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Extracting green premium from data centres

Research note

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Foreword by
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ISIS Malaysia

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Foreword

Every age chooses the resources it is willing to extract in the pursuit of progress. Where earlier centuries consumed coal and oil to power empires and industry, the present age devours electricity and water to fuel digital ambition – elevating data infrastructure into one of the most consequential foundations of modern civilisation, shaping how economies grow and how societies organise themselves. Yet the formulas that once rewarded scale and accumulation no longer govern an era defined by planetary limits and systemic interdependence. What delivered growth in the past now generates fragility in the present.

Data centres embody this rupture. Malaysia's decision to position itself as a regional data centre hub reflects a deliberate effort to capture rising regional demand for digital services. Worth billions in committed capital, these investments have repositioned Malaysia as a critical node in Southeast Asia's digital infrastructure.

Nonetheless, the scale of these data centres is not without consequences. These facilities operate as resource-intensive industrial assets, often drawing tens to hundreds of megawatts per site and consuming millions of litres of water daily. In effect, what this means is that we are trading our natural endowments for strengthened headline FDI and near-term economic activity. We are powering the digital economy while potentially transferring environmental and climate risk exposure onto local systems and communities.

This research note directly confronts this tension. It challenges prevailing assumptions that investment volume alone constitutes success and exposes policy gaps between incentive-led expansion and sustainability governance. Without course correction, Malaysia risks entrenching a model that captures capital inflows while absorbing disproportionate ecological and infrastructure burdens. The country must, therefore, impose more stringent conditions on data centre development, precisely because it cannot afford long-term infrastructure strain and rising emissions in exchange for short-term gains.

Malaysia's investments need not come at the expense of its climate and resource security. But achieving that balance will require moving beyond incremental adjustments towards a disciplined and integrated green data centre development.

Datuk Prof Dr Mohd Faiz Abdullah
Executive Chairman
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Executive summary

- **Malaysia's data centre sector has expanded in recent years, primarily driven by efforts to position the country as a regional digital hub.** Attracting major global technology firms through government incentives and strategic location advantages, there are question marks surrounding the number of data centres serving overseas markets at the cost of long-term domestic interests.

- **If this growth is left unchecked, it poses risks to national water and energy systems.** Data centres are resource-intensive, drawing heavily on the power grid and competing with domestic users for water, particularly in stress-prone states like Johor. Without coordinated planning, expansion may outpace infrastructure capacity and undermine climate targets.

- **In response to mounting environmental concerns, the government has begun embedding sustainability requirements into its data centre agenda.** Policies now focus on efficiency standards, renewable energy targets and streamlined project approvals under a national framework. While these initiatives mark a shift towards greener practices, most remain voluntary and fragmented in governance.

- **Therefore, Malaysia's data centre developments demand a harder look.** Data centre development must be assessed through a broader lens by accounting for climate costs and risks, and social trade-offs. Stronger oversight, such as mandatory reporting and a pivot towards higher-value digital activities, will be critical to ensuring the sector supports both national competitiveness and sustainability objectives.

1 Background

1.1 Overview of data centres

Data centres are facilities that house computing systems to store, process and manage large volumes of data. A data centre can range from a dedicated room to a multiple complex of buildings filled with server racks and networking equipment comprising servers, data storage devices, cable and more. They are mainly digital infrastructure that ensures data are continuously available and services run reliably. Modern economies rely on data centres to power everything from cloud computing platforms to everyday applications, such as online banking, e-commerce and public services. As such, societies depend on connectivity between data centres and the continuous storage of data. In Malaysia, data centres increasingly support the digital economy by enabling digital services across various industries.

Beyond data storage, back-up, recovery and data management, data centres also handle machine learning and artificial intelligence (AI) workloads. These tasks require intensive computation and benefit from centralised high-performance hardware. Similar to the everyday applications, Malaysia's usage of data centres now mirrors global trends and requires these infrastructures to cater to this demand within national borders.

Data centres are complex systems composed of advanced IT hardware and critical supporting infrastructures. At their core are servers, which contain processors or chips that perform computations and handle heavy workloads. These servers are typically mounted on racks and organised into rows, often in the thousands in large facilities.[1] Alongside servers, data centres contain storage devices and networking equipment like routers. Together, these IT equipment forms the brain of data centres.

To keep these systems running optimally, data centres rely on extensive support infrastructure with power supply system being one of the key elements. They require a substantial amount of electricity and utilise redundant electricity to ensure continuous power distribution.[2] Another key component is its cooling systems. Servers and chips generate substantial heat when operating and require cooling systems to dissipate heat and maintain safe temperatures.

1.2 Types of data centres

Data centres are typically not one-size-fits-all but are categorised into several types based on scale and functionality. The choice of data centre type is often driven by the needs of the workload or business. Large-scale, computation-heavy functions, such as training AI models or serving millions of cloud customers, are best handled by hyperscale data centres, which provide scale and efficiency.[3] A smaller enterprise handling sensitive financial transactions might opt for a private corporate data centre of a secure colocation space to main control and meet compliance.

Colocation facilities offer versatility, allowing different businesses or organisations to run everything from websites to scientific computing by renting a space, making it ideal for functions that require reliability and growth without the capital investment of building a new facility. Edge data centres are chosen when the function prioritises latency and local presence. To put it simply, function determines the optimal data centre size and type.

1.3 Timeline of data centre growth in Malaysia

Malaysia's data centre industry evolved from small colocation hubs to today's hyperscale investments within two decades since the early 2000s. Growth accelerated after 2020, driven by pandemic-induced cloud adoption and Singapore's moratorium on new data centres.

As of November 2025, there are about 118 operational data centres offering 835MW of live capacity – 33 centres are in Johor, Klang Valley (64) and the rest scattered across other states.[4, 5] Industry forecasts suggest capacity will grow at an estimated compound annual growth rate of about 42%, rising from 128MW in 2020 to 750MW by 2025.[6] Major global players, including Amazon Web Services, Microsoft and Google, have announced additional investments, signalling that Malaysia is moving beyond colocation into hyperscale deployments.[7]

The wave of projects has been accompanied by incentives like tax exemptions for eligible data centre and cloud investments and priority grid engagement as well as low industrial electricity tariff.[8, 9, 10] These advantages, coupled with proximity to Singapore, have made Johor and the Klang Valley a focal point of the region's data centre boom.

1.4 Economic contribution and resource trade-offs

The accelerated growth of data centres comes with economic benefits of which Malaysia plans to take full advantage. The data centre market is projected to exceed RM57 billion by 2030 with plans to modernise the economy and transform Malaysia into a regional digital hub while also taking the opportunity to upgrade its digital infrastructure.[11] However, the data centre boom comes with trade-offs in terms of environmental cost and resource strains, especially on energy and water supplies.

Starting off with the economic benefits, Boston Consulting Group found that for every RM1 million of data centre investment, RM2 million of economic output is expected when accounting for direct and indirect effects, such as through construction, utilities and maintenance.[12] The report also states that spillover effects through catalysation of Malaysia's economic zones, such as the Johor-Singapore Special Economic Zone, will also improve competitiveness in technological services which consequently creates opportunities for talent development.[13]

Data centres also have had impacts on Malaysia's digital economy. By having a robust digital infrastructure, these data centres could support the country's digital capabilities, especially for data-intensive sectors like AI or e-commerce platforms. By hosting servers closer to end-users, local businesses and startups could benefit from lower latency, improved data sovereignty and compliance with data localisation requirements in certain sectors.

However, it is important to note that the link between local data centres and the broader digital economy is indirect. Digital services can still thrive using overseas data centres, as evidenced by successful digital economies in countries without major data centre hubs. Data centres are merely enablers, which do not guarantee digital innovation unless paired with skilled talent and supportive polices.

At present, Malaysia's data centres serve a primarily foreign client base with most capacity geared towards regional and global services via submarine cables,[14] This means that building data centres would not automatically create new digital startups or services domestically.

Withal the benefits it provides, the sector also incurs costs and externalities, notably in environmental and climate terms. As data centres are used for heavy-duty functions (Section 1.1), they tend to require an abundant of resources such as water and energy.

To operate the servers, data centres demand constant and reliable power supply. The amount depends on the type of data centres and its function (Section 1.2). For example, hyperscale data centres typically host AI model training and deployment and require a large amount of power supply. Hyperscale data centres consume 20-100MW, with roughly 38-50% of that energy used solely for cooling.[15] To illustrate, a 100MW hyperscale consumes about an average of five times the peak power of Petronas Twin Towers. By 2035, electricity demand from data centres in Malaysia is expected to exceed 5,000MW.[16] For context, this number is nearly one-fifth of the current total power generation capacity and more than half of the country's entire renewable energy (RE) capacity in 2023.[17]

Water consumption follows a similar pattern. Large facilities rely on water-based cooling because water is an efficient heat absorber and the volumes involved are substantial relative to local supply systems. A hyperscale data centre, for example, uses about five million litres of water per day for cooling alone while an average household in Kuala Lumpur uses about 240 litres a day. Hence, while data centres offer Malaysia economic opportunity, they are not entirely risk-free nor without environmental costs.

1.5 Case for green data centres

Given these externalities, Malaysia could jeopardise its climate ambitions if data centres operate unfettered. Malaysia has pledged to reduce the greenhouse gas (GHG) intensity to GDP by 45% by 2030 relative to 2005 and to reach net-zero emissions by mid-century.[18] However, its emissions profile is dominated by the energy sector. In 2019, the energy sector emitted roughly 78.5% of total emissions.[19] The energy demand required of existing and incoming data centres will put a pressure on Malaysia's main grid, which is heavily reliant on coal and gas.

As for national renewable energy plans, the National Energy Transition Roadmap (NETR) envisions renewables reaching 51% of the power mix by 2040 and 69% by 2050 but today's baseline means that any large electricity demand, such as from hyperscale data centres, translates into higher absolute emissions. Because the country's net-zero strategy hinges on decarbonising the power sector, the rapidly growing demand from data centres poses a direct challenge to national climate ambitions.[20]

Apart from the net-zero targets and climate ambitions, the Water Sector Transformation 2040 aims to ensure that water resources – including quality – are available to fulfil demands up to 2040 and beyond. Despite that, water consumption by data centres in the country is expected to increase 151% by 2030 from 2025 baseline and could jeopardise water security for households and other industries.[21]

Towards that end, the focus now is on how these facilities could operate sustainably as "green" data centres and not place undue strain on national resources. To frame the rest of this paper, it is essential to first define what constitutes a green data centre and examine its meaning in the Malaysian context against the global backdrop.

To meet the definition of "green" data centres, they need to be engineered to minimise energy and water use. A green data centre should be a facility whose mechanical and electrical systems improve energy efficiency and reduce carbon emissions.[22] The key performance metric is power usage effectiveness (PUE), which is the ratio of total facility energy to the energy used by IT equipment. A PUE close to 1 means almost all electricity runs the computing load whereby higher values indicate larger overheads for cooling and power conversion.[23] Alongside PUE, water usage effectiveness (WUE) measures the volume of water consumed on-site per unit of IT energy delivered for cooling. A lower WUE signals a more water-efficient facility, an increasingly important consideration in water-stressed regions. Carbon usage effectiveness (CUE) is also monitored to determine the amount of GHG emissions from a data centre.

2 Mapping data centre policies

While Malaysia has successfully attracted hyperscale data centre investments through a range of fiscal and regulatory incentives, this investment-led approach has outpaced the development of environmental regulations, and sustainability has yet to be embedded fully into the data centre agenda. As data centre growth accelerates, Malaysia now faces a critical turning point: shifting from piecemeal measures to a cohesive policy framework that can balance economic ambition with long-term climate and resource resilience.

2.1 Investments, incentives and policy reinstatements

Malaysia's investment strategy has relied on generous tax incentives to woo global cloud and AI providers. The centrepiece is the Digital Ecosystem Acceleration Scheme (Desac), introduced in Budget 2022. Desac offers investment tax allowances (ITAs) of up to 100% of qualifying capital expenditure for five to 10 years. Adopting a minimum of one green technology is one of the many pre-conditions for the tax exemption. These incentives have helped attract more than RM184 billion in data centre investments since 2021.

To ensure long-term sustainability, Desac's pre-conditions are tied to local value creation. To qualify for full Tier 1 incentives, operators must:

1. hire Malaysian talents and local staff must earn a minimum of RM5,000 per month;
2. develop vendor programmes by ensuring that operators integrate small and medium enterprises into their supply chains; and,
3. adopt Industry 4.0 and green technologies, such as energy efficient cooling and renewable energy systems in accordance with the sustainable development of data centres guideline.

While these conditions speak volume about the desire to convert capital inflows into high-value jobs and technology transfer, the reality is that data centre operations are capital intensive and labour light as a hyperscale facility may employ as few as 150 people once operational.[24] Much of this capital is directed towards non-local expenditures, such as land, power infrastructure and server acquisitions.[25] This raises concerns that incentives may not deliver the high skilled employment envisioned by the government.

In addition to the incentives, the government launched the National Sustainable Data Centre Framework (NSDCF) in October 2025 to provide long term policy clarity. Under the framework, the Malaysian Investment Development Authority (Mida) becomes the sole approval agency for new and expanding data centre projects. This centralisation streamlines land use approvals and investment certification, replacing the current patchwork of federal and state processes. The framework will also link incentives to sustainability criteria: preliminary guidelines indicate that operators must source about 30% of electricity from renewables by 2030, use reclaimed water for cooling and pay a dedicated water tariff. The Data Centre Task Force, formed in 2023, will coordinate policies across ministries and monitor compliance.

Apart from these incentives, the Transport Ministry removed cabotage restrictions for foreign ships involved in submarine cable repair in a bid to attract more foreign investment in the data centre services sector. While this openness attracts hyperscale investors, it also raises concerns about profit repatriation and limited local decision making.

2.2 Environmental guidelines and frameworks

Fiscal incentives alone do not produce sustainable outcomes. Without guidelines and frameworks, investment-led expansion risks the unchecked developments of high-carbon infrastructure and intensifying water scarcity. The frameworks below represent Malaysia's attempt to fill that gap, with Table 1 summarising their scope, purpose and sustainability provisions.

Table 1. Policies on data centres in Malaysia

Policy or guidelines	Purpose and key provisions	Sustainability elements
Desac	Offers 100% or 60% investment tax allowances or reduced tax rates for new and expanding digital infrastructure providers	Requires local hiring, vendor development and adoption of Industry 4.0 and green technologies
Guideline for sustainable development of data centres by Miti	Defines sustainable data centres; sets PUE, CUE and WUE metrics; categorises facilities (hyperscale, colocation)	Recommends PUE ≤1.4-1.7 and WUE ≤2.2m^3/MWh, encourages renewable energy and reclaimed water; currently voluntary but linked to incentives
MCMC technical code for green data centres	Sets technical standards for energy efficient design and cooling; standardises PUE and WUE measurements	Provides a framework for private, government and commercial data centres to optimise their energy practices
Data centre planning guidelines by PlanMalaysia	Site selection rules prior to development phase	Encourages disaster resilient design, renewable energy and water recycling

Source: Mida, MCMC, PLANMalaysia

To address these risks, MITI developed the Guideline for Sustainable Development of Data Centres in December 2024, as an interim framework ahead of NSDCF. Building on the metrics introduced in Section 1.5 (PUE, WUE and CUE), the guideline translates those concepts into operational thresholds.

It sets design PUE targets of ≤1.4 for hyperscale centres, ≤1.6 for post-2020 colocation facilities and ≤1.7 for pre-2020 or converted facilities. The WUE target is ≤2.2 m^3/MWh, improving to ≤2.0 m^3/MWh over a decade, and operators are encouraged to avoid water stress zones and adopt reclaimed water systems.[26] The guideline, however, only describes the CUE value for data centres to be in accordance with international standards of IS0/IEC 30134-8, depending on the annual carbon emissions and IT equipment energy demand.[27]

Before NSDCF came about, the Malaysian Communications and Multimedia Commission (MCMC) introduced a technical code on specifications for green data centres in 2015 that was ahead of its time. The agency has since reviewed and published a revision in 2024 to reflect the current requirements needed to acclimatise to Malaysia's net-zero goals but differs in expectations with NSDCF. This technical code remains a guideline for data centres to receive accreditation to certify "green" facilities but does not act as a regulatory requirement.

On the water side, NSDCF plans to introduce a dedicated tariff for data centre cooling water and mandate reclaimed water use as data centres now typically use treated water.[28] Several operators in Johor, such as Bridge Data Centres and AirTrunk, have already built on site water reclamation plants, demonstrating industry adaptability. These measures respond to warnings from the National Water Services Commission (SPAN) that the country could face water shortages within five years if demand continues to grow. It is also important to note that water management is privatised and falls under state jurisdiction.

To support these policies, the government introduced the Corporate Renewable Energy Supply Scheme (CRESS), which allows large consumers to purchase renewable energy directly from independent power producers via the national grid. In principle, this creates a market-based pathway for data centres to green their operations while expanding renewable generation capacity. In practice, uptake has been limited due to network charges and wheeling fees frequently make CRESS electricity more expensive than the subsidised gas-based tariff that data centres access as large industrial consumers.

3 Gaps and challenges

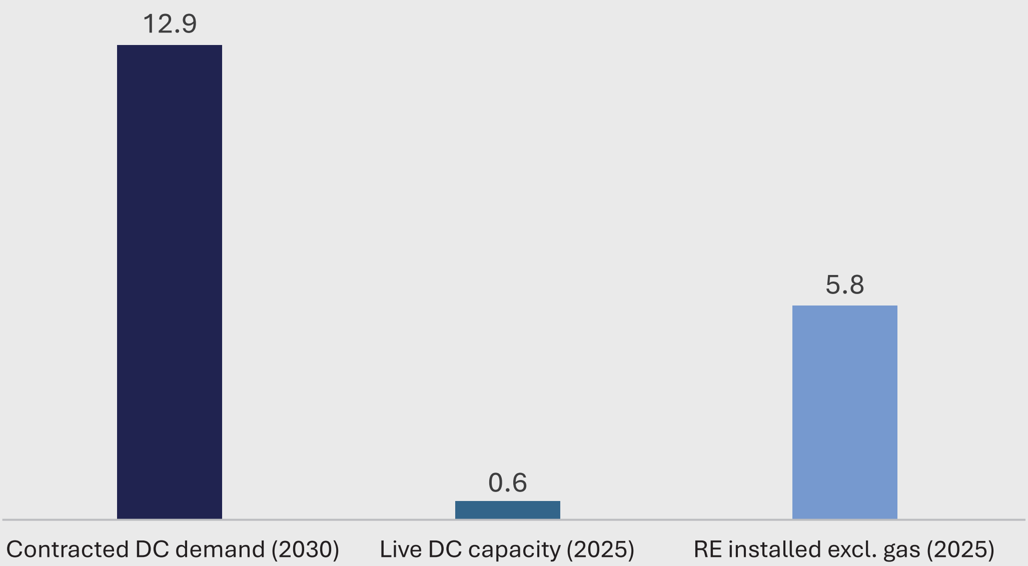
Malaysia's data centre boom has outpaced the regulatory and resource management frameworks intended to guide it. While the previous section showed that the incentives and guidelines are emerging, the sector still faces significant gaps in capacity planning, environmental governance, climate resilience and geopolitical stability.

3.1 A structural energy and water deficit

At the current rate of planned data centre electricity consumption, it requires a significant amount of electricity supply but the low RE generation (Fig. 1.) will force Malaysia to rely on its "brown" energy. A high growth trajectory could push demand beyond 11GW, equivalent to the entire installed capacity of some ASEAN member states. Such growth would amplify Malaysia's reliance on fossil fuels, which already account for more than 81% of the electricity mix and generate 54% of national emissions.[29]

Fig. 1. Data centres' potential energy usage exceeds Malaysia's renewable energy supply

Data centre planned energy consumption, live consumption and RE generation (MW)



Source: author's estimates, Tenaga Nasional Berhad

At the current rate of planned data centre electricity consumption, it requires a significant amount of electricity supply but the low RE generation (Fig 1.) will force Malaysia to rely on its predominantly brown energy. Between 2019 and 2025, Malaysia's live data centre capacity grew from 55 MW to 784 MW, an increase compounding at 55.6% annually, as reported by Bank Negara Malaysia.[30] Over the same period, total renewable energy generation grew from an estimated 31 TWh to a confirmed 41.53 TWh, an almost one-third increase.[31] In absolute terms, data centre capacity grew about 11 times faster than the renewable energy supply it is expected to draw from.

This divergence is a consequence of two different growth dynamics being treated as if they were compatible. A sector compounding more than 50% annually cannot be matched by a renewable energy build growing at under 5% per year, regardless of how incentive schemes are designed. CRESS, NSDCF and the Desac green conditions all operate on the assumption that the RE supply side should be stretched to meet a demand trajectory that is expanding at 10 times the speed as the gap widens with every new approval. The critical policy implication is that sustainability conditions attached to data centre approvals must be evaluated against the RE capacity that exist when those facilities are operational.

On the other end of the spectrum, water demand presents a governance challenge that is, if anything, harder to resolve than the energy problem because of a governance system that is not designed for it. Cooling systems account for roughly 50% of data centre electricity use and translate directly into water withdrawal. A 100MW facility can draw 4.16 million litres per day, equivalent to the daily consumption of a city of 10,000 people.[32] Johor, the epicentre of Malaysia's data centre boom, is already under stress as SPAN has warned that the state could face water shortages within five years, driven by climate change and ageing distribution infrastructure.[33]

Yet the warnings are from the federal level while the authority that approves and manages water allocation is a state. This jurisdictional split means federal agencies can sound alarms but cannot mandate how Johor allocates water between domestic and non-domestic water consumption. Without a national framework that establishes binding water allocation rules and overrides state-level discretion in declared shortage zones, the federal government has no reliable mechanism to prevent data centres from crowding out household or agricultural water users during periods of stress. The NSDCF proposed water tariff and reclaimed water mandates are a step in the right direction but their effectiveness depend entirely on whether compliance obligations are enforceable across state jurisdictions.

3.2 Aligning digital ambition with environmental limits

The energy and water pressures documented in Section 3.1 collide directly with Malaysia's existing climate and resource commitments. Malaysia has pledged to reduce GHG intensity to GDP by 45% by 2030, with net-zero by mid-century. The energy sector already accounts for roughly 78.5% of total national emissions and the grid remains heavily reliant on coal and gas. NETR envisions renewables reaching 51% of the power mix by 2040 and 69% by 2050 but as Fig. 1 demonstrates, projected data centre demand is on a trajectory that could absorb the entire renewable build before it decarbonises the rest of the economy.

Further, today's baseline means that any larger electricity demand, such as from hyperscale data, could result in higher absolute emissions and slow down RE transition. RimbaWatch found that just 14 new AI-scale centres could emit about 9.9 $MtCO_2e$ annually – equivalent to roughly two million additional vehicles – because most lack credible plans to source green power.[34] Because the country's net-zero strategy hinges on decarbonising the power sector, the rapidly growing demand from data centres poses a direct challenge to national climate obligations.

On water, the Water Sector Transformation 2040 targets resource adequacy through mid-century, yet data centre water consumption is projected to rise 151% by 2030.[35] In Johor, 250,000 consumers faced water rationing in 2019. Adding multi-million-litre daily demands from server farms introduces a compounding risk that existing frameworks are not structured to manage.

Box article 1: Will data centres undermine Johor's plan to boost water reserves?

Any large server farm uses enormous amounts of water for cooling, which can put them at odds with local communities during droughts. In the United States, for instance, residents of The Dalles, Oregon, fought to reveal how much water Google's data centres were consuming – and discovered it was more than 1.34 million m^3 in 2021, roughly a quarter of the city's total water use.[36] In this case, the increase in demand raises fears that in water-scarce times, data centre operators might be prioritised over households and farmers.

Similar tensions are emerging in Malaysia. In Johor, the epicentre of the country's data centre boom, approved projects are projected to use 69.1 million litres of water per day and enough to supply more than 500,000 consumers. This surge comes at a time when the state's domestic and industrial consumption already exceeds 1.4 billion litres daily. However, Ranhill SAJ, Johor's water operator, aims to increase its reserve margins to 25% by 2029 from 11.5% in 2022 but it is unclear how it will reach the goal while expecting an increase in demand.

Public concern deepened in 2024 when a major data centre investor in Johor acquired control of the state's water utility. The move prompted fears of water allocation skewing in favour of industrial clients, especially in a system where water rights fall under state jurisdiction. But despite these overlapping risks, Malaysia lacks binding national standards for reporting or mitigating the climate and water exposure of data centres. Without intervention, communities may find themselves competing with server farms for scarce resources.

3.3 Inequitable resource use and the sovereignty deficit

Malaysia's data centre boom is largely driven by foreign hyperscale operators who use local facilities to serve customers across Southeast Asia. Singapore's moratorium on new data centre approvals has diverted capacity to Johor. As a result, Malaysia is effectively subsidising digital services for neighbouring economies by supplying affordable power and water to store non domestic data. While the investments could increase Malaysia's FDI figures in the short term, it raises questions about equitable resource use.

The formal "SG+" framework as well as JS-SEZ incentives actively encourage Singaporean companies to host servers in Johor, benefitting foreign firms whose workloads are served or the offshore shareholders who capture the returns. Local authorities warned that Malaysia's cheap land, water and electricity are used to run foreign data, potentially at the expense of its needs. Construction generates employment but hyperscale operations are capital-intensive and labour-light. The ratio of resource consumption to domestic value retention is structurally unfavourable compared to sectors that compete for the same grid and water allocations. This asymmetry is compounded by a fiscal dimension that is rarely stated explicitly whereby Malaysia's cheap industrial electricity tariff and subsidised gas pricing mean that data centre operators are effectively receiving a public subsidy calibrated for a different era of industrial policy.

The revenues generated for the state have not been independently benchmarked against the emissions liabilities and water stress that the sector imposes. Without that accounting, Malaysia cannot determine whether it is capturing a fair premium for the natural endowments it is monetising. This matters, not just as a matter of equity, but because it directly constrains the resources available for green transition. If data centre revenues are not leveraged on to fund renewable energy build, water infrastructure or climate adaptation, the sector's expansion will generate fiscal inflows that are insufficient to offset the environmental liabilities it creates.

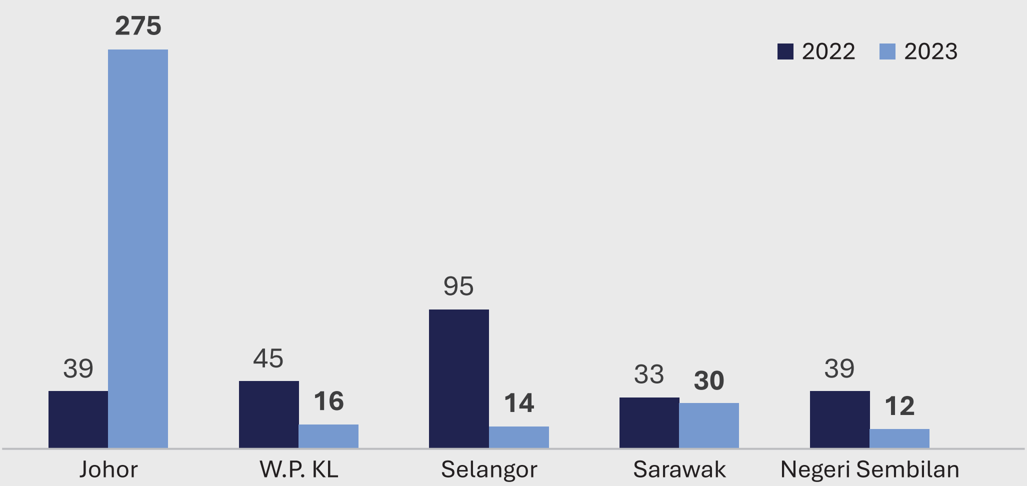
In effect, even if policies focus on investment and digital jobs, Malaysians face the environmental costs while the data benefits flow elsewhere. This dynamic – of Malaysia as a regional data hub for others – must inform any sustainability strategy if global data ambitions continue to deplete Malaysia's resource and drive its climate footprint.

3.4 Climate vulnerability and physical risk exposure

Data centres are also vulnerable to climate change despite the impacts they bring. Malaysia already endures stark weather swings – extreme heat and droughts in dry months, then heavy rains and floods shortly after.[38] For example, Johor Bahru is among the highest flood-risk areas among data centre states and recorded economic losses because of intense rainfall and flooding (Fig. 2.).

Fig. 2. Johor recorded highest flood losses in 2023

Flood losses in states with data centres (2022-23)
(RM million)



Source: author's estimates, Department of Statistics Malaysia

A facility that draws 100MW or more cannot be taken offline during a flood event without cascading consequences for the cloud services, AI workloads and other systems it supports. However, there is currently no national standard requiring data centre operators to assess or disclose their physical climate risk exposure prior to approval. The vulnerability is structural. Standard data centre siting criteria – proximity to the grid, access to water for cooling and land availability – tend to concentrate facilities in low-lying coastal and riverine areas, precisely the zones most exposed to flood risk under climate projections. Johor Bahru recorded significant economic losses from flooding in recent years.

Apart from floods, Malaysia's tropical climate would also mean that data centres must run cooling year-round. Hence, prolonged heat spells intensified by climate change could push cooling systems and local power grids to the brink.

Without adaptation, a growing share of global data centres will face higher risks of floods, fires and storms by 2050, which could cause operational disruptions.[39] Any interruption in supply from climate-driven disasters would knock out computing services. However, as of current, there is no national framework that currently requires operators to model, disclose or mitigate this exposure.

3.5 Policy fragmentation undermines accountability

Malaysia's regulatory landscape for data centres is incoherent in ways that undermine accountability at the project level. At least four government agencies issue guidelines with direct bearing on data centre sustainability: MITI, MCMC, PlanMalaysia and SPAN. They operate on different bases, metrics and enforcement, and none has primacy over the others. The most consequential clash is between MITI's Guideline for Sustainable Development of Data Centres (December 2024) and MCMC's Technical Code for Green Data Centres (revised 2024). Both use PUE, WUE and CUE as performance metrics but their thresholds diverge in ways that create regulatory arbitrage. Further, an operator can satisfy Desac criteria to access tax allowances while declining MCMC accreditation. The result is a system where the most generous incentives are available to operators meeting the least demanding standards, because Desac's sustainability pre-conditions are self-declared and not independently audited.

On the surface, MITI tracks investment metrics; MCMC tracks technical compliance selectively; SPAN tracks aggregate water demand without facility-level granularity; and the Energy Commission tracks grid draw without disaggregating by consumer type. There is no mandatory, consolidated sustainability disclosure enabling cross-agency oversight or public scrutiny. Until the governance architecture assigns clear primacy, the current system will continue to produce accountability gaps that no individual guideline can close.

The physical climate risk dimension also reinforces this accountability gap. As Section 3.3 documents, data centres in Johor face material flood and heat exposure, yet no framework requires operators to model or disclose that exposure as a condition of approval. Without that integration, Malaysia's sustainability frameworks will continue to address environmental performance and climate vulnerability as separate concerns but they are two dimensions of the same governance oversight.

4 Policy direction

4.1 Mandatory cost-benefit analysis for data centre approvals

Malaysia needs a holistic assessment of the true costs and benefits of data centre development. Under this assessment framework, considerations for approvals must go beyond commitments towards investments and job creation and include externalities, such as energy consumption, water use, carbon emissions and climate-risk exposure.

A rigorous cost-benefit analysis should be applied to all new and expansion projects, capturing direct economic benefits, such as capital investment, tax revenue, upstream and downstream employment, and contributions to digital services exports. At the same time, environmental costs should be quantified using carbon pricing and water tariff assumptions consistent with NETR. Finally, the framework must incorporate social and climate risks, including heightened flood exposure, displacement of local communities and impacts on biodiversity, to ensure that Malaysia's digital transformation does not come at the expense of long-term environmental and social resilience.

The CBA results would determine eligibility for incentives and inform mitigation measures, such as investments in renewable energy, water recycling or climate proofing. It should also be updated periodically to reflect changing tariffs, climate projections and technology trends. Crucially, the outcomes of each CBA must be publicly accessible to foster trust and scrutiny, especially as these projects often involve large-scale use of public resources and carry long-term environmental implications.

4.2 Attract higher-value functions through conditional incentives

Malaysia should seek to attract higher value-add data centre investments rather than mere data storage. Attracting foreign companies to set up regional offices, R&D labs or cloud service hubs would multiply economic benefits beyond the data centre's physical footprint and shift the environment-economics calculus in favour of the investment. To this end, the authorities have emphasised approving only high-quality investments that align with national priorities. Indeed, the data centre sector already promises many specialised roles as RM115 billion of data centre investment is expected to create about 2,325 new high-value jobs, such as data scientists and network engineers.[40] But most of those jobs are tied to operating centres and maintenance. To boost spillover, policies could tie incentives to commitments to create higher-skilled roles. For example, requiring or incentivising firms to establish a regional headquarters or local training academy as part of their project, especially on green jobs to operate or deploy their in-house green technologies.

Malaysia should reward companies that create on-site AI research teams or encourage a favourable ecosystem surrounding data centre tech parks. There are also potential on building green technologies to help data centres operate more efficiently or exploring local knowledge on how AI could best use for climate actions within the data centre ecosystem. By integrating front-end functions, Malaysia would capture more technological value rather than merely acting as a resource platform for data storage. This focus on moving up the value chain would create sustainable innovative jobs and knowledge transfer.

4.3 Streamline SOP for green data centres

As multiple guidelines and frameworks have already been rolled out across different levels of government, consolidating them into a single, streamlined framework would reduce confusion and improve compliance. A unified approach would provide greater clarity for developers while ensuring consistency in implementation across jurisdictions.

Therefore, Malaysia should establish a national standard operating procedure (SOP) on green data centres via the Data Centre Task Force. For instance, NSDCF already calls for developers to declare a design PUE and CUE. These metrics should be formalised whereby every new data centre could be mandated to calculate and publish its annual usage effectiveness calculations. Similarly, regulations could require regular third-party audits of PUE/CUE and public disclosure of results. This would make sustainability a clear performance criterion aligned with best practices in accordance with the SOP. The document should also be reviewed and refined periodically to improve the PUE, WUE and CUE targets, and to include stronger measures, such as minimum renewable-energy sourcing and stipulating water reuse or air-cooled design in drought-prone areas.

4.4 Outline reduction plans and transparent emissions disclosure

Data centres are typically concentrated in certain areas or specific zones, which means emissions and resource use are likewise concentrated. To ensure these emissions are managed, the government should mandate strict emissions accounting by every data centre operator. In practice, each facility would calculate its annual CO_2 output from electricity use (using the local grid's carbon intensity) and publicly disclose it. Making this data public means Malaysia can include the data centre sector's emissions in its national GHG inventory and Paris Agreement reporting, addressing a loophole whereby only some large companies disclose in their sustainability reports.

PUE and CUE are part of the existing sustainability guidelines. Hence, requiring operators to report using this method would provide consistent and comparable data across the sector. While some large, publicly listed companies are required to report emissions, many data centre operators are not subjected to mandatory disclosure. A specific rule targeted at the data centre sector would close this gap and create a level playing field for all operators.

Such reporting would also support long-term decarbonisation planning. Given that Malaysia has committed to economy wide emissions reductions by 2035 under its latest climate strategy, it is reasonable to expect that major energy consumers like data centres contribute proportionately. Requiring operators, not only to report emissions, but to outline credible reduction plans would ensure the sector evolves in line with national climate goals.

4.5 State- and sector-based climate risk assessment

Malaysia should develop a sector-based climate-risk assessment and adaptation planning. Malaysia has recognised this in planning its first National Adaptation Plan (MyNAP) for 2026, but it still lacks comprehensive climate risk data. A priority policy action is to commission a detailed risk assessment ahead of MyNAP, as data centres are increasing in numbers and their impacts are still unknown to many. This assessment should quantify vulnerabilities across the economy under multiple climate scenarios. More importantly, it should cover investments like data centres and establish baselines that can inform all sectors.

Beyond a national overview, risk analysis must drill down to key sectors. For example, the surge in Johor could be stressed with scenarios of extreme drought or heat. Similarly, the Johor–Singapore corridor should be evaluated for tug-of-war effects on water and power. Each major industry should have a tailored risk model projecting economic impacts under 1.5°C, 2°C or 3°C future. This means including projections of GDP or productivity losses based on different climate scenarios. It should also account for its direct and indirect impacts on surrounding communities. The results should directly feed into policies – for instance, requiring water recycling in DC parks if river flows drop below safe levels or elevating flood barriers at critical installations. These assessments must be done quickly to keep pace with rapid influxes of investments. Evidence-based, sector-specific scenarios will give businesses and authorities the foresight to adapt rather than reacting after costly disasters.

5 Conclusion

Malaysia's ambition to become a Southeast Asian digital and AI hub has spurred a wave of data centre projects, with tech giants enticed by affordable resources. This growth trajectory, while yielding huge economic, brings into focus the environmental pressures associated with large-scale digital infrastructure. These facilities require high volumes of energy and water, placing additional strain on a power grid still heavily reliant on fossil fuels and intensifying pressure on water resources in climate-sensitive regions. In response, Malaysia has introduced a series of guidelines encouraging more sustainable operational practices, including measures for reducing emissions and improving water efficiency. The problem lies in the fact that policies continue to rely on discretionary incentives rather than binding regulation, which may prove inadequate in safeguarding environmental and social interests over time. Aligning data centre development with national climate goals and water security priorities will be essential to ensure that the pursuit of digital investment strengthens rather than compromises Malaysia's long-term sustainability objectives.

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