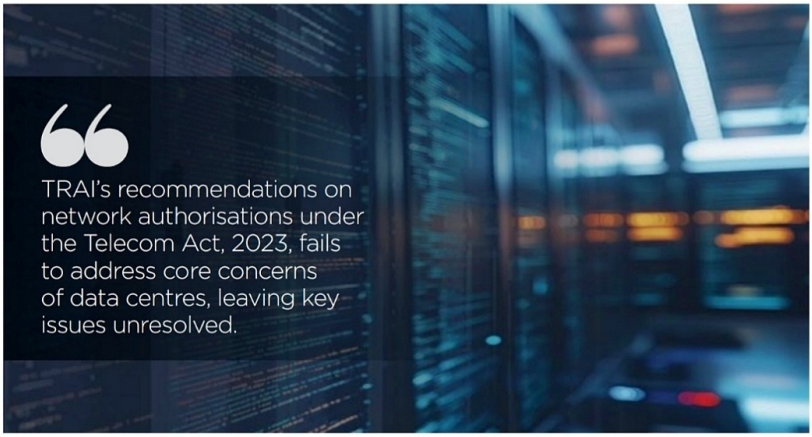
TV RAMACHANDRAN

LAYING THE BRICKS OF INDIA'S DIGITAL TREASURE CHEST

As India's data-driven economy expands, building a robust, scalable, and sustainable data centre ecosystem is key to unlocking its digital potential.

In today's hyper-connected world, data centres (DCs) serve as the veritable Treasure House of the digital economy, silently safeguarding and powering everything from cloud computing and AI-driven applications to everyday digital services. Whether streaming content on an OTT platform, making a video call, or conducting a simple web search, every digital interaction depends on the seamless functioning of DCs. As artificial intelligence (AI) becomes ubiquitous and data-driven technologies evolve, handling the exploding demand for high-performance, scalable, and sustainable DC infrastructure is indubitably one of our highest priorities.

Today's digital world requires us to elevate our vision to rise from conventional macro DCs to include nano and edge centres, from power-guzzling giant centres to sustainable and super-efficient ones, and from ground-level units to cloud DCs. In an era where AI-driven applications demand near-instantaneous responses, the emerging trend of 'edge data centres' strongly indicates the market's response to growing consumer needs for ultra-low latency and real-time processing. These smaller, decentralised facilities process data at the so-called edge of the delivery chain and closest to the end user, improving quality as well as network efficiency while alleviating the burden on centralised DCs. Edge computing not only enhances real-time digital experiences but also reduces energy consumption and bandwidth requirements. Thus, the benefits are rich and manifold. The importance of uninterrupted and resilient DC operations is often overlooked—until outages occur. A



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IN BRIEF

- India's data demand is set to skyrocket, requiring a massive expansion of data centre capacity beyond the current 1 GW.
- Edge data centres are emerging as a solution for ultra-low latency applications, decentralising storage and reducing network strain.
- Policy inconsistencies across states hinder seamless DC growth, requiring a unified national framework for scalability.
- Regulatory hurdles prevent DCs from procuring their own network infrastructure, limiting efficiency and global competitiveness.
- Sustainability remains a key challenge, with DCs needing incentives for renewable energy adoption and energy-efficient operations.
- Strategic investments in AI, cloud infrastructure, and connectivity are essential for India to become a global data centre hub.

DC blackout can bring digital transactions to a halt, disrupt businesses, and impact millions of users. As India's data load soars, ensuring robust DCs of adequate capacity has become an economic and strategic imperative.

GROWING NEED FOR DATA CENTRES

With the rapid adoption of 5G, AI, and cloud computing and increasing focus on fixed-line broadband, India is on the brink of exponential data demand and consumption growth. While mobile data usage is projected to grow threefold, from 20 GB per month to 62 GB per month by 2028, fixed-line connections are expected to zoom to 110 million by 2030 and, given that fixed-line data consumption is at least 10 times that of mobile—and could even rise to 20-30 times as fixed-line connections grow—the overall data demand in India is likely to increase several folds in the coming years. This again underscores the need for a comprehensive and robust DC ecosystem.

Generally, data centres are energy guzzlers, so the watt-hours of energy consumption indirectly designate their capacity. Estimates suggest that global data centre energy consumption ranges between 200 and 500 terawatt-hours (TWh) annually. Translating this to capacity, considering continuous operation, implies a global capacity of approximately 23,000 to 57,000 MW.

As customer needs evolve, data management and storage trends are shifting rapidly—from end-user device storage to DCs and cloud infrastructure. IDC White Paper, 'The Digitization of the World from Edge to Core' indicates that the share of data stored in DCs is likely to rise from 38% in 2010 to 85% by 2030, reinforcing the importance of hyperscale DCs, edge computing, and decentralised storage solutions.

This transition necessitates aggressive cloud and DC infrastructure scaling to accommodate future storage and computational needs. According to industry estimates, the United States of America hosts a significant portion of the world's data centre capacity. Recent projections indicate that by 2030, the US may require up to 90 gigawatts (90,000 MW) of new data centre energy

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to support advancements in Artificial Intelligence and related technologies. This clearly indicates the enormous challenge the global economy faces in keeping pace with digital growth.

Specific data on China's total data centre capacity is less readily available. However, given China's significant investments in digital infrastructure and technology, it is inferred that China possesses substantial data centre capacity, potentially comparable to or exceeding that of the United States.

While precise figures are challenging to ascertain, the United States and China are undoubtedly the leaders in data centres and far ahead of India in capacity. Both have substantial infrastructure to support their digital economies. India is rapidly expanding its capacity, positioning itself as a key player in the Asia-Pacific region. These developments underscore the global emphasis on enhancing data centre infrastructure to meet the growing demand for digital services and technologies.

India accounts for about 15% or more of global Internet users, yet it holds less than 5% of global data centre capacity. Nevertheless, India has emerged as a leading data centre hub in the Asia-Pacific region (excluding China), surpassing established players like Singapore, Australia, South Korea, Japan, and Hong Kong in installed capacity. Recent reports indicate that India has an installed capacity of approximately 1 GW, with projections indicating growth to about 2.1 GW by 2027 and potentially reaching 3.25 GW by 2030. While this growth is impressive, it may still be insufficient to meet the burgeoning demand.

BROAD CHALLENGES BEFORE INDIA

The Draft Data Centre Policy (2020) was a step in the right direction, but the absence of a cohesive national framework has led to fragmented growth, with different states pursuing independent policies. Several states, including Maharashtra, Tamil Nadu, Karnataka, and Andhra Pradesh, have introduced incentives to attract DCs, yet operational inconsistencies and inter-state and infra-state differences hinder their scalability. Additionally, single-window clearance mechanisms exist in some states but remain ineffective, and operators face lengthy approval timelines, defeating the purpose of an integrated system.

DC operations require reliable electricity, water, and Internet connectivity, as well as land with the requisite resources. However, existing infrastructure in several regions is inadequate to support the rapid expansion of DCs. Right-of-way challenges and high deployment costs for fibre connectivity also hinder the expeditious rollout of connectivity.

At the regulatory level, DC operators cannot buy or lease infrastructure from licensed mobile operators. They have to procure generic network connectivity services from Telecom Service Providers (TSPs), limiting their ability to efficiently manage their own captive networks (configured to their internal specialist requirements). However, the problem is that traditional networks are principally designed for voice or public data services, such as IP services, and are unsuitable for digital services requiring very high availability, bandwidth and low latency digital services for extremely high amounts of data.

Achieving these outcomes using TSP services becomes especially difficult given India's vast geography, relatively limited technology infrastructure, and broadband deployment. These factors discourage investment in technology and cloud businesses in India, resulting in slower, less reliable, and more expensive cloud services than in other countries.

The Telecom Regulatory Authority of India's (TRAI) recent recommendations on the terms and conditions of network authorisations to be granted under the Telecommunications Act, 2023, also fail to address DCs' underlying concern. In relation to the current framework, the TRAI noted that, given that data centres are not authorised, if IP-1 or proposed Digital Connectivity Infrastructure Providers are allowed to connect them, it would amount to the provision of telecom services by network providers.

Lastly, DCs, being high-energy-consumption setups, contribute significantly to carbon emissions, warranting

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the adoption of sustainable practices. While DCs are focusing on energy-efficient designs, including advanced cooling systems and AI-optimised infrastructure tailored to India's geography, reliance on renewable energy sources is also crucial. However, state-level restrictions and additional charges for renewable power create financial burdens for operators trying to transition to greener energy sources.

STRATEGIES TO STRENGTHEN DATA CENTRE ECOSYSTEM

A conducive policy framework is essential to address these challenges and fully capitalise on the "infrastructure Status" accorded to DCs. Further, India must take advantage of the geopolitical shifts and attract foreign investments to make it a Global DC hub, creating incentives for global hyperscalers to relocate and expand operations in India.

The first step in this direction should be a cohesive national policy that harmonises state-level regulations and focuses on a uniform open access policy to source renewable energy to ensure growth with sustainability. This framework would promote DC growth clusters in regions with abundant renewable energy resources and minimal grid congestion.

DC operators should be allowed to procure infrastructure, including dark fibre, and establish and operate captive networks among DCs to meet their own internal connectivity requirements without obtaining authorisation or license – in line with the leading economies such as the USA, Australia, and Singapore. A flexible regulatory approach towards digital enterprises is warranted to harness the digital telecom infrastructure's true potential and economic benefits. Even the Draft DC Policy recommended a second option for implementing a private telegraph concept of "captive fibre networks".

On the infrastructure side, enhancing power supply, grid reliability, and Internet bandwidth across regions will support the scalability effects of DCs, particularly in Tier-II and Tier-III cities where edge DCs are likely to emerge. Further, waivers for Interstate Transmission System or ISTS charges for transmission of electricity generated from renewable sources, coupled with tax rebates and fiscal incentives for investments in renewable energy technologies, could encourage a shift toward carbon-neutral and energy-efficient DCs.

Other infrastructural considerations include extending subsea cables to DCs and allowing them to host Cable Landing Station (CLS) Points of Presence, which could improve India's data infrastructure resilience. Additionally, allowing DCs, for their captive consumption, to own Subsea cables and CLS without mandating them to have an International Long Distance Operator License and significant stakes in subsea cables could significantly enhance global connectivity.

While coping with increasing data volumes, the focus should remain on expanding demand. Storage capacity and mandates on localisation or restrictions on cross-border transfer should be limited to sector-specific requirements (RBI, SEBI, IRDAI) rather than blanket provisions. Restricting operations to specific in-country requirements would inhibit service innovation, increase cybersecurity risks, and prevent Indian enterprises from fully leveraging hyperscale cloud services.

ENHANCING DATA CENTRE TREASURES

As India strides towards becoming a global digital powerhouse, DCs will be at the core of this transformation. The opportunities are vast, with scaling AI infrastructure to support next-gen computing, building hyperscale facilities to drive cloud growth, and many others.

By addressing regulatory bottlenecks, ease of doing business concerns, and connectivity challenges and aligning with sustainable energy and net-zero carbon goals, India can create a robust DC ecosystem to meet the growing demand and set a benchmark for sustainable digital infrastructure. The time to act is now—before the demand outpaces India's infrastructure readiness.

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