economic growth. It is a useful unit to make cross-country comparisons of average living standards and economic wellbeing.

Source: World Bank

Ease of obtaining construction permits

The procedures, time, and costs to build, including obtaining necessary licenses and permits, completing required notifications and inspections, and obtaining utility connections.

Source: World Bank

Price of electricity

The average price of electricity for warehouse use in each country is measured in US cents per kilowatt-hour.

Source: World Bank

Energy security

The energy trilemma score scores countries on their ability to provide sustainable energy through three dimensions: energy security, energy equity (accessibility and affordability), environmental sustainability.

Source: World Energy Council

Cybersecurity

Measures the commitment of countries to cybersecurity at a global level.

Source: The International Telecommunication Union

Domestic market size

Sum of gross domestic product plus value of imports of goods and services, minus value of exports of goods and services.

Source: The World Economic Forum Global Competitive Index

Mobile-broadband subscriptions

Number of active mobile-broadband subscriptions per 100 population in leading online markets.

Source: The World Economic Forum Global Competitiveness Report

Mean download speed

Mean download speed is based on the download speed of at least 50% of customers at peak time.

Source: cable.co.uk

About Arcadis

Arcadis is the leading global Design & Consultancy firm for natural and built assets. Applying our deep market sector insights and collective design, consultancy, engineering, project and management services we work in partnership with our clients to deliver exceptional and sustainable outcomes throughout the lifecycle of their natural and built assets. We are 27,000 people, active in over 70 countries that generate €3.3 billion in revenues. We support UN-Habitat with knowledge and expertise to improve the quality of life in rapidly growing cities around the world.

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Arcadis. Improving quality of life

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