# Deloitte.

Attracting Al Data Centre Infrastructure Investment in India

May 2025

# List of Abbreviations

3G	Third Generation	DoT	Department of Telecommunications
4G	Fourth Generation	DPDP	Digital Personal Data Protection
5G	Fifth Generation (wireless technology)	DRDO	Defence Research and Development
AI/ML	Artificial Intelligence / Machine Learning		Organisation
AIRAWAT	Al Research, Analytics and Knowledge	DTA	Domestic Tariff Area
	Assimilation platform (specific to India's AI cloud	E2E	End-to-End (in E2E Networks)
	infrastructure)	ERP	Enterprise Resource Planning
ANI	Agency for New Innovations	ESG	Environmental, Social, Governance
APAC	Asia-Pacific	EU	European Union
API	Application programming interface	EV	Electric Vehicle
AWS	Amazon Web Services	EVA	Electronic Virtual Assistant
B2B	Business-to-Business	FBOs	Facilities-Based Operators
BFSI	Banking, Financial Services, and Insurance	FY	Fiscal Year
Bn	Billion	G20	Group of Twenty (an international forum for
BNSS	Bharatiya Nagarik Suraksha Sanhita		governments and central bank governors from
BPO	Business Process Outsourcing		19 countries and the EU)
CAGR	Compound Annual Growth Rate	Gbps	Gigabits Per Second
CAIR	Centre for Artificial Intelligence and Robotics	GCCs	Global Capability Centres
Capex	Capital Expenditure	GDC	Global Data Centres
ССРА	California Consumer Privacy Act	GDP	Gross Domestic Product
CDAC	Centre for Development of Advanced	GDPR	General Data Protection Regulation
	Computing	GenAl	Generative Artificial Intelligence
CERT-In	Computer Emergency Response Team - India	GEOA	Green Energy Open Access
CET	Critical and Emerging Technology	GIFT City	Gujarat International Finance Tec-City
CGPDTM	Controller General of Patents, Designs, and	Gol	Government of India
	Trademarks	GPAI	Global Partnership on Artificial Intelligence
CoEs	Centers of Excellence	GPT	Generative Pre-trained Transformer
CPU	Central Processing Units	GPU	Graphics Processing Unit
CRI 2025	Draft Guidelines for Examination of Computer	GPUaaS	GPU-as-a-Service
65. I	Related Inventions, 2025	GST	Goods and Services Tax
CRM	Customer Relationship Management	GW	Gigawatt
CSIR	Council of Scientific and Industrial Research (India)	H1	First Half of the year
CSPs	Carriage Service Providers	HCI	Hyper Converged Infrastructure
DC	Data Center	HPC	High-Performance Computing
DCF7	Data Center Economic Zones	laaS	Infrastructure as a Service
	Data Centre Facilitation Units	IFSC	International Financial Services Centre
	Direct Contact Liquid Cooling	IGST	Integrated Goods and Services Tax
	Directorate of Defense Research and	IIT	Indian Institute of Technology
	Development (Israel)	IITM	Indian Institute of Tropical Meteorology
		INR	Indian Rupee

IoT	Internet of Things	Opex	Operational Expenditure
IP	Intellectual Property	PaaS	Platform as a Service
IPR	Intellectual Property Rights	PE	Permanent Establishment
IT	Information Technology	PoC	Proof of Concept
IT/ITES	Information Technology/Information Technology	PPA	Purchasing Power Agreement
	Enabled Services	PPP	Public Private Partnership
ITA	Income Tax Act	PSUs	Public Sector Undertakings
iTNT	Tamil Nadu Technology Hub	PUE	Power Usage Effectiveness
IXPs	Internet Exchange Points	R&D	Research and Development
kW	Kilowatt	RBI	Reserve Bank of India
KWh	Kilowatt hours	Rmax	Maximum Sustained Performance
LED	Light Emitting Diode	Rpeak	Peak Performance
LIC	Liquid Immersion Cooling	SaaS	Software as a Service
LLMs	Large Language Models	SBOs	Services-Based Operators
LMMs	Large Multimodal Models	SERCs	State Electricity Regulatory Commissions
M sqft	million square feet	SEZ	Special Economic Zone
MAT	Minimum Alternate Tax	SLM	Small Language Models
MeitY	Ministry of Electronics and Information	SMEs	Small and Medium Enterprises
	Technology	SMRs	Small Nuclear Reactors
ML	Machine Learning	SPDI Rules	Sensitive Personal Data or Information Rules
Mn	Million	Sqft	Square feet
MoU	Memorandum of Understanding	STT GDC	ST Telemedia Global Data Centres
Ms	Milliseconds	ТВ	Terabyte
MSMEs	Micro, Small, and Medium Enterprises	TBPS	Terabits Per Second
MW	Megawatt	тсо	Total Cost of Ownership
MWh	Megawatt-hour	TCS	Tata Consultancy Services
nasscom	National Association of Software and Service	TDM	Text & Data Mining
NDC	Companies	TNAIM	Tamil Nadu Artificial Intelligence Mission
NBC	National Building Code	TPU	Tensor Processing Unit
NCIVIRWE	National Centre for Medium-Range Weather	TPUv4	Tensor Processing Unit version 4
NCR	National Capital Region	TSP	Telecom Service Provider
NDTSP	National Deep Tech Startup Policy	TWh	Terawatt-hour
NKN	National Knowledge Network	UAE	United Arab Emirates
NLP	Natural Language Processing	UK	United Kingdom
NM-ICPS	National Mission on Interdisciplinary Cyber-	US	United States
	Physical Systems	US\$	United States Dollar
NSM	National Supercomputing Mission	VC	Venture Capital
NTT	Nippon Telegraph and Telephone (Japanese	WTCA	World Trade Centers Association
	telecommunications company)	ZB	Zettabyte
OEM	Original Equipment Manufacturer		

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# Executive summary

As global Artificial Intelligence (AI) growth and domestic ambitions converge, India stands at a critical inflection point. Worldwide, AI adoption continues to surge. India, too, is riding this digital wave. Poised to become one of the fastest-growing leaders in AI, India's AI market is expected to reach US\$20–22 billion by 2027, posting a CAGR of 30 percent.<sup>1</sup>

However, despite hosting nearly 20 percent of the world's data, India has just 3 percent of the global data centre capacity.<sup>2</sup> The gap between India's AI aspirations and compute infrastructure presents a strategic opportunity and a national imperative to build AI data centres at scale. Given the rising demand, India must boost its AI-ready infrastructure.

To achieve the vision of becoming a global AI hub and strengthening its AI infrastructure, attracting strategic investments across the AI stack (AI compute, large language models (LLMs), AI applications, AI products and AI services) becomes imperative. With its strategic location, cost advantages and rising digital demand, India has the potential to lead in AI infrastructure. While India has attracted ~US\$29.6 billion in AI investments between 2013–24, it dwarfs compared to US with ~35X (US\$1012.5 Bn), and China with ~13X (US\$384.6 Bn) investments.<sup>3,4</sup>

Against this background, this report identifies six key pillars for India to reach its full potential in building a world-leading, Already ecosystem. These pillars – **real estate, power & utilities infrastructure, connectivity & network infrastructure, computing infrastructure, talent, and policy framework** – are critical to build a conducive environment for boosting investments in Al in India.

For example,

• Under **real estate**, to support the growing number and capacity of data centres, Deloitte analysis suggests an additional 45-50 million square feet of land would be

required by 2030, up from the existing 13 million square feet in 2023,<sup>5</sup> based on the estimated number of data centres and the land area needed for different data centre types. However, land acquisition in India poses multiple challenges like delays caused by land acquisition processes and lengthy approval processes.

- Similarly, under **power**, India still has a high dependence on non-renewable energy, accounting for ~55 percent, increasing operational costs for AI data centres/ energyintensive AI.<sup>6</sup> Moreover, inconsistent policies across states for the use of renewable energy creates policy uncertainties.
- As for **network**, inconsistent internet bandwidth, limited fibre optic network outside tier-1 cities, nascent 5G infrastructure and high latency are gaps that need to be addressed.
- Under **compute infrastructure**, challenges such as limited number of GPUs, global semiconductor shortages, and overall high cost of GPU acquisition require addressal to cater to the rising demand.
- Lastly, multiple **policy** interventions are required to address challenges like permanent establishment risks, lack of clarity on data access norms, and intellectual property implications creating an environment of unpredictability.

India's AI future is bright. Today's investments will cement India's long-term leadership in AI. By addressing these challenges, India can convert perceived gaps into advantages. For India to accelerate its AI capabilities and reach its development potential, there is a need to introduce enabling policies which boost the industry's commitment to India's AI journey. Given this pivotal moment for India, this **report addresses these core challenges across the six pillars and provides strategic policy recommendations to enhance the AI ecosystem.** 

<sup>&</sup>lt;sup>1</sup>Powering India's technology growth: The continuous rise of Indian AI | Tech News - Business Standard

<sup>&</sup>lt;sup>2</sup>https://www.fortuneindia.com/long-reads/the-coming-data-centre-boom/118240

<sup>&</sup>lt;sup>3</sup>https://hai-production.s3.amazonaws.com/files/hai\_ai\_index\_report\_2025.pdf

<sup>&</sup>lt;sup>4</sup>https://oecd.ai/en/data?selectedArea=investments-in-ai-and-data&selectedVisualization=vc-investments-in-ai-by-country&visualizationFiltersHash=eyJkYXRII jpbljlwMTMiLClyMDI0II0sImVudGI0aWVzljp7lkNvdW50cnlDb2RIJpblIVTQSIsIkNITiIsIkdCUiIsIkIORClsIkNBTiIsIkRFVSJdfX0%3D

<sup>&</sup>lt;sup>5</sup>https://www.grantthornton.in/globalassets/1.-member-firms/india/assets/pdfs/realty-bytes-data-centres-indian-real-estate-and-regulatory-dimensions.pdf <sup>6</sup>https://pib.gov.in/PressNoteDetails.aspx?NoteId=153279&ModuleId=3&reg=3&lang=1

#### **Real Estate**

- Establish a **single-window clearance system** and fast-track approvals for data center land parcels. Set up Data center Facilitation Units (DCFUs) to coordinate regulatory approvals
- Introduce a separate category code for data centers in the National Building Code 2016 to build specialized commercial assets. Recognize data centers under the Essential Services Maintenance Act, 1968 to ensure service continuity
- Provide **upfront capital subsidies** for mechanical, engineering, and plumbing (MEP) costs to reduce initial investment burden while establishing data centres
- Provide **interest subvention** on borrowed capital for first 5 years to improve financial viability
- Establish **Data Centre Economic Zones (DCEZs)** and R&D hubs to operate plug-and-play model and have dedicated infrastructure facilities
- Empower the High-Level Regulatory Reforms Committee (Budget 2025) to address land acquisition and regulatory challenges

- Power

- Invest in **grid modernisation** and **renewable integration** to ensure a stable power supply
- Offer a **weighted deduction** on expenses for establishing captive renewable energy plants and/or expenditure incurred on hi-tech cooling systems
- Develop a policy framework for **dedicated power infrastructure in data centres**, enabling captive power plants to minimize transmission losses
- Establish a **national policy providing fiscal incentives** for usage of renewable energy for data centres
- Standardise the national/state-level banking policies for use of renewable energy to enable data centers to capitalise on the same



#### Connectivity

- Ensure **robust connectivity** with high-capacity backhaul, common service ducts, utility corridors, shared TSP infrastructure, and dedicated captive fiber networks
- Address policies related to dark fibre or campus crossconnect to reduce the cost of operations for enterprises when they grow from one data centre to another in a nearby vicinity
- Rationalise provisions for seeking information and device seizure powers under BNSS and Telecom Act 2023
- Ease regulatory frameworks for data centres to invest in and operate their **own terrestrial and subsea network infrastructure**

Compute Infrastructure

- Establish **AI industrial zones and R&D** hubs with longterm incentives to build Exaflop-scale GPU infrastructure featuring high-performance H100 GPUs
- Incentivise technology investments and R&D through weighted deductions and low/no tax rates for nonresident collaborators
- Establish **long-term AI infrastructure support schemes** such as sustained GPU subsidies, low-cost financing, and viability gap funding for AI compute facilities
- Engage in G2G conversations and deals to dilute the impact of restrictive policies on GPU imports



- Prioritise **workforce development** for data center roles, including specialists, infrastructure engineers, and operations managers
- **Collaborate with institutions** and firms to develop Alfocused training programs
- Offer **visa incentives** for global AI, cloud, and data center experts to address skill gaps

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**Regulatory and Policy** 

- Exempt/clarify overseas digital service providers using data hosting services in India from PE risks under Section 9(1)(i) of the Income Tax Act
- Implement safe harbor rules for data hosting service providers, similar to BPOs, ensuring arm's length costplus compensation without additional profit attribution
- Streamline exchange control procedures, allowing operations in convertible foreign currency with simplified investment and reporting
- Extend **IFSC-like incentives to data centers,** including tax exemptions, reduced MAT, GST and stamp duty relief, and simplified compliance under the Companies Act
- Enable frameworks for access to high-quality data by Al researchers without compromising privacy and security
- Adopt a balanced Al governance approach by **amending the Copyright Act** to uphold author rights
- Expand **fair dealing to** cover AI-generated content with significant transformation for alternative use
- Amend the Patent Act suitably to allow only software content (without any element of hardware attached) to also be eligible for patent protection

# Chapter 1: Global AI market overview

#### Introduction

The global AI market is undergoing a transformative evolution characterised by rapid advancements and widespread adoption across various sectors. AI continues to revolutionise industries, reshaping business operations, enhancing decision-making processes and creating new revenue streams. As organisations recognise the potential of AI to enhance operational efficiency, improve customer experiences and drive innovation, the market is projected to witness substantial growth expected to surge to nearly US\$1 trillion by 2027 in just three years up from under \$200 billion in 2023 growing at 40 to 55% annually.<sup>7</sup>

#### Key drivers of growth in the AI market



**GenAl expansion:** GenAl is set to become a major focus, rising from 8 percent of Al-driven platform engagements in 2024 to an ~25 percent by 2028.<sup>8</sup> While Al is widely adopted, GenAl is still nascent in most organizations. Yet, rising optimism is driving investments in external services to explore its transformative potential.



Al software growth: Global spending on Al software is projected to reach ~US\$300 billion by 2027 growing at a CAGR of 19percent.<sup>9</sup> Key contributors to this growth include applications in Natural Language Processing (NLP), computer vision and machine learning platforms.



Sectoral demand: Software, information services, banking and retail are the leading AI sectors, accounting for 38 percent of global AI spending and planning to invest ~US\$90billion in AI in 2024.<sup>10</sup>



Government support:

Governments worldwide are ramping up Al efforts through funding, ethical frameworks and publicprivate partnerships to stay and address societal concerns.

<sup>&</sup>lt;sup>7</sup> AI Market to Surge to Near \$1 Trillion by 2027, as Bain Warns of Supply Crunch - Bloomberg

<sup>&</sup>lt;sup>8</sup> https://www.gartner.com/document/5710751?ref=solrAll&refval=440298459&

<sup>&</sup>lt;sup>9</sup> https://www.gartner.com/document/4916331?ref=solrResearch&refval=440300349&

 $<sup>^{\</sup>rm 10}$  IDC's Worldwide AI and Generative AI Spending – Industry Outlook | IDC Blog



#### Al Investment across major countries

Private investment constitutes majority of the funding in the AI sector globally. In 2024, the United States led global private AI investment with USD 109.1 billion, followed by China with USD 9.29 billion. Meanwhile, the European Union and the United Kingdom together attracted a combined USD 16.9 billion in private AI investment.<sup>11</sup>

### Figure 1: Global private investment in AI by geographic area, 2024<sup>12</sup>



Total investment (in billions of US dollars)

Despite the decline in VC funding since 2022, AI start-ups have shown resilience, continuing to attract significant investments.

The 2021 funding peak—driven by pandemic demand, low interest rates, and a strong tech market—was followed by a correction in 2022, which, though still the second-best year for start-up funding, marked the beginning of a more cautious investment climate.





Investors focus has shifted towards established players and specific AI applications rather than broad generalist use cases, signalling a maturing AI landscape where established firms are better positioned to innovate and scale.

Overall, as the market evolves, investors are prioritizing sustainable growth over rapid and speculative expansion.

# Symbiotic relationship between rapid growth of AI and the evolution of data centres

The rapid growth of, especially GenAl is driving a surge in demand for robust data centres capable of delivering higher processing power, energy efficient infrastructure and scalable storage including adoption of advanced technologies such as High-Performance Computing and advanced cooling solutions.

<sup>&</sup>lt;sup>11</sup> https://hai-production.s3.amazonaws.com/files/hai\_ai-index-report-2024-smaller2.pdf

<sup>&</sup>lt;sup>12</sup> https://hai-production.s3.amazonaws.com/files/hai\_ai\_index\_report\_2025.pdf

<sup>&</sup>lt;sup>13</sup> https://oecd.ai/en/data?selectedArea=investments-in-ai-and-data&selectedVisualization=vc-investments-in-ai-by-country

# Chapter 2: Global AI data centre ecosystem

The global AI data centre ecosystem is undergoing a transformation driven by rapid adoption of AI and the need to support intensive computational demands.

The global data centre market, valued at ~US\$125billion in 2024 is projected to be a ~US\$364.6 billion opportunity by 2034.<sup>14</sup> AI driven growth is accelerating demand for hyperscale data centres and is also expected to accelerate the growth of data centre power demand<sup>15,16</sup> thereby necessitating advanced cooling solutions.

### Figure 3: Global data center colocation market size by country in primary, secondary and emerging markets (in MW of built-out critical IT load capacity)<sup>17,18</sup>



<sup>&</sup>lt;sup>14</sup> https://www.precedenceresearch.com/data-centre-market

<sup>&</sup>lt;sup>15</sup> https://www.goldmansachs.com/pdfs/insights/pages/generational-growth-ai-data-centres-and-the-coming-us-power-surge/report.pdf

<sup>&</sup>lt;sup>16</sup> https://www.iea.org/commentaries/what-the-data-centre-and-ai-boom-could-mean-for-the-energy-sector

<sup>&</sup>lt;sup>17</sup> https://www.jll.co.uk/content/dam/jll-com/documents/pdf/research/global/jll-data-centre-outlook-global-2024.pdf

<sup>18</sup> https://www.digitalrealty.com/resources/articles/data-centre-ai

#### Attracting AI Data Centre Infrastructure Investment in India



### Country-wise analysis of the AI data centre market

Al's rapid adoption worldwide is transforming the data centre industry, reshaping data centre design, location selection and investment strategies—much like the cloud-driven growth of the past decade.

### Figure 4: Gigawatt data centers will require massive amounts of energy<sup>19</sup>

A gigawatt-size data center using 85% of its peak demand over the course of a year will consume nearly as much energy as 710,000 U.S. households or 1.8 million people.



Note: Assumes average electricity consumption of 10,500 kWh per U.S. household and average household size of 2.5 people

Source: CNBC analysis of energy consumption and population satistics from U.S. Energy Information Agency and U.S. Census Bureau

Exponential rise in power demand has resulted in industry challenges such as limited colocation supply and intense competition for power from other sectors, such as EV infrastructure and advanced manufacturing – presenting both opportunities and threats for the data centre sector's future.

# Figure 5: Leading countries by number of data centres (as of March 2024)<sup>20</sup>



As of 2024, the US leads with 5381 data centres, followed by Germany (521), UK (514) and China (449). While countries such as Japan, Russia and Australia are also rapidly scaling up their data centre infrastructure to meet AI driven demand.

<sup>&</sup>lt;sup>19</sup> https://www.cnbc.com/2024/11/23/data-centres-powering-ai-could-use-more-electricity-than-entire-cities.html

<sup>&</sup>lt;sup>20</sup> https://www.statista.com/statistics/1228433/data-centres-worldwide-by-country/

#### Key AI data centre market trends across major countries

#### Increasing rack density

GenAl's rapid growth is driving a significant rise in rack power density, a measure of the power drawn per server rack.



These trends underscore the need for continuous innovation to meet evolving computational and infrastructure demands.

#### Liquid cooling adoption

As rack density increases, cooling demands in data centres are intensifying due to the substantial heat generated by densely packed computing equipment, driving the adoption of advanced solutions such as liquid cooling and rear-door heat exchangers.



**Efficiency gains:** Liquid cooling can reduce energy use by up to 90 percent while enhancing computational performance and optimising space. This is crucial, as cooling accounts for ~40 percent of a data centre's electricity usage.



**Cost competitiveness:** Air-based cooling will remain viable for lower-density setups, but high-density centres will increasingly shift to liquid cooling as it becomes more affordable.



**Sustainability focus:** Liquid cooling supports offers superior heat management and energy efficiency, supporting greener data centre operations.

This marks a key shift towards a more sustainable and efficient data centre infrastructure.

<sup>&</sup>lt;sup>21</sup> Key Insights: The Future of Data Centers

### Power transmission and supply challenges in data centres

The surge in energy demand from AI and HPC is stressing grids already under pressure from decarbonisation, the intermittent nature of renewables and ageing infrastructure.

**Flat energy use amid rising workloads:** Despite steady data centre power use since 2015, workloads have doubled due to efficiency gains and hyperscaler growth. However, existing power grid infrastructure may not be capable of supporting the rising power needs across power-intensive industries, such as electric vehicles, advanced manufacturing and data centres.

**Regional challenges:** Smaller countries with fast expanding data centre markets face mounting strain on power infrastructure.

**Power procurement delays:** Power sourcing timelines for large-scale power have doubled or tripled, pushing developers to explore new markets.<sup>22</sup>

**Efficiency innovations:** Colocation operators are tapping "stranded power", i.e. contracted but unused energy capacity to improve operational efficiency. As energy demands and sustainability goals intersect, governments, grid operators, power generators and data centre operators must strategically invest in upgrading power infrastructure, and innovation to ensure sustainable and reliable power.

## Global high-performance computing initiatives<sup>23</sup>

HPC is a strategic priority for many countries, driving advancements in AI, economic growth and national security. US leads globally with 172 supercomputers followed by China with 63 systems. India is still in the early stages of scaling its supercomputing infrastructure, with only seven supercomputers, reflecting the need for increased investments to compete on the global stage.

#### Figure 6: Number of Supercomputers, by country (Nov 2024)<sup>24</sup>



<sup>22</sup> https://www.jll.com/en-us/newsroom/search-for-power-puts-focus-on-emerging-data-centre-markets

<sup>23</sup> https://www.oecd.org/en/publications/a-blueprint-for-building-national-compute-capacity-for-artificial-intelligence\_876367e3-en.html

<sup>24</sup> https://www.top500.org/statistics/list/

# Chapter 3: India: The AI marketplace of tomorrow

Al has emerged as a transformative force in India, contributing significantly to the nation's economic growth, with applications ranging from advanced research and development, predictive analytics, GenAl and automation tools to advanced data solutions across industries. Some of the critical parameters fuelling the India AI story are its large customer base, growing economy, burgeoning start-up culture, growing internet penetration and a vast talent pool.

#### State of India's AI ecosystem

India's AI expenditure is poised to surge at a pace mirroring the swift global expansion in AI investments, driven by rapid digital transformation across sectors, supportive government policies, a large and diverse data ecosystem, cost-effective AI talent, the rise of localised and B2B AI applications, a thriving start-up ecosystem and significant investments in AI-enabling infrastructure such as data centres and cloud services. India's AI market is currently valued at US\$7–8 billion and is poised to grow 2.5 times to reach US\$20-22 billion by 2027.<sup>25</sup> AI is directly and indirectly expected to contribute ~US\$1 trillion to India's economy by 2035 underscoring AI's potential to enhance economic growth and create job opportunities.<sup>26</sup> This growth will establish India as the second-largest talent base for AI globally, with an expected 1.25–1.35 million professionals skilled in AI by 2027.<sup>27,28</sup>

GenAl is expected to drive the majority of Al spending. India's Gen Al start-up ecosystem has witnessed exponential growth, with over 240 start-ups as of H1 2024 - a 3.6x increase from 66 start-ups in H1 2023, according to a NASSCOM report ranking the country sixth globally.<sup>29</sup> Key players such as Krutrim, Sarvam.ai, Nurix and ZekoAl have been instrumental in this rise, spanning infrastructure, services and applications, particularly since the launch of 17 native GenAl language Figure 7: The AI Market in India is currently a ~USD 8 billion opportunity, slated to become 2.5X in the next four years



models in late 2023.<sup>30</sup> Investments in India's GenAl start-ups also saw a two-fold increase to US\$82 million in H1 2024 compared with US\$42 million in H1 2023, indicating growing confidence in the sector.<sup>31</sup>

India has embraced this AI revolution with enthusiasm, achieving an adoption rate of ~48 percent across key sectors between 2017 and 2023.<sup>32</sup> This uptake is underpinned by increasing internet penetration, a tech-savvy consumer base, the government's unwavering focus on digital transformation through initiatives such as Digital India and IndiaAI Mission, burgeoning AI start-up ecosystem, higher R&D spending, AI talent and investments.<sup>33</sup> These trends have propelled India into the ranks of the world's most promising AI market. However, this exponential growth of AI demands a complete revaluation of the traditional IT infrastructure to keep up with the growing requirements of AI.

<sup>&</sup>lt;sup>25</sup> Powering India's technology growth: The continuous rise of Indian AI | Tech News - Business Standard

<sup>&</sup>lt;sup>26</sup> Deloitte collaborates with Yotta Data Services to help clients develop innovative GenAI applications

<sup>&</sup>lt;sup>27</sup> https://www.accenture.com/content/dam/accenture/final/a-com-migration/r3-3/pdf/pdf-153/accenture-ai-for-economic-growth-india.pdf

<sup>&</sup>lt;sup>28</sup> https://www2.deloitte.com/content/dam/Deloitte/in/Documents/deloitte-analytics/in-da-deloitte-nasscom-ai-skilling-in-india-report-noexp.pdf

<sup>&</sup>lt;sup>29</sup> India's Generative Al Startup Landscape 2024 | nasscom

<sup>&</sup>lt;sup>30</sup> https://www.business-standard.com/companies/start-ups/genai-start-up-landscape-witness-broad-based-growth-crosses-240-in-h1-2024-124101601105\_1. html

<sup>&</sup>lt;sup>31</sup> https://nasscom.in/knowledge-centre/publications/generative-ai-tracker-tech-industry-activity

<sup>&</sup>lt;sup>32</sup> https://www.techcircle.in/2024/07/24/india-s-rising-need-for-ai-infrastructure-are-we-well-equipped

<sup>&</sup>lt;sup>33</sup> https://nasscom.in/knowledge-centre/publications/ai-powered-tech-services-roadmap-future-ready-firms

Hence, India needs to build high-performance computing, scalable power and cooling, efficient networking, localised edge computing, energy-efficient designs and expanded supercomputing capabilities to support AI deployments.

### Current Al infrastructure landscape in India

Al has significantly driven India's overall progress by enhancing productivity, fostering innovation, and addressing critical socioeconomic challenges. The country has witnessed significant growth in its Al computing infrastructure in recent years and is positioning itself as a global leader in Al development, driven by private sector initiatives and significant government support.

Several leading technology companies, research institutions and start-ups have established data centres and computing clusters equipped with high-performance computing resources. Major cloud service providers, such as Amazon Web Services, Microsoft Azure and Google Cloud Platform are investing in large-scale, energy-efficient facilities to cater to the growing market demand. Additionally, India has the fourth largest contribution in Al-related patents focused on developing Al computing solutions.<sup>34</sup>

Government initiatives, such as the National AI Strategy, AI for All, Digital India, India AI Mission and National Supercomputing Mission, coupled with the 5G rollout, are boosting investment in AI infrastructure, connectivity and fostering localised edge computing and helping India emerge as an attractive destination for global data centre investments.

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It makes complete sense that India should manufacture its own AI. You should not export data to import intelligence

Nvidia's Founder<sup>35</sup>

India's cost advantages, including lower operational expenses and competitive labour costs, further enhance its appeal. The country's focus on renewable energy, combined with substantial investments in sustainability, aligns with the global trend towards energy-efficient data centres. India's strategic geographical location also allows it to serve domestic and regional South Asian markets effectively, positioning it as a critical node in the global data centre ecosystem. These factors collectively make India a hotspot for AI-powered data centre development in the coming years.

#### Government initiatives to boost Al Infrastructure in India

Government initiatives play a crucial role in shaping up the Al infrastructure landscape through policies, funding, and R&D support. Recognising the transformative potential of Al across various industries, the Indian government has launched several initiatives aimed at enhancing the country's Al infrastructure.

Budget 2025 allocated INR2,000 crore to the IndiaAl Mission, a ~262 percent increase from FY 2024–25's allocation. The Indian government has committed to investUS\$1.2 billion (INR10,372 crore) to establish Al supercomputing and quantum computing infrastructure with plans to procure over ~29,000 GPUs.<sup>36</sup>

The investment will fund data centres, AI applications for government use and deep-tech AI start-ups, offering access to compute at up to 40 percent reduced cost. The mission aims to build AI infrastructure, develop indigenous and domain specific models promote AI education through FutureSkills with NASSCOM and ensure safe, ethical, self-reliant and responsible AI development to strengthen India's global leadership in AI.

Beyond IndiaAl Mission, the government is taking additional initiatives to promote the development of Al in the country:

- India in collaboration with 29 Global Partnership on Artificial Intelligence (GPAI) nations, is advancing a declaration on responsible AI to promote human-centric AI development and reinforce its global leadership in AI innovation.<sup>37</sup>
- The "IndiaAl Datasets Platform" will provide high-quality datasets for researchers and companies, democratising access to accurate and reliable data for start-ups and smaller institutions. Sourced from government, academia and private entities, the platform addresses social and economic challenges while enhancing skills.<sup>38</sup>
- Priority to early-stage funding for AI and deep tech, under the National Deep Tech Startup Policy (NDTSP) which aims to drive innovation, economic growth and societal development.<sup>39,40</sup>

<sup>&</sup>lt;sup>34</sup> These Countries, Companies Are In An Al Patent Frenzy: Report

<sup>&</sup>lt;sup>35</sup> 'India Should Manufacture Its Own AI,' Declares NVIDIA CEO | NVIDIA Blog

<sup>&</sup>lt;sup>36</sup> India to nearly double GPU capacity to 29,000 under national AI Mission

<sup>&</sup>lt;sup>37</sup> Press Release: Press Information Bureau

<sup>&</sup>lt;sup>38</sup> Understanding the significance of the datasets platform in IndiaAI

<sup>&</sup>lt;sup>39</sup> Decoding The National Deeptech Startup Policy

<sup>&</sup>lt;sup>40</sup> https://www.india-briefing.com/news/india-to-fund-ai-computing-infrastructure-33565.html/

- The National Supercomputing Mission (NSM) aims to establish 24 supercomputers and 70 HPC systems by 2025, linked via the National Knowledge Network (NKN) to boost computational power for scientific research and AI-related applications.<sup>41,42</sup>
- The Draft National Data Centre Policy 2020, released by the Ministry of Electronics and Information Technology, aims to establish India as a global hub for data centres through a single-window clearance system, granting infrastructure status to the sector, facilitating access to long-term credit, encouraging domestic and foreign investments, pushing for sustainable capacity development, domestic manufacturing of equipment and designating data centres as essential services. Additionally, it proposes the creation of Data Centre Economic Zones (DCEZs) to enhance connectivity and operational efficiency. Several states in India have introduced a range of initiatives and policy measures aimed at promoting and advancing the development of AI. Telangana was the first state to launch an official AI policy (2020), focusing on AI innovation, adoption in government services, creation of an "Al Hub," and promoting responsible and ethical AI. Tamil Nadu also released a Safe and Ethical Al Policy (2020), prioritizing Al for public governance, social welfare delivery, data-driven decision-making, and also established a CoE in emerging technologies with a focus on Al. Maharashtra: Launched an Al-based platform for agritech solutions and smart public services. The state also runs the Maharashtra AI Accelerator and is integrating AI in police operations and urban governance. Odisha drafted an AI policy as part of its broader "Digital Odisha" strategy. Focus areas include education, agriculture, and healthcare, with investments in AI-focused skilling programs and innovation hubs.

#### Investments into the AI ecosystem in India

India has emerged as a key destination for AI-related investments, attracting domestic and international players. It is driven by a vibrant market, abundant talent, and strong government support, which has fuelled the rapid growth of the country's AI ecosystem.<sup>43</sup> India has ranked fifth in terms of investments received by start-ups offering AI-based products and services in 2022, behind the US, China, the UK, and Israel.<sup>44</sup>

Here are a few examples of private investments across the AI stack in India.

### Investments in Al infrastructure (Illustrative)

- Jio Platforms, Tata Communications and Yotta are among the 19 top tech and cloud service providers to have bid for the government's tender to procure GPUs under the IndiaAI Mission.<sup>45</sup>
- Tata Communications is launching AI Cloud powered by NVIDIA GPUs, which has the potential to become one of India's largest NVIDIA Hopper GPU cloud-based supercomputers.<sup>46</sup>
- AWS is launching a GenAl start-up hub with TNT, PayPal is opening an Al/ML development centre, creating 1,000 jobs, and Applied Materials is setting up an Al-driven semiconductor tech centre with 500 jobs. Additionally, Google is partnering with IIT Madras's Wadhwani School to support ethical Al research.<sup>47</sup>

### Investments in Al Platforms/ LLMs (Illustrative)

- Wipro, TCS and Infosys are driving Al innovation with significant investments and platforms. Wipro has committed US\$1 billion over three years to its Al360 and FullStride Cloud initiatives. TCS launched Al WisdomNext, a GenAl platform enabling scalable Al adoption, while Infosys introduced Topaz for GenAl.
- Nvidia is collaborating with Tech Mahindra on a Hindi LLM, Flipkart for conversational AI and healthcare companies to enhance care and research. It has partnered with Reliance and Tata to build AI data centres, with Reliance developing AI tools under JioBrain. Additionally, Nvidia proposed a joint chip development initiative to leverage India's semiconductor expertise and growing market.<sup>48</sup>

<sup>&</sup>lt;sup>41</sup> https://nsmindia.in/about

<sup>&</sup>lt;sup>42</sup> https://dst.gov.in/national-super-computing-mission

<sup>&</sup>lt;sup>43</sup> https://www.india-briefing.com/news/india-to-fund-ai-computing-infrastructure-33565.html/

<sup>&</sup>lt;sup>44</sup> https://www.livemint.com/companies/start-ups/india-ranks-fifth-in-ai-startup-investments-receives-3-24bn-in-2022-stanford-report-11681314138709.html

<sup>&</sup>lt;sup>45</sup> https://www.moneycontrol.com/technology/indiaai-mission-jio-platforms-tata-communications-among-19-bidders-competing-to-provide-10-000-gpusarticle-12882123.html

<sup>&</sup>lt;sup>46</sup> https://www.tatacommunications.com/press-release/tata-communications-unveils-ai-infrastructure-with-nvidia/

<sup>&</sup>lt;sup>47</sup> https://www.businesstoday.in/technology/news/story/tamil-nadu-emerging-as-indias-ai-hub-attracting-major-investments-and-projects-from-googleamazon-and-more-444151-2024-09-03

<sup>&</sup>lt;sup>48</sup> https://economictimes.indiatimes.com/industry/cons-products/electronics/reliance-and-nvidia-to-build-ai-infra-in-india/articleshow/114537590. cms?from=mdr

#### Data centres: The backbone of AI in India

While the rapid growth and widespread adoption of AI is promising, the truth is that AI necessitates the use of highperformance computing infrastructure, state-of-the-art hardware, and vast volumes of reliable data to operate efficiently. Specifically, the training phase of GenAI requires high-performance computing and large datasets, which has triggered a significant increase in the demand for data centre services. Data centres serve as the central hub for AI operations, functioning as the fundamental infrastructure that sustains AI systems' extensive computational demands and storage requirements.49

India may prioritise democratising data access by creating a structured data marketplace that enables equitable availability of datasets. Many datasets can be offered pro bono, while others (except personal data) can be monetised under clear conditions. Currently, big tech firms dominate due to their years of data accumulation, with players such as Jio potentially joining this elite group. Without intervention, data control may be concentrated in a few hands, underscoring the need for fair, transparent access to drive innovation and competition.

As AI applications proliferate, data centres must evolve to process and store massive amounts of data efficiently and handle increasingly complex AI workloads while balancing energy efficiency and sustainability. As AI technologies become more sophisticated and more data is generated, this demand

is only projected to grow. The continuous rise in Al's processing power and data usage requires the construction of new data centres. These centres must be equipped to handle the energy demands of the AI's high-speed servers and the necessary cooling requirements and green energy to maintain these servers' performance and efficiency.

With the ever-increasing demands of AI, one can also expect a parallel growth in the storage capacity of data centres. Of the 147 zettabytes of data generated globally,<sup>50</sup> 20 percent is generated in India which has over 1,300 AI companies; however, India hosts only ~2 percent, i.e., 150 data centres of the world's 11,000 data centres. India's data centre capacity per million Internet users stood at just 1MW, against 4MW in China.<sup>51</sup> Citing this gap, India is rapidly advancing its data centre infrastructure to support the increasing demands of Alpowered applications.52

#### **Demand and growth projections**

India is rapidly establishing itself as a global centre for AI innovation and the data centre sector has witnessed a gradual but steady growth of 2.5 times over the past five years (~24 percent CAGR). The industry is on an accelerated growth trajectory, poised for a transformative ~44 percent plus future capacity growth over the next few years, propelled by advancements in AI and the nationwide rollout of 5G. Adoption of GenAl across sectors is expected to accelerate data centre growth even further and create a second stream of data centre demand comparable to the cloud.

L&T; Nxtra; NTT Data; E2E Cloud

#### Figure 8: India DC capacity has witnessed gradual but steady growth historically at 20% CAGR, tailwinds like accelerated adoption of AI are expected to drive transformative future growth of data centers at 44% CAGR<sup>53,54</sup>



<sup>49</sup> https://yourstory.com/2024/11/how-ai-is-driving-data-centre-growth-in-india

<sup>51</sup> 1715156271\_Data Centre\_CareEdge Report.pdf

53 1715156271\_Data Centre\_CareEdge Report.pdf

<sup>54</sup>India's data centre capacity to surge to 17 GW by 2030; \$27 billion invested in last three years, ET EnergyWorld

<sup>&</sup>lt;sup>50</sup> Amount of Data Created Daily (2024)

<sup>&</sup>lt;sup>52</sup>'India generates 20% of data, but has 2% of data centres' - Technology News | The Financial Express



There are ~150 operational data centres in the country, with over 1200-1300 MW of IT load capacity in 2024 across Tier-1 cities like Mumbai, Chennai, Bengaluru and Delhi-NCR, accounting for more than 87 percent of the total inventory as of 2024. Projections suggest that the momentum will continue, with the industry poised to achieve a capacity of 2,100 - 2,200 MW by 202655,56,57,58 and an assured 5,000 - 6,000 MW by 2030 with a possibility of another 5,000 - 6,000 MW if India leverages the opportunity to position itself as the global hub for AI with the right policy frameworks. India is steadily emerging as a key hub for data infrastructure in the Asia-Pacific, likely to record the highest capacity addition over 2024–26, more than projected for other APAC countries like Japan, Singapore, Korea, Australia, Hong Kong etc.. Further, India's computing power is also expected to increase nearly 20-fold within a year, underscoring India's potential as a global AI powerhouse.59

India is scaling up its investments in AI ready data centre infrastructure to match global leaders like US and China and to meet the growing demand for AI-driven applications that require high data processing capabilities.

### Investment flows across the data centre landscape

The growth of India's data centre ecosystem, driven by AI, has caught the eye of many developers, operators, investors and other ecosystem players alike, as evidenced by the influx of long-term stable capital in this sector.

#### Figure 9 India's cumulative DC Investments (2019-2027 E)<sup>60</sup>



The Indian data centre industry has attracted investments of over US\$60 billion between 2019 and 2024, with ~US\$19 billion of investments in 2024 alone.<sup>61</sup> Even the Government of India acknowledges the critical nature of this tech infrastructure in nation-building, with the cabinet approving over INR10,300 crore for IndiaAl Mission. The country's strong economic growth and commitment to becoming a global technology major in software services and product businesses are luring multinational technology giants to be part of India's growth story.<sup>62</sup>

<sup>&</sup>lt;sup>55</sup> https://www.jll.co.in/content/dam/jll-com/documents/pdf/research/apac/india/jll-booming-data-centre-industry-in-india-a-golden-opportunity.pdf

<sup>&</sup>lt;sup>56</sup> https://www.grantthornton.in/globalassets/1.-member-firms/india/assets/pdfs/realty-bytes-data-centres-indian-real-estate-and-regulatory-dimensions.pdf <sup>57</sup> 2024\_India\_Data\_Centre\_Market\_.pdf

<sup>&</sup>lt;sup>58</sup> https://www.business-standard.com/industry/news/india-s-data-centre-capacity-to-more-than-double-by-fy27-crisil-ratings-124122300677\_1.html

<sup>&</sup>lt;sup>59</sup> India to see 20 times growth in computing capacity in 2024: Nvidia CEO | Tech News - Business Standard

<sup>60 2024</sup>\_India\_Data\_Centre\_Market\_.pdf

<sup>&</sup>lt;sup>61</sup> Geopolitical stability: India's edge in the Asian data centre market - DCD

<sup>&</sup>lt;sup>62</sup> https://www.techcircle.in/2024/07/24/india-s-rising-need-for-ai-infrastructure-are-we-well-equipped

Demand remains strong from BFSI, tech firms and cloud providers, with a shift towards colocation and hyperscale facilities. Engineering, manufacturing, and tech companies are establishing dedicated R&D data centres. India's pro-DC policies offer uninterrupted power, renewable energy access, subsidies, and infrastructure support for SMEs, promoting investment across the sector.

To meet the rising demand for data storage and processing, India's leading cloud infrastructure providers and data centre operators are rapidly ramping up their data centre capacity. NVIDIA is also playing a key role, with its GPU deployments expected to grow nearly 10x by year's end, creating the backbone for an AI-driven economy.<sup>63</sup>

However, newer policies and acts can create significant challenges to GPU deployments worldwide. The US AI Diffusion Framework introduces a comprehensive set of export controls aimed at managing the global spread of advanced AI technologies, particularly focusing on the national security risks posed by frontier AI systems. It establishes compute allocation ratios, restricts deployment of AI infrastructure in Tier 2, and limits chip volumes to ensure countries outside Tier 1 remain behind the AI frontier. Under specific allowances, it will limit India's access to high-end chips, with a cap of 50,000 Nvidia H100 equivalent units until 2027.<sup>64</sup>

India is set to become a major player in the global AI landscape as it receives investments from technology companies pouring billions into computing infrastructure. This aligns with India's aspirations to be a leading AI hub.

#### Hyperscale investments

- Microsoft is building data centres in Telangana with a 660 MW capacity to support India's sovereign AI ambitions and ensure data security.<sup>65</sup>
- Amazon plans significant investments in cloud infrastructure to strengthen its presence in the country.
- Google is making major investments in India's data centre market, including its first self-built facility in Navi Mumbai.<sup>66</sup>

#### **Private investments (Illustrative)**

- CtrlS is scaling its infrastructure for high-density computing and Al workloads. Planning to invest US\$2 billion over the next five years in line with the IndiaAl Mission.<sup>67</sup> The company is adding over 300 MW and 3 million square feet to its current installation base of more than 27,000 racks across 2.5 million square feet of floor space in core digital hubs of India.
- Ola's Al platform Krutrim has committed INR 10,000 crore (~\$1.2 billion) to democratise Al research, attract top talent, and position India as a global leader in open-source Al. The company has announced building of energy-efficient data centres and cloud service offerings for Al development with plans to scale its data centre capacity to 1 GW by 2028.<sup>68</sup>
- Jio has announced a partnership with NVIDIA in 2023 to build India's largest AI infrastructure, including a cloud-scale AI compute platform. The company is set to build the world's largest data centre in Jamnagar expected to cost between US\$20-30 billion with 3GW of capacity.<sup>69</sup>
- AdaniConneX (JV between Adani and EdgeConneX), announced plans to invest US\$5 billion in 5 years with a target to develop 1 GW of data centre capacity by 2030, scaling up from its current capacity of 17 MW at Chennai facility. They have also recently announced AI-ready data centre parks in Visakhapatnam and Noida, aimed at serving both hyperscalers and AI firms.<sup>70</sup>
- E2E Networks is expanding its cloud infrastructure by deploying 1,500 GPUs to support AI innovation.<sup>71</sup>
- Yotta Data Services has announced a US\$500 million purchase of AI chips from Nvidia, bringing its total order book with the US-based company to US\$1 billion.<sup>72</sup>
- Princeton Digital Group recently announced a US\$1 billion investment in India as part of its US\$5 billion plan for AIready data centres in Asia. The US\$1 billion investment includes adding 100MW in Mumbai (currently 50 MW) and 72MW in Chennai.<sup>73</sup>
- Sify Technologies plans to invest INR9,000 crore over the next five years to expand its data centre capacity from 100 MW to 350 MW.<sup>74</sup>

 $<sup>^{\</sup>rm 63}$  India Tech Leaders Build AI Factories for Economic Transformation | NVIDIA Blog

<sup>&</sup>lt;sup>64</sup> https://indianexpress.com/article/explained/explained-sci-tech/us-ai-export-rule-india-9780103/

<sup>&</sup>lt;sup>65</sup> https://www.business-standard.com/technology/tech-news/ai-in-india-gets-a-boost-as-microsoft-amazon-invest-billions-in-data-infra-124061800328\_1.html
<sup>66</sup> Google office: Google in talks to acquire 22.5-acre in Navi Mumbai for maiden India captive data centre - The Economic Times

<sup>&</sup>lt;sup>67</sup> https://www.datacentredynamics.com/en/news/ctrls-to-build-data-centre-park-in-chennai-india/

<sup>&</sup>lt;sup>68</sup> https://www.financialexpress.com/life/technology-olas-krutrim-commits-rs-10000-crore-to-democratise-ai-plans-indias-largest-supercomputer-3737606/ <sup>69</sup> https://techovedas.com/30-billion-ambanis-project-to-build-worlds-largest-data-centre-in-jamnagar-with-nvidia-partnership/#:~:text=Mukesh%20

Ambani's%20Reliance%20Industries%20is,on%20the%20global%20technology%20map.

<sup>&</sup>lt;sup>70</sup> https://marksmendaily.com/business/adani-enterprises-unveils-5b-plan-to-expand-data-centres/#:~:text=Adani%20Enterprises%20Announces%20%245%20

Billion%20Plan%20to%20Expand%20Data%20Centre%20Business&text=Adani%20Enterprises%20Limited%20(AEL)%2C,over%20the%20next%20five%20years <sup>71</sup> https://blogs.nvidia.com/blog/india-ai-infrastructure/

<sup>&</sup>lt;sup>72</sup> https://datacentrenews.in/story/yotta-to-double-nvidia-ai-chip-order-in-500m-deal

<sup>&</sup>lt;sup>73</sup> https://princetondg.com/newsroom/princeton-digital-group-unveils-major-india-expansion-taking-total-capacity-to-230-mw-in-mumbai-andchennai/#:~:text=The%20USD%201%20billion%20India,occupy%20~15%20acres%20of%20land.

<sup>&</sup>lt;sup>74</sup> https://www.thehindubusinessline.com/info-tech/sify-to-invest-9000-crore-in-six-years-on-data-centres/article67375957.ece

ST Telemedia Global Data Centres is investing US\$3.2 billion to expand its DC capacity in India by 550MW over the next 5–6 years.<sup>75</sup> This expansion is set to triple STT GDC India's current IT load capacity, of 318MW across 28 data centres in 10 major cities.

Strategic investments by hyperscalers and other private investors are a great starting point, and they are likely to propel India to the top spot for self-built data centre capacity in the Asia-Pacific region, up from sixth place.

### Figure 10: Mumbai and Chennai together constitute~70% of India's DC stock; these two cities are expected to continue dominating the new DC supply additions<sup>76</sup>



Source: 2024 India Data Centre Market Update | CBRE India

#### Key data centre hubs in India

Cities such as Chennai, Delhi, Bengaluru, Pune, Mumbai and Hyderabad are emerging as key data centre hubs attracting major investments from global tech giants and large-scale developers.

 Mumbai holds a crucial position in India's data centre landscape, accounting for ~48 percent of the total DC capacity, due to its strategic location.<sup>77</sup> which provides robust connectivity, reliable power, fibre infrastructure, huge BFSI demand, telecom infra and no major natural threats.

It is expected to retain its leadership as a data centre hub expected to add~35 percent of additional capacity over the next five years. Navi Mumbai is also emerging as a prime location in this region with data centre demand forecasted to reach 800 MW in the near future.

 Chennai, expected to account for ~24 percent of the capacity additions, is also anticipating significant growth, given some of the centre- and state-level initiatives. These developments reflect India's growing infrastructure to support digital growth, with major players investing in Tier I and II cities. This shift is part of the country's broader digital transformation.<sup>78</sup> In addition to expanding infrastructure in major cities, data centre operators are establishing micro data centres in smaller cities. These compact facilities support AI applications in real time and enhance smart city solutions across India's Tier II and III cities.

#### Preparing for Al-ready data centres in India: A requirement analysis

As AI workloads and data volumes continue to grow exponentially, there is a need to develop scalable and futureready AI computing infrastructure. Addressing these challenges and limitations will be crucial to maximise the potential of AI computing capacity and drive India's AI ecosystem. As a result, the demand for large-scale campuses is rising, with vertical and horizontal scalability in mind for deploying AI training models.

<sup>&</sup>lt;sup>75</sup> https://www.techradar.com/pro/india-gearing-up-to-be-ai-powerhouse
<sup>76</sup> 2024\_India\_Data\_Centre\_Market\_.pdf

<sup>77 10</sup> Data Centres to Drive India's Digital Transformation in 2024

<sup>&</sup>lt;sup>78</sup> https://analyticsindiamag.com/ai-mysteries/top-data-centre-projects-in-india/

Country	Construction Cost (USD Mn /MW)	Cost of Land (USD/ sqft)	Cost of Electricity (USD/kWh)	Cost of Data (USD/GB)	# IT Professionals (Mn)	Data Center Inventory (MW)	#Supercomputers in TOP500	
India	7.50	~100-130	0.08	0.16	5.43	~1,250	6	
US	9.50	-	0.18	6.00	~4.5	~16,000	173	
Canada	-	-	0.13	5.37	1.42	~750	9	
Germany	10.00	-	0.37	2.14	1.3	~2,730	40	
Japan	12.73	~300	0.22	3.48	0.9	~1,420	34	
Singapore	11.23	~1,100	0.25	0.63	0.21	1,400	4	
Australia	9.17	~50	0.27	0.44	1	1,230	4	
China	9.20	~270	0.08	0.38	7	~4,200	63	*)
Philippines	4.59	137	0.20	0.59	-	~150	-	
Malaysia	9.25	95	0.05	0.28	-	~350	-	
Mongolia	-	-	0.08	0.38	-	-	-	
Vietnam	6.70	16	0.08	0.29	0.53	~50	-	5
Indonesia	-	17	0.10	0.28	-	~300	-	
UAE	8.35	-	0.08	4.61	-	240	3	
Saudi Arabia	10.00	-	0.05	1.49	-	275	7	

#### Table 1: Benchmarking India with developing and developed countries across key metrics79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96

Notes: All countries are categorized into four quartiles based on their performance in the specific category with a distinct color code for each quartile Source: Cushman & Wakefield, World Population Review, Cable.co.uk, Press Information Bureau, Nearshore Americas, Make it in Germany, CFOTech, IMDA, BIV, Kyanon, Business Standard, BDC Network, Data Center Dynamics, ET CIOSEA, Property Report, Savills, Dgtl Infra, Top500, Silicon Saxony, S&P Global, Inquirer, Hanoi Times, Business Wire, Argaam





Key competing developing markets

<sup>79</sup> https://www.aprea.asia/images/Files/Cushman-&-Wakefield-Press-Release-Data-centre-construction-cost-increases-of-up-to-8%25-across-region-year-onyear-but-development-shows-no-sign-of-pausing.pdf

3<sup>rd</sup> Quartile

- <sup>80</sup> https://worldpopulationreview.com/country-rankings/cost-of-electricity-by-country
- <sup>81</sup> https://www.meity.gov.in/content/software-and-services-sector
- <sup>82</sup> https://pib.gov.in/PressNoteDetails.aspx?NoteId=152130&ModuleId=3&reg=3&lang=1
- <sup>83</sup> https://nearshoreamericas.com/will-chinas-digital-workforce-ambitions-disrupt-the-global-it-hierarchy/
- <sup>84</sup> https://www.make-it-in-germany.com/en/working-in-germany/it-specialist-in-germany/discover-the-german-it-scene
- <sup>85</sup> https://www.imda.gov.sg/-/media/imda/files/infocomm-media-landscape/research-and-statistics/sgde-report/singapore-digital-economy-report-2024.pdf <sup>86</sup> https://cfotech.com.au/story/australia-s-tech-workforce-surpasses-one-million-in-2024
- <sup>87</sup> https://www.biv.com/news/technology/nearly-7-canadas-workforce-are-technology-workers-8294372
- <sup>88</sup> https://kyanon.digital/labour-of-vietnam-it-industry-in-2023-and-prediction-for-2024/
- <sup>89</sup> https://www.cbre.co.in/insights/reports/2024-india-data-centre-market-update#:~:text=India%27s%20total%20DC%20capacity%20reached,under%20 construction%20across%20several%20cities.
- <sup>90</sup> https://www.cushmanwakefield.com/en/singapore/news/2024/09/malaysia-the-fastest-growing-data-centre-market-in-asia-pacific
- <sup>91</sup> https://www.spglobal.com/commodity-insights/en/news-research/latest-news/energy-transition/100224-canada-prepares-for-increased-electric-loads-ascountry-attracts-data-centres
- <sup>92</sup> https://www.cushmanwakefield.com/en/insights/global-data-centre-market-comparison
- <sup>93</sup> https://www.jll.de/en/trends-and-insights/investor/german-data-centre-market-addressing-rising-demand
- 94 https://top500.org/lists/top500/2024/11/
- <sup>95</sup> https://www.meti.go.jp/shingikai/economy/daiyoji\_sangyo\_skill/pdf/001\_s02\_00.pdf
- 96 https://e-janco.com/career/employmentdata.html

Rising interest in colocation models (businesses that rent data centre infrastructure) and government initiatives such as offering data centres on lease will be key to supporting the continued growth of Al data centres in India.

Building an AI data centre in India requires a comprehensive evaluation of multiple parameters, such as real estate needs, driven by factors such as land size required for AI data centres, regional characteristics, and location of the data centre. The cost of construction of a data centre is also contingent upon provisions for scalability, talent availability, design, and location. These elements are crucial for supporting the performance and efficiency of the data centre. The AI revolution has just begun and will only rise exponentially in the coming years. Data centres must evolve quickly to keep up with the rising demand for AI-ready DCs. This brings us to the main question:

### Is India equipped to meet this demand, and what does it take to get there?

### Assessing India's readiness across six critical pillars of data centre

The following is a detailed assessment of India's AI readiness across the six critical pillars of a data centre: real estate, power & utilities, network & connectivity, infrastructure (Software, Hardware), talent pool and regulations.

Pillar 1: Real estate

As AI workloads and data volumes grow exponentially, the real estate requirements for data centres have evolved significantly. The industry has grown from using dedicated floors to entire buildings to large-scale campuses capable of powering hundreds of megawatts. Moreover, to accommodate the increasing demand for AI capabilities, infrastructure changes are necessary, such as the requirement for a higher floor loading capacity of 2,500 kg/m<sup>2</sup> and higher floor-to-ceiling heights of 18 feet. These upgrades will ensure the data centres can support heavy equipment and advanced cooling systems.

India offers a distinct advantage in data centre real estate due to relatively lower land and labour costs.

- The per-megawatt (MW) cost of construction in India is among the lowest globally, at ~US\$7.50 million/MW, 40–45 percent lower than the world average<sup>97</sup>
- Furthermore, India has low-cost land for data centres at US\$100–130 per sq. ft compared with other countries such as the US, China, Japan, Australia, and Singapore<sup>98</sup>
- India's varied climate zones provide other operational advantages – developers can take advantage of cooler northern regions to build energy-efficient data centres

#### Supply and demand dynamics

To support an additional 4-5GW of data centre capacity expected to be added by 2030 in a base case scenario, India





will need an additional 45-50 million square feet of real estate in the same time period to meet the growing demand for AI capabilities, assuming that a typical AI data centre in India requires 10,000-15,000 square feet for each MW of capacity added.<sup>99</sup>

99 2024\_India\_Data\_Centre\_Market\_.pdf

<sup>&</sup>lt;sup>97</sup> https://www.fortuneindia.com/long-reads/the-coming-data-centre-boom/118240

<sup>&</sup>lt;sup>98</sup> Cushman-&-Wakefield-Press-Release-Data-centre-construction-cost-increases-of-up-to-8%-across-region-year-on-year-but-development-shows-no-signof-pausing.pdf

- 65% of data centre floor space is allocated to the server room ("white space") for server racks and IT infrastructure.
- A midsized AI data centre typically requires 200,000– 500,000 sq. ft. of space<sup>100</sup>
- 20% of the space is used for non-IT equipment, including cooling systems and power distribution units
- 15% of the space is reserved for aisles and access paths for maintenance, airflow, and personnel movement<sup>101</sup>

#### Challenges

Despite the advantages afforded by the real estate sector in India, several challenges persist which create roadblocks to efficient deployment of data centres:

#### Delays and lack of single window clearances

Significant land acquisition delays - often taking over a year, especially without experienced real estate partners lead to overall project execution delays. A very lengthy and complex approval process with ~40+ approvals needed from multiple levels of government, adds another year to the timeline.<sup>102</sup> The absence of a standardised single window clearance system across Indian states poses significant hurdles for data centre developers. This fragmented approach hampers the timely establishment of data centres, which is critical given the rapid growth of India's digital economy.

#### **Disparate fiscal incentives**

There is a notable disparity in fiscal incentives offered by different states, affecting the attractiveness of investments in data centre infrastructure. While some states provide benefits like stamp duty reimbursements and electricity duty exemptions, others lack such incentives, leading to an uneven investment landscape.<sup>103</sup> This inconsistency can deter potential investors seeking predictable and supportive fiscal environments.

Major customers, including cloud and AI service providers, are increasingly evaluating colocation spaces to solve the high investment in real estate. Colocation allows companies to access cutting-edge technologies and expertise from specialised providers.

#### Lack of designated zones

The development of designated zones equipped with specialised infrastructure for data centres remains limited. Although the Draft Data Centre Policy, 2020, proposes the establishment of Data Centre Economic Zones with preapproved clearances and affordable land, implementation has been slow. The lack of such dedicated zones hinders the efficient setup and operation of data centres, which require robust infrastructure support. Further, limited access to Al compute in smaller cities/rural areas which face difficulty accessing advanced computing resources, stalling Al ecosystem participation.

#### Other regulatory challenges

On the regulatory front, there are multiple considerations regarding the acquisition, conversion, and creation of land infrastructure. Complexity in land acquisition can include:

- Identifying adequate contiguous land that meets essential requirements such as the availability of water and electricity, fibre connectivity, access to infrastructure, and transportation.
- Conducting due diligence to ascertain land ownership, legal capacity to sell, transfer, assign and/or convey the land, veracity of approvals obtained, encumbrances, encroachment, title defect, usage restrictions, ongoing litigation/disputes, etc.
- Assessing the zoning permissibility under the relevant regulations/master plan, especially for land within conservation zones, flood plains, coastal regulation zones, reserved forests, etc.

Beyond time, the cost of approvals is also significantly high. While the government has accorded "infrastructure status" to data centres,<sup>104</sup> an upfront capital subsidy for mechanical, engineering, and plumbing costs is vital.

Furthermore, data centre infrastructure and construction techniques differ from other real estate assets, demanding a tailored regulatory approach. Data centres require distinct pre-approved standards, as opposed to standards specified under National Building Code, 2016 (NBC).<sup>105</sup>

<sup>&</sup>lt;sup>100</sup> How many servers does a data centre have? - RackSolutions

<sup>&</sup>lt;sup>101</sup> https://www.racksolutions.eu/news/blog/how-many-servers-does-a-data-centre-have/

<sup>&</sup>lt;sup>102</sup> https://cio.economictimes.indiatimes.com/news/data-centre/datacentre-industry-seeks-ease-of-doing-business/90250283#:~:text=Today%2C%20In%20 India%2C%20a%20new,operator%20starts%20sourcing%20the%20land.

<sup>&</sup>lt;sup>103</sup> https://www.snrlaw.in/wp-content/uploads/2023/04/SR-Insights-Data-Centres-in-India-%E2%80%93-Opportunity-and-Incentives.pdf

<sup>&</sup>lt;sup>104</sup> https://dea.gov.in/sites/default/files/Harmonised%20Master%20list%20of%20Infrastruture%20sub%20sectors%202022.pdf

<sup>&</sup>lt;sup>105</sup> https://www.bis.gov.in/standards/technical-department/national-building-code/

For instance, windowless structures due to security and operational requirement, floor-space index accommodations and reductions in typical parking requirements are unique to data centres. Similarly, non-inclusion of data centres under The Essential Services Maintenance Act, 1968 creates the risk of disruption of essential services especially during times of calamities or crisis.

In addition to these factors, when selecting locations for data centres, it is crucial to avoid regions prone to natural disasters and political instability, as these pose significant risks to critical infrastructure. Areas classified under Zone V, which are highly susceptible to earthquakes - often including hilly regions and remote parts of the country, should be avoided. Similarly, politically unstable areas with a history of violence or terrorist attacks present security threats that could disrupt operations and compromise the safety of the facility.

#### To summarise, the real estate pillar faces key challenges in enabling the efficient development of the data centre market:

- C1. Lack of uniform single window clearance processes for land acquisition and development of data centres and AI parks
- C2. Lack of standardised fiscal incentives to offset high land acquisition and infrastructure development costs
- C3. Lack of designated zones with specialised infrastructure to support AI and data centre development
- C4. Regulatory and operational challenges in land acquisition for data centres
- C5. Excessive compliance and cost burden for meeting building norms and disruption in service continuity for data centres





#### Pillar 2: Power and utilities infrastructure

#### **Power infrastructure**

Unlike real estate, a data centre is not measured only in yards, acres, or square meters but also by its capacity for electricity consumption. Al Data Centres require a high and continuous power supply to maintain uninterrupted functionality. A dual power grid system is essential to ensure reliability and minimise disruptions, sourcing electricity from two independent grids. This redundancy enhances operational stability and provides a critical backup, guaranteeing an uninterrupted power supply for seamless performance. A traditional data centre consumes around 5-10 kW per rack, but Al-focused racks can require at least 10 times more power per rack.<sup>106</sup> These high-performance racks would incur higher costs, requiring a greater investment.

India currently has a relatively low cost of electricity at US\$0.08–0.14 per unit, and 45 percent of its power grids are less than 10 years old, compared with only 23 percent of those in advanced economies such as Japan, Europe and US.<sup>107</sup> This modern grid foundation offers a strategic advantage for efficiently scaling up to meet future demand.

The total power consumption of data centres in India was approximately 9-10 TWH for the year ending 2023. India will need an additional 40-45 TWH to power the growth in data centre capacity.<sup>108,109</sup> Given the anticipated growth rates of power capacity in the country, a demand-supply gap may emerge in meeting the power needs of data centres, as the data centre energy requirements are projected to grow faster, driven by AI workloads, than the expansion of India's power capacity. Addressing this gap is critical to using this transformative period's economic and sustainability opportunities.

Data centres rely heavily on dedicated and uninterrupted power supply including minimal transmission losses. As "electricity" is a subject on the Concurrent List of the Indian Constitution, a significant concern is the varying regulatory frameworks between the centre and states, such as restrictive banking of renewable energy or excessive divergence in power tariff rates.

However, this surge in energy demand also presents India with a once-in-a-century opportunity to embrace the Aldriven energy transition and invest in sustainable power infrastructure that ensures long-term returns. The exponential growth in power demand—fuelled by AI—provides certainty of returns on investments in renewable energy, enhanced grid capacity, and policy reforms. If harnessed correctly, this moment could position India as a global leader in sustainable Al infrastructure, balancing unprecedented power needs with sustainability goals.

<sup>&</sup>lt;sup>106</sup> https://www.datacentreknowledge.com/energy-power-supply/data-centre-power-fueling-the-digital-revolution

<sup>&</sup>lt;sup>107</sup> https://iea.blob.core.windows.net/assets/70f2de45-6d84-4e07-bfd0-93833e205c81/ElectricityGridsandSecureEnergyTransitions.pdf

<sup>&</sup>lt;sup>108</sup>https://iea.blob.core.windows.net/assets/34eac603-ecf1-464f-b813-2ecceb8f81c2/EnergyandAI.pdf

<sup>&</sup>lt;sup>109</sup> https://ieefa.org/resources/blue-seas-and-green-electrons-powering-indias-ai-data-centres

#### **Renewable energy integration**

To sustainably manage the rising demand from AI data centres, it has become crucial for these facilities to transition towards renewable energy sources such as solar and wind power. Integrating renewable energy brings three key advantages: it reduces operational costs for AI data centres, enhances power usage effectiveness and minimises environmental degradation. The industry has seen a 17–20 percent reduction in electricity consumption from 2020 levels, and renewable energy adoption has become a critical strategy for improving energy efficiency.<sup>67</sup>

One key metric in this shift is power usage effectiveness (PUE). The average PUE for a typical data centre in India is 1.9, compared to 1.3 for data centres designed with sustainability in mind. A PUE closer to 1 indicates better power efficiency, with less energy lost to transmission, lighting, and cooling systems.<sup>110</sup>

Indian data centres are increasingly prioritising the adoption of renewable energy sources. STT GDC utilised 62.5 percent renewable energy in 2023,<sup>111</sup> Yotta is using 30 percent renewable energy in 2024 with plans to increase this to 80 percent by 2029, CtrlS aims to achieve 100 percent renewable energy use by 2030.<sup>112</sup> Nxtra is utilising 38 percent renewable energy in 2024 and plans to raise this to 70 percent by 2070.<sup>113</sup>

The contribution of renewable energy to total energy capacity in India is projected to rise from 46 percent in 2024 to 61 percent by 2030.<sup>114,115</sup> To further support this transition, government initiatives actively promote solar and wind energy projects specifically tailored to data centres. For instance, the Maharashtra government has approved the creation of green integrated data centre parks, with an expected investment of INR1.6 lakh crore.<sup>116</sup> Despite these advances, several restrictive elements exist which are impeding faster adoption and spread of renewable energy for data centres:

- While some Indian states have introduced policies encouraging the use of renewable energy in data centres, there is no overarching national mandate or significant financial incentives to promote this transition
- The banking policy of renewable energy poses limitations to data centres to rely more on renewable power. Some provisions such as allowing banking only within same day or month and lack of express provision of banking for data centres as open access consumers limits data centres to use renewable energy
- Variations in banking charges and regulations across states<sup>117</sup> create operational uncertainties for data centres seeking to integrate renewable energy sources, highlighting the need for standardised policies to facilitate smoother transitions to green energy
- An assessment<sup>118</sup> of the Green Energy Open Access Rules 2022<sup>119</sup> (GEOA Rules) found that while 28 out of 29 states have adopted the GEOA Rules, there are significant deviations from the national guidance on aspects such as approval window period, open-access charges, and standby charges. For example, per the Central GEOA Rules, 15 days is stated to be the approval window. However, Maharashtra's policy prescribes a 30-day window. Whereas, in a notification dated 13 May 2022, the Ministry of Power clarified that the GEOA Rules notified by State Electricity Regulatory Commissions (SERCs) should be consistent with the central GEOA Rules, and any deviation will be liable for action.<sup>120</sup> Moreover, the Karnataka High Court struck down the GEOA Rules in January 2025<sup>121</sup> citing overreach by the

<sup>&</sup>lt;sup>110</sup> https://investmentguruindia.com/editorial/uploads/news-pdf/780732d6\_CII-Data-Centre-Report-Final.pdf

<sup>&</sup>lt;sup>111</sup> Power-Hungry Data Centres Drive Demand for Renewable Energy in India

<sup>&</sup>lt;sup>112</sup> Data centres turn to renewable energy sources as power demand surges | News - Business Standard

<sup>&</sup>lt;sup>113</sup> Nxtra's Data Centres Meet 38% of Energy Needs from Renewable Sources

<sup>&</sup>lt;sup>114</sup> https://pib.gov.in/PressNoteDetails.aspx?NoteId=153279&ModuleId=3&reg=3&lang=1

<sup>115</sup> India's Data Centre Revolution: Potential for 5X Capacity Expansion to Fuel Digital Transformation: Cushman & Wakefield | IN | Cushman & Wakefield

<sup>&</sup>lt;sup>116</sup> https://telecomreviewasia.com/news/network-news/4582-maharashtra-approves-green-data-centre-parks-to-boost-digital-infrastructuree

<sup>&</sup>lt;sup>117</sup> https://ieefa.org/wp-content/uploads/2021/12/Banking-Restrictions-on-Renewable-Energy-Projects-in-India\_December-2021.pdf

 $<sup>^{118}</sup> https://ieefa.org/sites/default/files/2024-12/Impact\%20of\%20Green\%20Energy\%20Open\%20Acess_Dec2024.pdf$ 

<sup>&</sup>lt;sup>119</sup> https://greenopenaccess.in/assets/files/Green%20Energy%20Open%20Access\_rules.pdf

<sup>&</sup>lt;sup>120</sup> https://powermin.gov.in/sites/default/files/Determination\_of\_Green\_Tariff\_under\_Electricity\_Promoting\_Renewable\_Energy\_Through\_Green\_Energy\_ Open\_Access\_Rules\_2022\_and\_Implementation\_of\_the\_Rules.pdf#:~:text=The%20Electricity%20(Promoting%20Renewable%20Energy%20Through%20 Green,and%20to%20further%20accelerate%20India's%20RE%20programs.&text=This%20issues%20with%20the%20approval%20of%20competent%20 authority.

<sup>&</sup>lt;sup>121</sup> Brindavan Hydropower Pvt. Ltd. vs. Union of India and Ors Writ Petition no. 11235 of 2024

central government. An amendment dated 27 January 2023 to the GEOA Rules introduced an additional "other charge"<sup>122</sup> category to be levied on consumers, which some states have used to impose extra charges against green energy openaccess projects.

 Data centres have not been able to leverage the benefits of the domestic carbon credit trading scheme (CCTS) under the Energy Conservation (Amendment) Act, 2022.<sup>123</sup>

#### **Cooling solutions**

Al data centres generate substantial heat due to the highperformance computing required for Al workloads. Effective cooling systems are essential to maintain optimal server temperatures and prevent overheating. Traditional cooling methods, such as evaporative cooling and chiller plants, are commonly used but require a continuous water supply, which can strain local resources.

In AI data centres, where high-density GPU racks are critical to infrastructure, cooling systems must be even more powerful. They often need to handle heat loads 1.5–2 times greater than the heat output of the servers themselves. For instance, a 1 MW data centre consumes around 68,500 litres of water daily and a 20 MW data centre would require a staggering 1.37 million litres of water per day.<sup>124</sup> Water required for cooling in data centres is expected to almost double in the next four years as the data centre capacity in India also doubles, largely driven by AI workloads. AI data centres' freshwater demand could be as much as 1.7 trillion gallons by 2027.<sup>125</sup>

Major metros such as Mumbai, Chennai, Hyderabad, and Bengaluru have become prime data centre locations due to their robust infrastructure, skilled workforce and proximity to undersea cable landing stations. **However, these cities are facing severe water scarcity.** Bengaluru alone faces a deficit of 500 million litres against its daily requirement of 2,600 million litres, while similar crisis is unfolding in Mumbai, Delhi, and Chennai.<sup>126</sup>

With the increasing strain on water resources, many facilities are shifting towards more sustainable cooling solutions. Some companies have already embraced cutting-edge technologies to curb their water usage. Digital Connexion, a joint venture between Reliance, Brookfield, and Digital Realty, is utilising immersion cooling and magnetic levitation air-cooled turbo chillers, reducing energy consumption by 15 percent. Its Chennai data centre operates with zero water dependency.



### Figure 12: India Water Requirement for DC Cooling (Bn Gallons/Year)<sup>125</sup>

Global leaders such as Equinix have already switched to aircooled chillers, which do not rely on water. Similarly, Indian data centre giants such as CtrIS are adopting liquid cooling and adiabatic cooling systems, using AI for predictive maintenance and optimisation.<sup>127</sup>

As the AI data centre industry grows in India, it is becoming increasingly important to integrate renewable energy and sustainable cooling solutions to ensure long-term environmental and operational viability.

### To summarise, the power and utilities pillar faces several key challenges:

- C6. India's reliance on conventional energy and limited grid stability affects service consistency
- C7. Data centres in metro hubs such as Mumbai and Bengaluru risk water shortages, highlighting the need for sustainable solutions
- C8. Lack of dedicated power and utility policies for data centre operations
- C9. Despite state-level incentives, there is no national policy or significant financial benefits for renewable energy in data centres
- C10. Lack of uniform banking policies for use of renewable energy

<sup>122</sup> https://greenopenaccess.in/assets/files/Green%20Energy%20Open%20Access.pdf

<sup>&</sup>lt;sup>123</sup>https://powermin.gov.in/sites/default/files/webform/notices/The\_Energy\_Conservation\_Amendment\_Act\_2022.pdf

<sup>&</sup>lt;sup>124</sup> https://economictimes.indiatimes.com/news/india/thirst-trap-water-sustainability-issues-loom-over-indias-booming-data-centre-industry/ articleshow/111718418.cms?from=mdr

<sup>&</sup>lt;sup>125</sup> Data centre sustainability | Deloitte insights

<sup>&</sup>lt;sup>126</sup> Bengaluru Water Crisis: Bengaluru facing shortage of 500 MLD water daily, admits CM Siddaramaiah - The Hindu

<sup>&</sup>lt;sup>127</sup> https://economictimes.indiatimes.com/tech/artificial-intelligence/how-indian-data-centre-operators-are-mitigating-ai-power-consumption-woes/ articleshow/111666268.cms?from=mdr



#### Pillar 3: Connectivity and network infrastructure

India's robust network infrastructure, characterised by extensive fibre optic coverage, competitive internet charges and a burgeoning 5G ecosystem, positions it as an attractive hub for data centres. With ~3.9 million kilometres of fibre optic networks<sup>128</sup> forming the backbone for supporting highspeed data transfer and mobile internet charges averaging just US\$0.16 per GB—the cheapest globally—India offers significant cost advantages, while other countries such as the US, China, and Japan, have USD 6.00 per GB, USD 0.38 per GB, and USD 3.48 per GB respectively.<sup>129</sup>

The rapid rollout of 5G, with over 270 million users as of 2024, further strengthens the country's connectivity landscape. Projections suggest that by 2029, ~55 percent of the population (~850 million users) will have access to 5G,<sup>130</sup> enabling high-speed, low-latency connections critical for AI applications and edge computing. India's rural connectivity infrastructure has improved significantly, with 95 percent of villages now covered by 3G/4G networks and total internet subscribers reaching 954 million by 2024.<sup>131</sup> India's global connectivity is further strengthened by over 17 submarine cable systems<sup>132</sup> that link the country to international internet infrastructure. These undersea cables enable fast, reliable international data transfer, a crucial component for global AI operations. A geographical analysis of India's key data centre hubs reveals distinct connectivity advantages. Mumbai and Chennai clearly stand out due to their proximity to submarine cable landing points, which ensure superior global connectivity. Inland cities such as Hyderabad and Bengaluru are making significant strides through investments in domestic fibre optic networks and intercity links.

To support large-scale AI and High-Performance Computing (HPC) clusters, technologies such as InfiniBand are preferred for their low-latency, high-bandwidth communication capabilities. A well-planned network infrastructure ensures data flows along the shortest, most efficient paths, even across distributed, non-contiguous spaces. This is essential for AI training and production phases, where uninterrupted, high-speed network performance is necessary. Major cities such as Mumbai and Chennai benefit from strong connectivity to global internet exchange points (IXPs), reducing international traffic latency. However, the cost of leased high-speed lines (10 Gbps and above) in India remains substantial, ranging from INR10-20 lakh per month per Deloitte analysis.<sup>134,135</sup>

City	Submarine cable connectivity	Latency advantage	Geographical edge
Mumbai	High	Excellent (<30 ms)	Proximity to international IXPs; major landing point for
Chennai	High	Very Good (<50 ms)	Strong connectivity to Southeast Asia and Europe; second- largest submarine cable hub in India.
Hyderabad	Medium	Moderate (<60 ms)	Increasing fiber optic penetration; no direct access to submarine cables, relying on intercity networks.
Delhi NCR	Medium	Moderate (<60 ms)	Strategic inland hub with growing fibre optic infrastructure but reliant on coastal cities for IXPs.
Bengaluru	Medium	Good	Inland hub with strong IT backbone but lacks proximity to
-		(<50 ms)	submarine cable systems.
Kolkata	Low	Fair	Limited submarine connectivity; dependent on fibre optics
		(<70 ms)	for high-speed connectivity.

#### Table 2: City-wise Comparison of connectivity infrastructure<sup>133</sup>

<sup>128</sup> AU1498.pdf

<sup>129</sup> Worldwide Mobile Data Pricing 2023 | 1GB Cost in 237 Countries

<sup>&</sup>lt;sup>130</sup> https://www.ericsson.com/en/reports-and-papers/mobility-report/mobility-visualizer?f=1&ft=2&r=9&t=1&s=4&u=1&y=2022,2030&c=3

<sup>&</sup>lt;sup>131</sup> Press Release:Press Information Bureau

 $<sup>^{\</sup>rm 132}$  India's Three Subsea Cable Projects to Go Live By 2025

<sup>133</sup> https://maritimeindia.org/disaster-resilience-of-undersea-communication-cable-systems-in-india/

<sup>134</sup> https://www.ciscolive.com/c/dam/r/ciscolive/global-event/docs/2023/pdf/BRKDCN-2677.pdf

<sup>&</sup>lt;sup>135</sup> Microsoft PowerPoint - Airtel PNP NSIC

Al data centres require bandwidths of 100–400 Gbps, depending on the scale and nature of operations.<sup>136</sup> Future Al use cases that rely on edge computing will also depend on extending services to the last mile through 5G nodes and satellite links.

While India has made significant progress in expanding its data centre infrastructure, there is room for improvement in addressing connectivity challenges. **Many rural regions lack the infrastructure required to support data centres,** and despite initiatives such as the National Optical Fiber Network, reliable high-speed internet access remains limited. Additionally, the rapid growth in demand for high-bandwidth services often outpaces available capacity, leading to potential bottlenecks. Gaps in fibre optic coverage continue to hinder data centre expansion and the development of efficient, high-speed connectivity.

#### **Investments in connectivity**

Strategic investments in network enhancements, including expanding fibre optic reach, improving last-mile connectivity, and ensuring redundancy in network paths, are crucial. For instance, AI data centres often require multi-path fibre connections from different service providers to maintain operational continuity, adding INR1–2 crore to setup costs.

Future investments in last-mile connectivity through 5G nodes and satellite links will enable seamless AI integration, particularly in remote areas. Planned investments in expanding fibre optics, enhancing submarine cable networks, advancing last-mile connectivity, and reducing dependency on high-cost leased lines will be essential to bridge the connectivity gaps and fully unlock India's AI potential.

Due to proximity to demand hubs, **India's data centre expansion has primarily been confined to major cities and their outskirts.** India must develop dedicated data centre zones with pre-planned fibre and power infrastructure to decentralise growth.

#### **Other regulatory challenges**

Under the extant unified licence framework, a licence holder's scope of services includes providing leased circuits within its respective service area.<sup>137</sup> **However, there is ambiguity around whether this includes only bandwidth provisioning or also extends to dark fibre. Due to this, licensees are unable to provide dark fibre directly to data centres** (as they are unlicenced enterprises). As a result, enterprises are

compelled to take leased bandwidth or telcos deploy dense wave division multiplexing transmission equipment for leased bandwidth, significantly increasing cost and space requirements as telcos and data centres are unable to share fibre infrastructure in a nearby vicinity.

Right of Way is another challenge for laying fibre infrastructure due to delayed approval from multiple government departments and higher charges. While the DoT has recommended significant changes in Right of Way policies under the Telecommunications Act 2023, there is a need to align with the global best practices (such as in the US, Singapore, Australia, and the UK) on limited regulatory intervention in the use of dark fibre solely for captive purposes. For example, Singapore's Telecommunications Act of 1999<sup>138</sup> outlines a simple licensing for (1) Facilities-Based Operators (FBOs) - i.e., entities that deploy and operate telecom networks and (2) Services-Based Operators (SBOs) - i.e. entities that lease network capacity from FBOs to provide their own telecom services or resell those services to third parties. Both can resell local leased fixed-line connectivity services, including dark fibre, to unlicenced customers, such as data centres.

Similarly, under Australia's Telecommunications Act 1997<sup>139</sup> network owners are classified as carriers, while those leasing such network units are categorised as Carriage Service Providers (CSPs) and are not subject to the same licensing requirements as the carriers. Both can provide dark fibre access to unlicenced entities for captive use, providing flexibility in the deployment of dark fibre infrastructure.<sup>140</sup>

Further, lack of incentives for developing captive terrestrial and subsea network infrastructure by data centres create burden on existing infrastructure.

# Hence, to summarise, the connectivity and network infrastructure pillar faces the following major challenges:

- C11. High costs of leased high-speed lines and gaps in rural fibre coverage hindering scalability
- C12. Lack of clarity in the existing regulations regarding dark fibre connections
- C13. Current criminal law provisions and seizure powers related to data centres are onerous
- C14. Burden on existing subsea and terrestrial network infrastructure

<sup>&</sup>lt;sup>136</sup> https://www.tierpoint.com/blog/introduction-of-ai-in-data-centres

<sup>&</sup>lt;sup>137</sup> https://dot.gov.in/sites/default/files/Compendium-UL-AGREEMENT%20updated%20up%20to%2031032024.pdf?download=1

<sup>138</sup> https://sso.agc.gov.sg/Act/TA1999

<sup>&</sup>lt;sup>139</sup> https://www.austlii.edu.au/cgi-bin/viewdb/au/legis/cth/consol\_act/ta1997214/

<sup>&</sup>lt;sup>140</sup> https://community.nasscom.in/communities/public-policy/nasscoms-feedback-telecommunications-right-way-rules-2024?page=24



#### Pillar 4: Computing infrastructure

Once the foundational elements such as land, power and connectivity are secured, computing infrastructure becomes a critical component of Al data centre operations. This infrastructure encompasses powerful servers, GPUs, advanced storage devices and specialised software. As Al models evolve in complexity and scale, the computing infrastructure's performance directly influences the efficiency and effectiveness of Al workloads.

Al computing infrastructure can be categorised into three layers: high-end compute, mid-range compute and edge compute, each designed to address users' diverse computational needs. This distributed architecture allows for seamless transitions between resources, supporting the increasing demand for GenAI and LLM training.

The high-end compute layer, which handles computationally intensive tasks, includes GPU clusters. The mid-range infrastructure is distributed across four geographical centres in India: North, South, East and West, offering GPUs for AI training. These centres handle both AI training and inference tasks in their respective regions, helping reduce latency and improve accessibility. The third layer, edge computing, serves users with limited resources and smaller datasets, consisting of GPUs spread across 12 locations, ensuring the broad availability of AI capabilities.

The three layers of AI infrastructure are built on hardware requirements (specialised processing units), memory and storage devices and software solutions.<sup>141</sup>

#### Hardware requirements

Unlike traditional IT infrastructure that relies on CPUs, AI infrastructure depends on specialised units such as GPUs and TPUs. GPUs/TPUs are at the heart of the computation backbone for AI applications. They are essential for parallel processing tasks such as deep learning, machine learning and data analysis, which are at the core of AI applications. GPUs, such as the Nvidia H100, are considered the gold standard for AI research due to their efficiency and performance in training large models. Additionally, AI workloads require high-performance racks and servers designed to support the immense computational power of GPUs and TPUs.

Based on usage pattern and workload (data centre capacity, GenAl applications and models, computational complexity and widening user base), India is estimated to need more than 40–50K A100/H100 GPUs for pre-training Indian foundation models, along with the accompanying racks and servers, to meet future demands, kickstart start-up innovation and manage inferencing workloads.

Al infrastructure is as critical as any other physical infrastructure element and utilities. In 2025 itself, India's GPU allocation under IndiaAl mission is expected to be around 29,000 units,<sup>142</sup> which falls within the limits of US AI



chip restrictions, while significant demand from other data centre projects for AI compute may further complicate access to advanced AI chips.

Thus, there is an urgent need to accelerate the supply of GPUs to meet the increasing demand. This expansion will

<sup>&</sup>lt;sup>141</sup> https://www.edgeir.com/indian-government-to-build-ai-computing-infrastructure-report-says-20231123

<sup>&</sup>lt;sup>142</sup> https://economictimes.indiatimes.com/tech/artificial-intelligence/india-to-nearly-double-gpu-capacity-to-29000-under-national-ai-mission/ articleshow/120590896.cms?from=mdr

<sup>&</sup>lt;sup>143</sup> Biggest Indian bet: Hiranandani-backed data centre bags coveted Nvidia AI chips - Times of India

<sup>&</sup>lt;sup>144</sup> India to procure 10,000 GPUs in 18-24 months to boost compute power for AI companies | YourStory

<sup>&</sup>lt;sup>145</sup> India to nearly double GPU capacity to 29,000 under national AI Mission - The Economic Times

<sup>&</sup>lt;sup>146</sup> https://www.thehindubusinessline.com/info-tech/india-eyes-to-have-50000-gpus-in-3-years-to-storm-into-the-ai-league/article68609960.ece

ensure the country remains competitive in the global AI landscape.<sup>147</sup>

However, scaling up GPU capacity poses challenges, including the high costs of GPUs ranging from US\$30,000 to US\$50,000 each, limited global supply, semiconductor shortages, supply chain disruptions and a shortage of skilled workforce. The diffusion law, which imposes export restrictions on GPUs from the US, is also expected to impact GPU imports into India. Government intervention, industry collaboration and strategic partnerships with global leaders such as NVIDIA and AMD will be essential to overcome these obstacles.

The IndiaAI mission aims to provide Indian IT companies and start-ups with subsidised access to these GPUs, accelerating AI research and innovation. The government will also establish AI data centres equipped with GPUs, storage, and hardware accelerators. These will be leased to private companies, academia, and researchers to help train and develop AI models, especially LLMs. This initiative is expected to reduce the cost of computing for AI start-ups by 40-50 percent, easing the financial burden of acquiring expensive hardware.<sup>148</sup> This approach is similar to the voucher model used in China, where the government subsidises, start-ups accessing state-owned computing infrastructure.<sup>149</sup>

Another solution to address the high costs of GPUs is GPU-asa-Service (GPUaaS), which provides GPU resources on a flexible pay-as-you-go basis. This allows AI researchers, businesses, and start-ups to access high-performance computing without needing dedicated hardware.

India needs to attract more foreign investment in setting up GPU infrastructure with at least Exaflop AI capacity and high-performance H100 GPUs or above in collaboration with a reputed cloud provider and system integrator. Considering the significant investments required for building compute infrastructure, the government needs to strategically plan longterm incentive programmes that accelerate industry investment in the continuous build-out of AI infrastructure to ensure India's long-term national competitiveness and achieve leadership in AI.

For this purpose, the Indian government and industry should collaborate to prioritise the establishment of an Indian GPU cloud. While the government can lead the initial investments in GPU infra, in the long term, India should explore private sector participation to scale out the GPU infrastructure.

Moreover, inability to claim refund of input tax credit on capital goods beyond rebate in case of export of data hosting services/ colocation services creates taxation issues. This has been explained further in the subsequent sections.

#### Memory and storage device

Al workloads require specialised memory and storage solutions. These include Al-optimised file systems and high-speed storage options such as Lustre and Amazon FSx, which differ from traditional IT infrastructure's block, object, and archival storage.

While older data centres in India lack these advanced storage capabilities, new facilities must incorporate them to meet the demands of AI applications.

#### Software requirements

Apart from hardware requirements, AI-specific data centres require top-quality software solutions such as AI frameworks, libraries or even development tools to ensure efficient training, deployment, and management of AI models. In addition to AI frameworks and libraries, APIs are critical in facilitating seamless integration and communication between different systems, enabling AI models to interact with external data sources, services, and applications. Virtualisation technologies are equally vital, as they allow for the efficient allocation of computing resources across multiple AI workloads, optimising scalability, and flexibility while minimising overhead. To ensure the safety of sensitive data, robust security protocols such as encryption, access controls and secure APIs are paramount to safeguard against data breaches and unauthorised access, ensuring compliance with industry regulations such as GDPR and CCPA.

The Indian government and private sector must invest heavily in AI infrastructure, including high-performance GPUs, memory and storage devices and software to support the growth of AI research and innovation in India. India aims to bridge the infrastructure gap and foster AI development across industries through subsidised access, data centres, publicprivate participation, and GPU-as-a-Service.

Summarising the analysis, it can be inferred that the Compute Infrastructure pillar faces the following major challenges:

- C15. Limited number of GPUs global semiconductor shortages, supply chain disruptions and overall high cost of GPU acquisition
- C16. Introduction of restrictive policies like The US Diffusion Act, which imposes export restrictions on GPUs from the US, will affect GPU imports into India
- C17. Inability to claim refund of input tax credit on capital goods beyond rebate in case of export of data hosting services/colocation services

<sup>&</sup>lt;sup>147</sup> https://www.linkedin.com/pulse/impact-generative-ai-indian-data-centre-bhushan-sethi-gmp0f/

<sup>&</sup>lt;sup>148</sup> https://www.business-standard.com/technology/tech-news/govt-to-use-50-of-india-ai-mission-funds-for-gpu-procurement-meity-124070400728\_1.html <sup>149</sup> https://techovedas.com/chinas-ai-empowering-start-ups-with-computing-vouchers/#google\_vignette

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Pillar 5: Talent

Establishing and maintaining data centre infrastructure requires a highly skilled workforce. Ensuring seamless setup, continuous operation, optimal efficiency, and uninterrupted uptime necessitates expertise in hardware installation, network management, system administration, cybersecurity and energy management. This expertise is critical during the initial setup and for the ongoing operation, enabling data centres to meet the growing demands of modern digital services and AI technologies with reliability and efficiency.

India has a strong IT sector and a large talent pool with a high degree of proficiency in English. It boasts the second-largest AI workforce globally, with 600,000–650,000 skilled professionals out of a total of 5.43 million in the IT industry.<sup>150,151</sup> It also leads in AI skill penetration, with a rate of 2.8, ahead of the US (2.2) and Germany (1.9).<sup>152</sup>



India has a huge opportunity to be a global leader in AI, and creating AI fluency at scale is a critical step in that journey.

India Head, Global Tech Major<sup>153</sup>



The Indian AI talent demand is expected to grow from 600,000–650,000 to >1,250,000 over 2022–27 at a 15 percent

#### Figure 14<sup>150,151</sup>



CAGR. However, the AI market is expected to grow at 30–35 percent CAGR, potentially signalling a demand-supply gap in the talent pool and a need for upskilling existing talent.<sup>155,156</sup>

India also currently lacks dedicated AI research institutions of global repute. None of the top 25 institutions for elite AI research are based in India, highlighting a significant gap in foundational AI research infrastructure. This absence hampers the development of cutting-edge AI technologies and limits opportunities for local talent to engage in highimpact research.<sup>157</sup>

Recent announcements of AI sector investments and partnerships indicate growing momentum. Most Indian IT companies have already started training their workforce on

 $^{151} https://info.randstad.in/hubfs/Thought%20 leadership\%20 reports/India\%20 talent\%20 insights\%20 report\%202024\%20 Ed.1.pdf$ 

<sup>&</sup>lt;sup>150</sup>https://nasscom.in/knowledge-center/publications/ai-adoption-index-20-tracking-indias-sectoral-progress-ai-adoption

<sup>&</sup>lt;sup>152</sup> https://indiaai.gov.in/news/india-tops-global-ai-skill-penetration-and-talent-concentration-rates

<sup>&</sup>lt;sup>153</sup> https://news.microsoft.com/en-in/microsoft-to-provide-ai-skilling-opportunities-to-2-million-people-in-india-by-2025/

<sup>&</sup>lt;sup>154</sup> India's IT: India's IT will be the 'front-office' of world's AI revolution: Nvidia's Jensen Huang - The Economic Times

<sup>&</sup>lt;sup>155</sup> https://pib.gov.in/PressReleasePage.aspx?PRID=2036445

<sup>&</sup>lt;sup>156</sup> Advancing India's AI Skills: Interventions and Programmes Needed | nasscom | The Official Community of Indian IT Industry

<sup>&</sup>lt;sup>157</sup> https://venkatarangan.com/blog/2024/09/bridging-the-ai-talent-gap-indias-urgent-call-to-action/

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AI and related technologies, highlighting the urgent need for upskilling in the face of imminent technological shifts.

- During 2023–24, Indian IT companies such as TCS trained 350,000 employees on AI, while Wipro trained 220,000 employees on AI.<sup>158</sup>
- Infosys has initiated customised and comprehensive in-house AI training programmes to upskill its existing workforce. They have also collaborated with multiple institutions under their digital literacy initiative, "Infosys Springboard," to assist academia in curriculum design.
- Samsung's launch of its largest AI research centre outside Korea in Bengaluru further underscores India's strategic importance in the global AI ecosystem.
- Microsoft has agreed to provide AI skilling opportunities to 2 million people in India by 2025 to empower India's workforce with future-ready skills. Google has announced a research lab in Bengaluru to advance AI research and develop healthcare, agriculture, and education solutions.<sup>159</sup>

Furthermore, the government has also started taking initiatives to bridge the existing skills gap, ensuring India's workforce remains competitive.

- Ministry of Electronics and Information Technology (MeitY) has envisioned multiple K12 and Graduate/Postgraduate level interventions to develop an AI-ready talent pool. These interventions will focus on model curriculum and technology, framework, ecosystem development, research for start-ups and MSMEs, faculty training, career path mapping and building an AI community.
- The Ministry of Skill Development and Entrepreneurship has also collaborated with tech companies for the ADVANTA(I)GE INDIA initiative to empower India's workforce with futureready skills and democratise access to AI skills nationwide.
- The Union Budget of July 2024 allocated INR2,550 crore to establish three AI centres of excellence, further positioning India as a key player in the global AI landscape.<sup>160</sup>
- Increase in Research Funding: Since 2017, India has established over 10 AI innovation and research centres in leading public institutions. These centres, often in collaboration with multinational companies or government

organisations, include notable examples such as the Robert Bosch Centre for Data Science and AI at IIT Madras, the Intel AI Research Centre at IIT Hyderabad and the Centre for Artificial Intelligence and Robotics (CAIR) at the DRDO.<sup>161</sup>

• Partnership between Singapore and India emphasizes crossborder cooperation in AI development, focusing on data sharing and talent exchange.

In conclusion, while India has significantly progressed in developing its AI talent pool, bridging the growing demandsupply gap necessitates coordinated investments across multiple dimensions. The government's strategic initiatives, such as the National Programme on Artificial Intelligence Skilling Framework and the establishment of AI Centres of Excellence, lay a strong foundation for upskilling efforts. Increased funding for research is equally critical.

These efforts must be complemented by private enterprises, which have already made strides in training their workforces, as seen with initiatives by Indian IT giants. Hyperscalers are establishing industry-academia collaborations to upskill the workforce. To meet the projected AI talent demand, investments in skilling programmes must focus on equipping talent with expertise in AI programming languages, frameworks, domain-specific skills, and practical application capabilities.

### Therefore, the talent pillar faces the following major challenges:

- C18. India's workforce needs to be upskilled and trained for specific roles in the AI and data centre ecosystem to significantly increase the growth of this sector
- C19. The absence of AI-focused research institutions hinders local talent development, posing a significant challenge to the industry's advancement
- C20. Current visa policies impede access to global expertise in AI and data centre development

<sup>&</sup>lt;sup>158</sup> India's AI Talent Pool to Grow to 1.25 Million by 2027: Nasscom-Deloitte India Report

<sup>&</sup>lt;sup>159</sup> Google to set up AI research lab in Bengaluru - The Hindu

<sup>&</sup>lt;sup>160</sup> https://www.cnbctv18.com/technology/as-india-embraces-artificial-intelligence-questions-remain-over-how-ready-its-talent-pool-is-19492596.htm

<sup>&</sup>lt;sup>161</sup> https://www.indianweb2.com/2024/11/10-leading-ai-innovation-and-research.html#google\_vignette

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Pillar 6: Policy Reforms

To fully unlock India's AI potential, a robust tax and policy framework that fosters investment, ensures regulatory clarity, and promotes sustainable growth is vital.

#### a. Taxation issues

Data centres do not enjoy sector-specific tax exemption incentives compared with other industries that receive tax benefits, such as SEZs or export-oriented hubs. Unlike SEZs or IFSCs, data centres catering to offshore clients do not benefit from exclusive export-oriented tax incentives. Revenue under cost-plus arrangements is not treated akin to BPO services, leading to globally uncompetitive tax liabilities. Unlike other priority sectors, data centres do not benefit from reduced MAT rates or corporate tax holidays.

Moreover, GST provisions challenge the claim of input tax credit on goods and services procured to construct data centres. The Hon'ble Supreme Court judgement in Safari Retreats provided relief by allowing input tax credit where a developer develops a data centre and provides it on a lease.<sup>162</sup> In its 55th meeting, the GST Council has proposed a retrospective amendment to the GST law that would reverse the said relief.<sup>163</sup>

While GST applies to data hosting services/colocation services provided by data centres, a zero-rating benefit would be available when exporting such services. Exporters have two options: a rebate of the output tax paid or a refund of the accumulated input tax credit. However, it is important to note that GST paid on capital goods can be claimed only under the rebate option.

Furthermore, the existing provisions under Section 9(1)(i) of the Income Tax Act, 1961 ('ITA')<sup>164</sup> create uncertainty for foreign investors due to the risk of business connection /Permanent Establishment (PE) classification and uncertainty about profit attribution. The absence of clear guidelines on PE and profit attribution to PE discourages foreign companies from investing in hosting their data services in India. Significant high-pitched audits around PE and profit attribution for foreign investors create uncertainty and doubts about fresh investments in India. Additionally, there is a lack of clarity regarding the position that payment of compensation on a cost-plus mark-up basis to the data hosting service provider is sufficient from the transfer pricing perspective.

#### **b.** Other policy issues

Currently, there are no clear guidelines for accessing various data types, including public, non-personal, publicly available personal, and proprietary data, while ensuring privacy, sovereignty, and fair competition, particularly for AI model training on diverse data sources. For example, there is no enabling mechanism under the Public Records Act, 1993, for access to quality public datasets.<sup>165</sup> Moreover, Section 4 of the Public Records Act restricts the transfer of any public records, i.e., records created by any governmental body outside India, without the prior approval of the central government.

While some measures have been announced to improve dataset quality, such as Indian Datasets Platform under the IndiaAI mission and the introduction of Draft National Data Governance Framework,<sup>166</sup> India needs a cohesive strategy for enterprises to securely access data for training AI models based on proper data classification and standardisation.

The recently enacted DPDP Act (set to replace the SPDI Rules) aims to establish a stringent framework for safeguarding digital personal data, several aspects still remain unclear. Who would be held responsible in case there is a data breach on an AI platform? Would it be the developer, the AI model, the platform, or the technology provider? Who would take charge in case of consent withdrawal? This interplay between AI and the DPDP Act must be sufficiently addressed to build an enabling AI ecosystem.

Moreover, there are a series of regulations in India that prescribe data storage within India's territorial limits, complicating operations for global companies engaged in cross-border data flows. For example, the Draft Digital Personal Data Protection Rules, 2025,<sup>167</sup> Public Records

<sup>163</sup> https://pib.gov.in/PressReleasePage.aspx?PRID=2086873

<sup>&</sup>lt;sup>162</sup> https://taxguru.in/goods-and-service-tax/itc-construction-supreme-courts-landmark-ruling.html

<sup>&</sup>lt;sup>164</sup> https://incometaxindia.gov.in/pages/acts/income-tax-act.aspx

<sup>&</sup>lt;sup>165</sup> https://www.indiacode.nic.in/bitstream/123456789/1921/1/a1993\_\_\_69.pdf

<sup>&</sup>lt;sup>166</sup> A summary may be found here: https://community.nasscom.in/communities/policy-advocacy/call-inputs-draft-national-data-governance-framework-policy <sup>167</sup> https://pib.gov.in/PressReleasePage.aspx?PRID=2090048

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Act, 1993,<sup>168</sup> Sensitive Personal Data or Information Rules 2011,<sup>169</sup> Intermediary Guidelines 2021,<sup>170</sup> Companies Act, 2013,<sup>171</sup> RBI Payments and Settlements Systems Act<sup>172</sup> and CERT-In Directions have provisions mandating data localisation. Al infrastructure often relies on globally distributed data; mandatory localisation limits real-time data processing, increasing infrastructure costs.

Concerns persist around the ownership of Al-generated data under the current Indian IP regime. A significant challenge for AI-based developers lies in their work's patentability. As a set rule, under the Indian Patents Act,<sup>173</sup> inventions involving only algorithms, computer programmes, mathematical or business methods – even if they meet other criteria for patentability are still inherently non-patentable. Under the present law, any invention that inherently has only software content, without any element of hardware attached, has constantly been rejected by the Patent and Design Controller's office in India, and no patent protection has been provided.

The Computer Related Invention Guidelines (2017)<sup>174</sup> and various judicial pronouncements since 2019<sup>175</sup> have acknowledged that the future of innovation lies in AI, blockchain and similar technology, all of which will be based on computer programmes, but such inventions would not become non-patentable inventions simply because it is a computer programme. Patents have been granted for algorithms that demonstrate technical effects such as high speed, reduced access time, lower data usage, etc. Moreover, the Office of the Controller General of Patents, Designs and Trademarks (CGPDTM) issued "Draft Guidelines for Examination of Computer Related Inventions, 2025" (CRI 2025) on 25 March 2025. Despite these positive developments, seeking patent registration for AI-based algorithms is still unclear, with no consistent jurisprudence.

Furthermore, the Copyright Act in India, 1957<sup>176</sup> does not address Al-generated works or expressly recognise Al as an author. This legal uncertainty should be resolved to ensure protection for Al- generated work under the Copyright Act. In 1994, the Copyright Act was amended<sup>177</sup> to widen the definition of "author" and include within its ambit a person who causes any "computer generated" work to be created, i.e., the programmer or person responsible for the intellectual property to exist.<sup>178</sup> While there are no judicial precedents or any clarification under the Copyright Act, which defines the scope of "computer generated" work or otherwise indicates whether Al/LLM-generated work qualifies as "computer generated", a strict interpretation of the statute suggests that the work/data that is Al generated, so far as it meets the threshold under the

<sup>&</sup>lt;sup>168</sup> https://www.indiacode.nic.in/bitstream/123456789/1921/1/a1993\_\_\_69.pdf

<sup>&</sup>lt;sup>169</sup> https://www.indiacode.nic.in/handle/123456789/1362/simple-search?query=The%20Information%20Technology%20(Reasonable%20Security%20 Practices%20and%20Procedures%20and%20Sensitive%20Personal%20Data%20or%20Information)%20Rules,%202011.&searchradio=rules
<sup>170</sup> https://www.meity.gov.in/static/uploads/2024/02/Information-Technology-Intermediary-Guidelines-and-Digital-Media-Ethics-Code-Rules-2021-

updated-06.04.2023-pdf

<sup>&</sup>lt;sup>171</sup> https://www.mca.gov.in/content/mca/global/en/acts-rules/companies-act/companies-act-2013.html

<sup>&</sup>lt;sup>172</sup> https://www.rbi.org.in/commonperson/English/scripts/FAQs.aspx?Id=420

<sup>&</sup>lt;sup>173</sup> Section 3(k), Indian Patents Act, 1970

<sup>&</sup>lt;sup>174</sup> https://www.ipindia.gov.in/writereaddata/Portal/IPOGuidelinesManuals/1\_86\_1\_Revised\_\_Guidelines\_for\_Examination\_of\_Computer-related\_Inventions\_CRI\_\_.pdf

<sup>&</sup>lt;sup>175</sup> Ferid Allani vs. Union of India W.P.(C) 7/2014, Microsoft Technology Licensing, LLC Vs The Assistant Controller Of Patents And Designs C.A.(COMM.IPD-PAT) 29/2022

<sup>176</sup> https://www.indiacode.nic.in/bitstream/123456789/1367/5/a1957-14.pdf

<sup>177</sup> https://copyright.gov.in/Documents/Notification/Copyright\_Amendment\_1994.pdf

<sup>&</sup>lt;sup>178</sup> Section 2 (d) of Copyright Act, 1957

modicum of creativity test (as laid down by various courts from time to time; particularly under *Eastern Book Company v. D.B. Modak*<sup>179</sup>) should be subject matter of protection under the Copyright Act.

This view is supported by the statement of the Union Minister of State for Commerce and Industry in a press release dated 9 February 2024,<sup>180</sup> wherein it was clarified that the existing IPR regime is well-equipped to protect Algenerated works.

Regarding Text and Data Mining (TDM), the same press release<sup>181</sup> also appears to indicate that the Copyright Act "obligates the user of GenAl to obtain permission to use their works for commercial purposes if such use is not covered under the fair dealing exceptions provided under Section 52 of the Copyright Act."

Additionally, via Rajya Sabha Question No. 558 dated 7 February 2025,<sup>182</sup> MeitY clarified that web scraping of any publicly available data by any intermediary for training AI Models would be regulated under Section 43 of the Information Technology Act 2000, Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules 2021 and the DPDP Act which could impose obligations relating to obtaining consent of individual (in case of personal data processing) for a specified purpose before processing their data and prevent intermediaries from hosting, displaying, or uploading content that violates any law.

Notably, the statement of the central government in the press release dated 9 February 2024 seems to indicate that the usage of copyright work (without licence/assignment) can lead to infringement. However, the growing importance of allowing TDM for training models highlights a significant gap in the extant legislative framework, especially for cases wherein the use of copyrighted material is done for noncommercial purposes.

Regarding seizure and interception of devices, India's criminal system relies on primary and secondary evidence, with laws such as the Bharatiya Nagarik Suraksha Sanhita, 2023<sup>183</sup> (BNSS) allowing judicial bodies to demand information for legal proceedings. Investigatory authorities can seize electronic devices, raising concerns for data centres, which function solely as storage and management entities without access to data content. The Bhartiya Sakshya Adhiniyam, 2023<sup>184</sup> requires electronic evidence to be accompanied by a certified statement, yet encryption and sharing often prevent data centres from being able to comply. Seizure power also remain under the Telecommunication Act, 2023.<sup>185,186</sup> As data centres do not control user/customer data, such obligations sometime become onerous versus customers/users/ application owners.

Similarly, AI models and LLMs that do not handle private real-time communications should not be subjected to interception designed for monitoring private exchanges. Extending interception to such AI models would be redundant and could lead to surveillance over data protected by foreign jurisdictions.

### Therefore, the policy pillar faces the following major challenges:

- C21. Foreign companies using Indian data centres (either by owning or renting space) may be considered to have a PE in India, even if they conduct no significant business beyond data hosting, leading to double taxation
- C22. No sector-specific tax exemptions available for data centres and non-treatment of revenue under cost plus arrangement akin to BPO services
- C23. Lack of clear guidelines for accessing and using various categories of datasets for training of AI models; Additional burden on data centres regarding device seizure liabilities & content blocking under BNSS 2023 and Telecommunications Act 2023
- C24. Ambiguity in intellectual property rights framework for Al-generated models restricts innovation and creates legal disputes

A strategic combination of regulatory reforms to address the above challenges, coupled with investments from private and public stakeholders supported by government initiatives, will significantly accelerate the growth of the Al industry in India.

<sup>&</sup>lt;sup>179</sup> Eastern Book Company v. D.B. Modak, 2008 (36) PTC 1 (SC)

<sup>&</sup>lt;sup>180</sup> https://pib.gov.in/PressReleasePage.aspx?PRID=2004715#:~:text=Existing%20IPR%20regime%20well%2Dequipped,create%20separate%20category%20 of%20rights&text=Intellectual%20Property%20Rights%20including%20Copyright,persons%20for%20a%20set%20duration.

<sup>&</sup>lt;sup>181</sup> https://pib.gov.in/PressReleasePage.aspx?PRID=2004715

<sup>&</sup>lt;sup>182</sup> https://sansad.in/getFile/annex/267/AU558\_hhtT2g.pdf?source=pqars#:~:text=(a)%20the%20measures%20in%20place,intermediaries%2C%20to%20 prevent%20users%20from

<sup>183</sup> https://www.indiacode.nic.in/bitstream/123456789/20099/3/aa2023-46.pdf

<sup>184</sup> https://www.indiacode.nic.in/bitstream/123456789/20063/1/a2023-47.pdf

<sup>185</sup> https://egazette.gov.in/WriteReadData/2023/250880.pdf

<sup>&</sup>lt;sup>186</sup> Section 63(4), Bhartiya Sakshya Adhiniyam, 2023

# Chapter 4: Recommendations and the way forward

Given the opportunities that lie ahead for India to become a global leader in AI, this Chapter provides recommendations across the six pillars identified for strengthening AI infrastructure in India.



Challenges	Recommendations
C1. Lack of uniform single window clearance processes for land acquisition and development of	R1a. Establish a single-window clearance system and fast-track approvals for data centre land parcels.
data centres and AI parks	R1b. Set up Data Centre Facilitation Units (DCFUs) to coordinate regulatory approvals and policy implementation.
C2. Lack of standardised fiscal incentives to address rising costs while acquiring land for	R2a. Provide upfront capital subsidy for mechanical, engineering, and plumbing costs for data centre establishment.
data centres and attract foreign investments	R2b. Grant interest subvention for borrowed capital for an initial 5 years of setting up the data centre to improve financial viability.
C3. Lack of designated zones with specialised infrastructure to support AI and data centre development	R3a. Create dedicated data centre economic zones (DCEZs) with the necessary infrastructure to host multiple data centres. These concentrated data centre areas can operate on a plug-and-play model to significantly reduce the time required to establish a data centre.
	R3b. Design greenfield data centres considering the advancements in computing infrastructure, specifically AI computing platforms that are an order of magnitude higher density than legacy telecom data centres. Supporting high-density compute aligned with the roadmap of various OEMs and technology providers should be a primary design criterion and it should get preferential power and industrial water allocation.
C4. Regulatory and operational challenges in land acquisition for data centres	R4. Entrust the High-Level Regulatory Reforms Committee (the formation of which was announced in Budget 2025) to consider regulatory issues on land acquisition, etc.
C5. Excessive compliance and cost burden for meeting building norms and disruption in service continuity for data centres	R5. Introduce a separate category code for data centres in the National Building Code 2016 and nationally recognise data centres under the Essential Services Maintenance Act, 1968, to incentivise developers to build highly specialised commercial assets.



Power and utilities

Challenges	Reco	mmendations
C6. India's reliance on conventional energy sources (~55%) and limited	R6a.	Invest in grid modernisation and renewable energy integration while ensuring a stable power supply.
service; India averages 1.9 PUE [Power Usage Effectiveness (PUE) which highlights efficiency gap] whereas sustainable designs typically reach 1.3	R6b.	Provide a weighted deduction for setting up the captive renewable energy power plant.
C7. Data centres in metro hubs like Mumbai and Bengaluru could face water shortages, emphasising need for cost-efficient ways for promoting renewable and energy-efficient technologies	R7.	Build incentives for using cutting-edge technologies in cooling systems to curb excess water usage, including incentives such as a weighted deduction for expenditures incurred on high-tech cooling systems.
C8. Lack of dedicated power and utility policies for data centre operations	R8a.	Build a supportive policy framework for dedicated power supply infrastructure for data centres, including embedded generation, to enable less energy loss in transmission.
	R8b.	Address the divergences in power regulations and differing tariffs across states along with consistency in the classification of data centres across states and allow data centres to avail power at industrial tariff rates.
C9. Despite state-level incentives, no national mandate or significant financial benefits exist for renewable energy in data centres	R9.	Establish a national policy providing fiscal incentives for usage of renewable energy for data centres
C10. Lack of uniform banking policies for use of renewable energy	R10.	Standardise the state-level banking policies for use of renewable energy to enable data centres to capitalise on it



Connectivity and network infrastructure

Challenges	Recommendations
C11. High costs of leased high-speed lines and gaps in rural fiber coverage hinder scalability	R11. Ensure robust connectivity through high-capacity domestic and international network backhaul, common service ducts, utility corridors for fibre optic cables, shared Telecom Service Provider (TSP) infrastructure and dedicated captive fibre networks.
C12. Lack of clarity in the existing regulations regarding dark fibre connections	<ul> <li>R12a. Address policies related to dark fibre or campus cross-connect to reduce the cost of operations for enterprises when they grow from one data centre to another in a nearby vicinity. Address policies related to dark fibre or campus cross-connect to reduce the cost of operations for enterprises when they grow from one data centre to another in a nearby vicinity.</li> <li>R12b. Align with global best practices on limited regulatory intervention in using</li> </ul>
	dark fibre solely for captive purposes under the forthcoming Right of Way Rules of the DoT.
C13. Current criminal law provisions and seizure powers to data centres are onerous	R13a. Rationalise provisions for seeking information under BNSS 2023 to account for data centre operators' limitations. Data centres cannot access data content; they only manage and store data. Their physical presence should not make them responsible for client companies when authorities seek data.
	R13b. Rationalise power to seize any electronic device of data centres as "telecom equipment" and exclude data centres from the scope of surveillance under the Telecommunication Act 2023.
C14. Burden on existing subsea and terrestrial network infrastructure	R14. Ease regulatory frameworks for data centres to invest in and operate their own terrestrial and subsea network infrastructure, which is necessary for operating AI data centres at scale.

•mmendations • Create AI-specific industrial zones and R&D hubs. Long-term incentive programme for investment by enterprises/ cloud providers for setting up GPU infrastructure with at least Exaflop AI capacity and high-performance H100 GPUs and incentives for manufacturing electrical and mechanical equipments
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. The government can incentivise technology investments and research thereof by providing weighted deduction on the related expenditure and providing a no / low tax rate for non-resident collaborators
. Establish long-term AI infrastructure support schemes such as sustained GPU subsidies, low-cost financing, and viability gap funding for AI compute facilities.
. Establish design and fabrication capabilities for indigenous compute infrastructure in the long term
. Engage in G2G conversations and deals to negate some of the restrictive policies
Allowance of refund of input tax credit on capital as well as works contract beyond claiming rebate of the output tax paid

Talent					
Challenges	Recommendations				
C18. India's workforce needs to be upskilled and trained for specific roles in the Al and data centre ecosystem	R18. Prioritise workforce development for data centre roles (including specialists, infrastructure engineers, operations managers) as well as core engineering talent, to support the sector's growth				
C19. Absence of Al-focused research institutions hinder local talent development	R19. Partner with educational institutions and tech companies to develop specialised training programmes that focus on practical skills needed in the AI sector				
C20. Current visa policies impede access to global expertise in AI and data centre development	R20. Offer visa incentives for international experts in AI, cloud computing and data centre operations, which will help bridge local skill gaps.				





Policy reforms

Challenges	Recommendations
C21. Foreign companies using Indian data centres (either by owning or renting space) may be considered to have a PE in India, even if they conduct no significant business	R21a. Exempt overseas digital service providers using data hosting services in India from constituting business connection/ PE through appropriate explanation under Section 9(1)(i) of the ITA. Alternatively, issue a specific Circular that data hosting services procured
beyond data hosting, leading to double taxation	from India by digital service providers do not constitute a business connection/ PE of the digital service providers in India.
	R21b. Introduce safe harbour rules for data hosting service providers in India, such as Business Process Outsourcing services where payment of arm's length compensation on a cost-plus basis should be considered with no additional attribution of profits required.
	R21c. Under exchange control procedures, allow business conduct in convertible foreign currency and simplified investment and reporting procedures.
C22. No sector-specific tax exemptions available for data centres and non-treatment of revenue under cost plus arrangement akin to BPO services	R22a. Mirror the incentives provided to IFSCs, including income/corporate tax exemptions, a reduced MAT rate, exemptions under GST (on the input and output side) and stamp duty. Also, simplify compliances under the Companies Act regarding CSR requirements, meeting protocols and administrative flexibility.
C23. Lack of clear guidelines for accessing and using various categories of datasets for training	R23a. Promote development and enable domestic training of AI models by allowing a framework for access to high-quality data for AI researchers and developers. These include:
of AI models; Additional burden on data centres regarding device seizure liabilities & content blocking under BNSS 2023 and Telecommunications Act 2023	R23ai. Establishing clear guidelines for accessing (a) public and non- personal data, (b) publicly available personal data and (c) proprietary data collected by businesses for fine-tuning AI model while ensuring that data privacy, sovereignty and fair competition are not compromised.
	R23aii. Developing a standardised framework for the segregation and anonymisation of data, particularly in cases where models are trained on primary and secondary data sources, to mitigate privacy violations under the DPDP Act.
	R23b. Revisit the guidelines for data integration and accessibility across government departments and PSUs, to enhance data sharing and collaboration while maintaining security and compliance.
	R23c. Simplify and build certainty in data localisation requirements without compromising on protecting sensitive information and compliance with local privacy standards. Therefore, there is a need for:

Challenges		Recommendations		
		R23ci. Aligning data localisation requirements under sectoral laws with a focus on necessity and the associated risks, ensuring that these requirements are proportionate and targeted to address specific concerns.		
		R23cii. Promoting the smooth transfer of data across borders through international agreements and policy frameworks to support global collaboration while maintaining data security and compliance.		
	R23d.	Recognise the unique role of providing data centre services to overseas entities and the associated technical limitations. Clarify the scope of obligations under the applicable IT Act, 2000, and the BNSS, 2023, especially regarding data access, interception and blocking content.		
	R23e.	Establish "data embassies" near affordable land and power hubs to minimise transmission costs, reduce operational expenses and implement a legal framework aligned with companies' home country regulations.		
C24. Ambiguity in intellectual property rights framework for Al-generated models restricts innovation and creates legal disputes	R24a.	Adopt a balanced approach to govern Al-generated work, ensuring the rights of copyright owners/authors are upheld while fostering the continued advancement of such emerging technologies responsibly by making suitable amendments in the definition of 'author' under the Copyright Act and expansion of the 'fair dealing' exemption under Section 52(1)(a) of the Copyright Act to include Al-generated content that meets the criteria of undergoing significant transformation vis-à-vis the original work for an alternative purpose.		
	R24b.	Carving out a specific exemption for TDM under the Copyright Act similar to legislation such as the EU's Digital Single Market Directive <sup>187</sup> will ensure that India remains competitive and aligned with global standards while balancing the rights of copyright holders and providing them with an opt- out mechanism. Further clarification regarding this key aspect of the law might also come through the Court's decision under ANI Media Pvt Ltd Vs Open Al Inc & Anr. <sup>188</sup>		

The development of AI data centres in India requires a collaborative approach that uses the strengths of the public and private sectors due to the high capital costs, technical expertise and scalability needed for AI projects.

Although the government can drive initiatives such as modernising power grids, improving regulatory frameworks and investing in Al education, the private sector brings essential technological, infrastructure and operational efficiency innovations. Key sectors requiring collaboration include real estate, infrastructure, power supply, networks, and talent development. Challenges such as capital shortages, power deficits and talent gaps require joint efforts to streamline policies and upskill the workforce. By fostering collaboration between government and private stakeholders, India can create a thriving AI landscape that enhances its technological capabilities and democratises access to these advancements across society. India has the right mix of elements needed and a once-in-alifetime opportunity to position itself as the global hub for AI. With a timely and well-designed policy framework to attract long-term investments, the country can emerge as the AI hub for the world while driving sustainable economic growth.

<sup>187</sup> https://eur-lex.europa.eu/eli/dir/2019/790/oj/eng

<sup>&</sup>lt;sup>188</sup> ANI Media Pvt Ltd Vs Open Al Inc & Anr. CS(COMM) 1028/2024

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