The Rise of Sustainable Data Centres in the APAC Region

Introduction

The Asia Pacific Region (APAC) is one of the fastest developing data centre regions in the world. With rapid digitalisation and the surge in demand for cloud-based services across the region, it is estimated that by 2024 the overall Asia Pacific data centre market size will be worth around US$28 billion. Much of the demand comes from global cloud providers, social media and e-commerce platforms, video streaming and banking, which all require robust IT infrastructure and data networks to support its growth.

China and Hong Kong lead the market in terms of data centre development, followed by India, Australia, Japan, and Singapore. Indonesia, Thailand, and Malaysia are also making a sizable contribution toward the region's growth. The implementation of 5G will have a significant impact on the market, while the introduction of artificial intelligence and machine learning workloads is expected to contribute over 40% in the infrastructure investment within APAC by 2025.

The average broadband penetration in APAC has reached 38% compared to 33% in 2015, and smartphone penetration has increased to 66% from 43%. This has been driven by increased penetration in markets such as India and Vietnam. Higher take-up of smartphones is indicative of a shift towards a digitally connected consumer lifestyle where social media and mobile applications proliferate. This translates to an increase in data consumption - and a rise in carbon emissions.

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Rising Carbon Emissions

55% of all internet users in the world are in APAC. To keep up with the increase in data demand, data centres need ever-growing amounts of energy. But the amount of energy consumption data centres are using has gained much attention locally and beyond, due to the extent of their carbon emissions.

Each year, millions of data centres worldwide are getting rid of tons of hardware, draining country-sized amounts of electricity, and generating as much carbon emissions as the global airline industry. It's been predicted that data centre energy usage could engulf over 10% of the global electricity supply by 2030 if left unchecked. Such growth would indicate similar increases for both gas emissions and e-waste produced.

With data centres in the APAC region continuing to consume ever-growing amounts of energy to keep up with demand, pressure is on for operators to introduce more sustainable solutions to their data centre operations – while building greater cloud efficiency.

But what are the current challenges of going green are APAC data centres facing? And what are the viable solutions that can help data centre operators fight the rising tide of environmental challenges?

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Sustainability is fast becoming a key business imperative in Asia Pacific (APAC) as customers, shareholders and the public demand accountability from corporations. Many countries in the region including Singapore are actively working on plans to build a low carbon and climate resilient future by developing renewable energy sources. Moreover, data centre efficiency and sustainability are now taking centre stage as massive digitalisation across sectors creates a parallel demand for energy.

As the demand for digital infrastructure continues to grow exponentially, data centres are becoming the ‘beating heart of our digital world’. APAC is set to be the biggest market for data centres by next year, with Southeast Asia (SEA) being one of the fastest growing regions globally.

At Digital Realty, we prioritise sustainability as a core business tenet. We’re committed to striking a balance between sustainable data centre operations while meeting customers’ demands for digital expansion. Our upcoming data centre in Singapore (SIN12), due to open in Q1 2021, prioritises a sustainable digital ecosystem by leveraging the latest in green designs and innovative cooling solutions. We’re also ramping up our sustainability efforts in other APAC facilities as we expand our regional presence, having recently announced new facilities in Korea and Hong Kong. As a company, we’re dedicated to bring our emissions in-line with a significantly below two-degree climate change scenario by 2030.

Omer Wilson Head of Marketing APAC, Digital Realty

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Battling with a Tropical Climate

The tropical climate and high humidity of Southeast Asia present a challenging environment for data centre operations. For a data centre to remain functional, it either needs to have been built in a country with a naturally cold climate or be housed in a temperature-controlled environment that's maintained continuously. Around 40 percent of the total energy that data centres consume goes to cooling IT equipment. The servers and IT equipment function best within a specific recommended temperature and humidity range, otherwise they are at risk of degradation or of breaking down completely.

To prevent this from happening, data centres rely massively upon air cooling systems. It is estimated that between 35-40% of total energy usage goes towards cooling a typical data centre in Southeast Asia. The global average is 30%.

The heavy use of air conditioners means higher carbon emissions, as well as energy usage which does not go towards the running of core data centre facilities.

Harnessing More Efficient Cooling Systems

Over 95% of data centres in Southeast Asia still use air-based cooling, a highly inefficient system. Servers can't overheat or there is a risk of data loss or of shortening a server's life span. Sustainable alternatives provide an efficient solution for heat transfer while saving space in the data centre. For example, a Frankfurt data centre has reduced its energy usage by covering the exterior walls and roof with plants in order to maintain a consistent internal temperature throughout the year. Outside air is used for cooling more than 60% of the time.

A popular solution is to simply locate data centres in cold or windy climates. But this isn't viable for the APAC region. A better solution might be to leave fewer servers turned on at any one time. For instance, Facebook invented a system called Autoscale in 2014 that reduces the number of servers that need to be on during low-traffic hours. This resulted in a 10–15% power saving.

Other major players like Google have turned to AI to optimise their internal cooling systems. By matching weather and operational conditions, they have been able to reduce cooling energy usage by almost 40%.

An alternative, albeit contrary approach to overcoming cooling system emissions, is to simply design server systems that perform at higher temperatures. Rather than cooling systems to a certain temperature, newer hardware would be able to function at higher temperatures without impacting reliability. This would require significantly less cooling – and less electricity – for the systems, therefore lessening their carbon footprint.

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Increasingly, enterprise and corporate clients evaluate data centre operators not only on their resiliency, operations and cost, but also on their sustainability objectives and processes.

We’ve seen niche examples of data centre sustainability such as Microsoft’s Project Natick, which saw a data centre at the bottom of the sea. The hypothesis was that an underwater data centre would allow for energy efficiency through consistently cool subsurface seas using heat-exchange plumbing similar to that found on submarines. With the data centre recently retrieved after two years under water, the sustainability benefits look to have been achieved in terms of cooling efficiency and removing the need to use freshwater resources.

Currently, deep sea data centres are not ready for mainstream adoption so more traditional energy efficiency initiatives are needed. Google has focused its sustainability initiatives on the use of renewal energy to power its data centres and reducing the overhead energy use, such as cooling and power conversion. Through these measures they have been able to reduce these overheads to 11% corresponding to a PUE of 1.11.

With the cloud operators leading the way, the colocation data centre industry needs to follow suit.

We expect to see more organisations include energy efficiency in their data centre colocation evaluations, and for it to increase in relative importance against other evaluation criteria, as sustainability becomes a must-have rather than a nice-to-have.

Simon Abela Managing Director, CS Technology Australia

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Overcoming Land Constraints

While there are various solutions to reducing the energy consumption of inefficient cooling systems, most are dependent on the size and location of the data centre. However, if we take Singapore as an example - one of the APAC region's big data centre players - the country's land area is made up of 724sq km, meaning there is limited space to build data centres. It's no surprise then that land is at a premium, with real estate prices among the highest in the world. As such, data centres in Singapore are forced to be built as high-rises, often scaling up to seven storeys high. This stands in stark contrast to the expansive data centres found in the US and Europe. For Singapore data centres, building upwards means putting extra measures in place to ensure air flow and cooling.

And limited land also means limited space to build sources of renewable energy, such as wind turbines. As of 2019, less than 1% of the country's energy came from solar power. Its lack of rivers means it's also unable to accommodate hydropower.

Due to these constraints, well-known approaches such as wind power and hydroelectricity, which are key drivers of sustainable data centre development in other markets, cannot be readily applied to Singapore.

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Sustainable practices and environmental stewardship have evolved to become a priority. Businesses have shifted their focus on sustainability, integrating it as a core aspect of their enterprise business strategy.

With the rapid growth of the digital economy, the demand on data centres literally powering it is growing in lock step. When taken as a class of building, data centres are among the highest consumers of power. It’s more critical than ever for enterprises to seek alternative energy solutions for their data centre infrastructure.

While efforts to improve the energy efficiency of data centres—such as fine tuning of cooling system sequence of operations, expanding the operating parameters of data halls, and optimising air flow by using smart sensors and controls—will remain an important area of focus, organisations are also capturing significant sustainability gains by leveraging smart innovations and technologies. New technologies such as Artificial Intelligence - currently still an untapped opportunity - should be embraced to modernise operations. Predictive platforms provide advanced analytics in real time and enable operators to foresee operational threats and improve energy efficiency. Additionally, enabling modularisation in systems to allow for the system to operate at its highest efficiency and introduce more efficient cooling systems, such as liquid cooling, that can lower temperature in a targeted manner while reducing power consumption by 20 to 30%.

Implementing green practices in data centres not only benefits the planet but is also good for business. The use of renewable energy resources can go a long way in helping businesses lower the overall ROI of their data centre while helping them achieve green initiatives and reduce the carbon footprint.

At Digital Realty, we are constantly looking to embrace smart technology innovations to drive sustainable growth across our facilities in Asia Pacific. Our upcoming SIN12 facility in Singapore will be equipped with modularised cooling to reduce power usage effectiveness (PUE) to within 1.2 and 1.3, and we aim to achieve the most competitive PUE for a commercial data centre in Singapore. We have pursued and achieved the latest BCA Green Mark certification for Data Centre for this facility, in line with our commitment to industry-leading sustainable design standards.

Jon Curry Vice President Operations, APAC, Digital Realty

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Powering Water-Based Solar Panel Deployment

Due to land constraints, the majority of Singapore's solar panel deployment for data centres can be found on rooftops and vertical surfaces of buildings. But there are supplies emerging in other, more creative locations: on water surfaces.

To meet their sustainability goals, data centres benefit from procuring solar energy from these sources. There is also an opportunity for Singapore to import solar electricity from Australia. A project in Australia, which links a giant solar farm to Singapore via a subsea cable, is aiming to be commercially operational by 2027. If successful, the project could supply 20% of Singapore's national energy needs.

But the environmental impact caused by data centres doesn't stop at electrical consumption.

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Schneider Electric recently commissioned a report from 451 Research to understand the pervasiveness of efficiency and sustainability efforts in the colocation market.

One of the questions we asked was about what projects and priorities colocation providers are planning in the next year and two years out. Optimizing existing data centre power distribution and upgrading existing data centre power distribution were the top two answers.

Additionally, projects related to diversifying energy mix, all doubled in interest between the next two years. The three stand-out initiatives were: power-purchase agreements to increase low-carbon energy sources (16% to 31%); switching energy utility for lower carbon energy mix (16% to 31%); and buying renewable energy credits (15% to 30%). These research findings make it clear that part of the solution must be diversified energy portfolios.

The main challenge is the wide range of options on how to create renewable programs and that those options vary dramatically by regions. For organizations that have global fleets – this matrix of options and providers can be overwhelming. Many companies need help to understand the options available in regions and vet those options. They also typically lean on SE’s Energy Sustainability Services team to help create a holistic strategy that is consistent around the world and then utilize our services to help execute it with the various renewable options.

These two types of projects - driving power optimization and diversifying energy mix illustrate the two approaches that SE recommends to our cloud and service provider customers: driving resource efficiency in current your current fleet and creating sustainable data centre designs for future builds. It’s through the combination of these two efforts that we will make an impact on our business and our sustainability goals.

Paul Tyrer VP, Cloud & Service Providers - APAC, Schneider Electric

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The Problem with Hazardous Chemicals

Coolants are often made of hazardous chemicals. Battery backups at data centres, necessary in the event of a power shortage, are an environmental hazard, both while mining for battery components and at the point of toxic battery disposal.

Furthermore, data centres often burn diesel fuel to keep up with power demands, and that fuel must be burned periodically when its shelf life expires.

But it's not just a sustainability challenge that data centres present; it's also a strategic one.

Energy costs can make up as much as 80% of operational expenses for a data centre and, simply put, power supply is a business-critical issue for data centres.

When it comes to optimising operations, harnessing advanced technologies is a guaranteed way towards a greener future.

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The digital world and the global climate have a complex relationship. Society is becoming more and more digital and although this brings enormous benefits, like working from home and freedom of information, there is also a cost. The digital industry has one of the highest carbon footprints in the world and, as the digitalisation progresses, this will only become higher. Having said this, technology is part of the solution too. A videoconferencing session is less energy consuming than a flight. And a digital invoice is better for the planet than a paper invoice.

The way forward is making sustainability a standard part of the agenda when we implement new technologies. Data can be moved to dedicated data centres so that data is warehoused in the most energy efficient environment possible. Traffic can be routed in the most direct and efficient manner so that equipment doesn’t have to work overtime to bring data from A to B. And hardware can be updated with models that use less power. AMS-IX upgraded its switches in the Amsterdam metro to a new model recently and saw a 30% drop in power usage.

Interesting developments lie ahead with the coming of 5G. Will the networks of the future be built with sustainability in mind? Will network operators for example share parts of their networks with others so that we use networks as (energy) efficiently as possible? I believe that every company in the digital ecosystem can make responsible choices today that will have a lasting effect for the world of tomorrow.

Peter van Burgel CEO, AMS-IX

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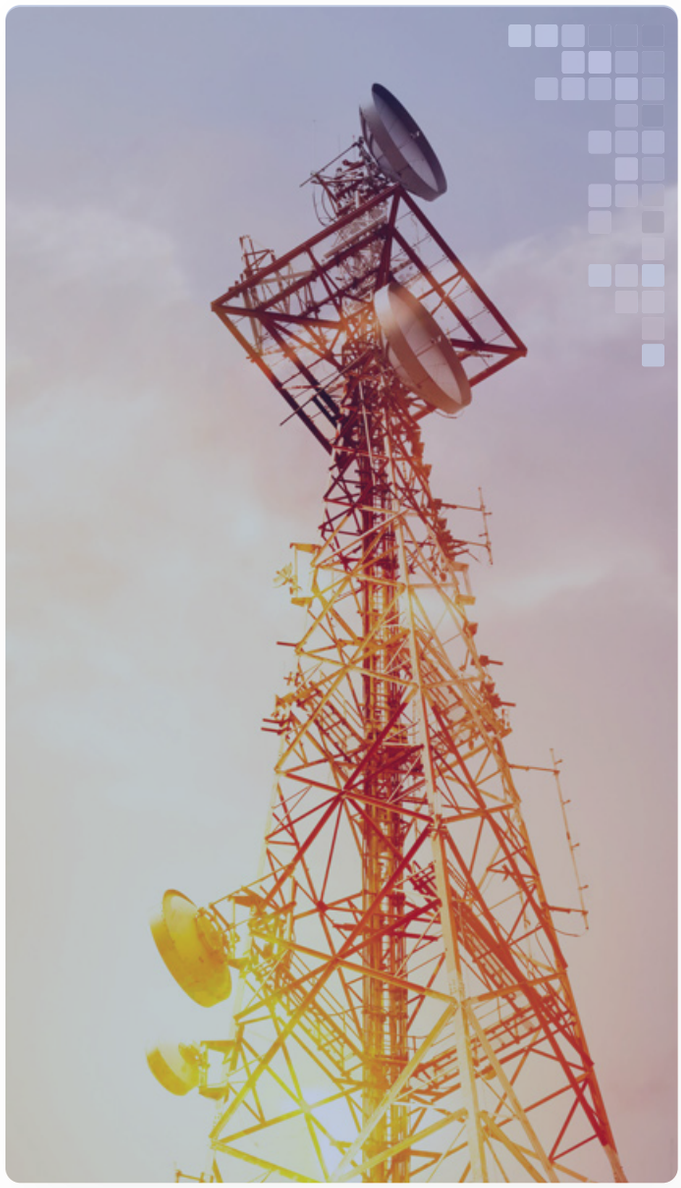
Maximising the Efficiency of New Technologies

AI and machine learning technologies must be embraced to modernise and green data centres. However, data centres in the region have been slow to adopt AI technology as they do not yet value the potential advantages of AI in maximising energy efficiency.

The key for organisations is to lead with an energy-efficient design from the onset. By establishing proactive sustainability and efficiency measures at inception, leveraging the latest technology can ensure that the data centre can be operated, maintained and repaired easily and efficiently. This will inevitably lead to a smarter, cleaner way of consuming energy and water.

Several new players are coming up with AI offerings and advanced tools to enable fresh ways to operate faster and more efficiently. Predictive platforms offer advanced analytics and machine learning in real time to anticipate operational threats and predict future outcomes to increase energy efficiency, while AI is being used to control energy consumption by air conditioners.

Due to the current viewpoint held by many data centre operators regarding the potential of advanced technology on facility efficiency in the APAC region, this is clearly an untapped opportunity. An opportunity that must be realised soon because, according to Gartner, by the end of 2020 more than 30% of data centres that fail to implement AI will cease to be operationally and economically viable.



Scope of Sustainability in Data Centre

In 2020, data centres will use 91 billion kWh of electrical energy of global energy consumption. Electricity use from IT devices could exceed 20% of the global total in the next 10-20 years, with data centres using more than one-third of that. Worldwide, it is estimated that data centres consume about 3% of the global electricity supply and account for about 2% of total GHG emissions. According to the Natural Resources Defense Council electricity consumed by data centres will result in the release of 100 million metric tons of carbon dioxide (CO2). This puts data centres on the radar of environmental groups for their carbon emissions.

India's Opportunities for Sustainability

India has equipped itself to meet the growing digital demand infused by domestic and foreign demands. As per Invest India, India was ranked as the fourth attractive renewable energy market in the world by 2019. There, power generation capacity of renewable energy stands at 23% (85908 MW) of their total energy consumption.

Solar power capacity has increased by more than 14 times in the last five years from 2630 MW in 2014 to 37505 MW in December 2019. India submitted its Intended Nationally Determined Contribution (INDC) to the UNFCCC, outlining the country's post-2020 climate actions. India's INDC builds on its goal of installing 175 gigawatts (GW) of renewable power capacity by 2022 eventually increasing the country's share of non-fossil-based installed electric capacity to 40% which is 450 GW of renewable energy power by 2030. This is the world's largest expansion plan in renewable energy.

Narendra Sen Founder and CEO, RackBank

Is the Future Green for APAC?

In terms of Asia-Pacific's sustainable future, Indonesia and Malaysia are rising stars in the region's green data centre game. While both markets are at a much earlier stage of data centre development, they offer ease of access and much lower cost of entry than other, more advanced markets.

Both counties also have a young, fast-growing, and sizeable base of digital and tech-savvy consumers, which drives dynamic e-commerce and technology industries and escalating data storage needs. In terms of sustainable growth potential, these markets have an abundance of land mass for data centre operations to expand. Unlike Singapore, this gives them the physical capabilities to generate their own supply of renewable energy.

With all parties in the APAC region collaborating and sharing expertise, the industry will be in an ideal position to achieve sustainable data centre growth and work towards a greener future.

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In this year where work-from-home has become the norm, both businesses and consumers have pushed the demand for data centres and digital goods and services to a new high. Industry watchers and researchers are fascinated by the patterns emerging from the usage spikes, as it depicts an alternative demand model for data use emerging - not just from business centres, but also from traditionally consumer/domestic demand hubs.

In the midst of the “new normal” and dealing with the data demand evolution surrounding the COVID-19 pandemic, it is easy for us to overlook existing issues. One issue of great importance is the need for the data centre industry to develop sustainable solutions to address its carbon footprint as part of our IT infrastructure operations. As technology developments advance relentlessly, are there new and efficient mechanisms and technologies by which existing data centres - and newer data centres yet-to-be-built - can use to formulate a greener, more sustainable data centre future?

May-Ann Lim Executive Director, Asia Cloud Computing Association

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