AI Edge for Viksit Bharat

January 2026

Contents

Prologue 01

01 AI and the world 04

02 AI and Viksit Bharat 11

03 3A2I: A systems approach for scalable, equitable, responsible AI 21

04 How AI can unlock economic value for India 44

Epilogue 49

References 52

Prologue

Sanjeev Krishan
Chairperson, PwC in India

11.74%

Share of India's GDP from the digital economy.

Building India's AI edge for a Viksit Bharat

The role of digital technologies as a driver of global economic growth is now well established and India's experience stands as a compelling illustration of this transformation. As of February 2025, the digital economy accounts for 11.74% of India's GDP, reflecting the scale and impact of a decade-long commitment to digital reform.[1]

This progress is anchored in the Digital India Programme designed to deliver universal digital services that bridge long-standing divides, and advance financial inclusion and digital empowerment across the society. Central to this journey is India's Digital Public Infrastructure (DPI).

Flagship initiatives such as Aadhaar, the world's largest digital identity system, the Unified Payments Interface, and platforms including DigiLocker, UMANG and DIKSHA, the world's largest education platform, have redefined access to public services through scale, trust and interoperability.

Supporting frameworks such as OpenForge and API Setu have strengthened open and collaborative governance, while digital health platforms such as eSanjeevani and e-Hospital have expanded the reach and efficiency of healthcare delivery. Together, these initiatives, often described as India's "Techade", have laid the foundations of a resilient and inclusive digital economy.[2]

India has built one of the world's most diversified and resilient technology ecosystems.

It ranks as the third-largest start-up market globally[3], serves as a core hub for IT and digital services, and hosts more than 2,000 Global Capability Centres supporting multinational enterprises. Public-led investments in skills, research and innovation have strengthened this base, while new initiatives are extending India's reach into frontier areas such as quantum computing through the National Quantum Mission.

India's startup ecosystem is central to the Viksit Bharat agenda[4], which aims to raise India's long-term growth rate beyond 8%.

Artificial intelligence(AI) has been identified as the critical enabler of this shift. India's advantage lies in its ability to deploy AI at scale, supported by a large STEM workforce, an expanding research ecosystem, and robust Digital Public Infrastructure (DPI). The challenge, and the opportunity, is to translate this capability into sustained productivity gains and more importantly, inclusive economic outcomes.

Global benchmarks reflect this trajectory. Stanford's Global Vibrancy Tool ranked India fourth worldwide in AI in late 2024, and its AI Index 2025 highlighted India's rapid rise[5], driven by a fast-growing workforce and broad-based adoption.

The economic stakes are significant. PwC's Value in Motion research estimates that AI could add up to 15% to global GDP by 2035[6], with sustained productivity gains as AI moves from research environments into everyday products and services across manufacturing, healthcare, finance and agriculture. India is reinforcing these advantages through targeted investment and policy intervention. Data-centre capacity is expanding rapidly, while the IndiaAI Mission is easing access to scarce and costly AI compute.

The approval of 10 semi-conductor plants[7] strengthens the domestic electronics ecosystem, even as startups develop Indian language and voice models critical for inclusion in a country as we are progressing towards universal literacy.

The AI Kosh repository, now hosting more than 6,200 local datasets[8], provides an innovation-ready data backbone. Anchored in DPI and guided by a techno-legal regulatory approach that balances innovation with safety, accountability and equity, India is shaping an AI pathway that aligns growth with trust and inclusion.

The central question, however, is not whether AI can accelerate growth, but whether it can do so while unlocking the gateway to advance equitable development and growth at scale.

UNDP's latest report highlights AI's upside[9], suggesting that widespread adoption could lift annual GDP growth in Asia and the Pacific significantly, while raising productivity in sectors such as health and finance.

It simultaneously cautions that countries constrained by weak connectivity, limited data and fragile institutions risk early exclusion, resulting in what it terms "unequal abundance", where gains accrue to a few while many fall behind.

The Stanford AI Index 2025 echoes this concern, pointing to gaps in India's private investment, patents, research citations, and globally recognised AI models.

USD 550Bn

Potential value to be unlocked in five key sectors through AI

Yet India is comparatively well positioned to pursue an inclusive AI transition. The government's strategy reflects this intent. Integrating AI with DPI is expected to enable affordable and inclusive services, from voice-based access to stronger fraud controls. National initiatives, including the IndiaAI Mission, the India Semiconductor Mission, the development of local language and voice models, and the AI Kosh dataset repository, are strengthening domestic capability. In parallel, a techno-legal regulatory approach seeks to encourage innovation while embedding safety, accountability, and equity by design.

3A2I framework

To propel India on the path of using AI to drive equitable growth at scale leveraging its evolving AI infrastructure and ecosystems, we recommend the 3A2I framework—a systemic approach wherein governments, civil society and the private sector make AI tools and platforms accessible, acceptable, assimilative (3As) within different segments of society before implementing and institutionalising (2Is) the relevant initiatives associated with the same.

The report applies this framework to five pivotal sectors: agriculture, education, energy, healthcare and manufacturing that constitute the foundation of Viksit Bharat.

As per PwC's Value in Motion research, AI has the potential to contribute between **USD 550.2 billion to USD 607.3 billion** to these five sectors by 2035 at a nominal level. Pilots across India in these sectors demonstrate that integrating elements of the 3A2I framework can help achieve these numbers—advancing operational excellence, sustainability, good governance, resilience, and financial discipline. Together these key components form the foundation of what we refer to as India's AI-Equitable development and growth enablement (Edge) framework.

Distinct from Edge AI, which focuses on where models run, the AI-Edge framework centres around the economic and social value AI must deliver across sectors. It enables AI's transition from promise to practice by defining measurable outcomes and a structured pathway for deployment at scale.

From the above discussion, it is evident that this is the moment for our nation to build its AI-Edge. Applied with discipline, this can become India's distinctive contribution to the world – building an AI-driven developmental framework that drives inclusive growth with a human touch.

01

AI and the world

The next wave of Artificial intelligence Pg 05
From a tool to a catalyst Pg 06
India can lead the world on AI inclusion Pg 10

The next wave of Artificial intelligence

British mathematician and data scientist Clive Humby and AI pioneer Andrew Ng neatly framed successive eras of technology with enduring phrases:

> “Data is the new oil and AI is the new electricity”

capturing the rise of data analytics and Artificial intelligence, respectively.[10,11,12]

We are seeing both these trends pan out as the world witnesses the swift evolution of traditional AI, which focuses on analysing historical data to spot patterns and making predictions, to generative AI (GenAI) that creates original text, code, images, audio and video through simple prompts in natural languages such as English and Hindi.

Such is the popularity of this tech that an AI assistant launched just three years ago, now has 700 million active weekly users[13]. Recent estimates suggest GenAI apps could generate over USD 10 billion in revenue by 2026.[14]

The next shift is towards agentic AI, where systems move beyond content generation to reason, plan and act autonomously on a user’s behalf, pushing AI closer to artificial general intelligence, or AGI. We believe the future of GenAI is agentic, where AI agents collaborate in real-time to automate complex tasks and enhance decision-making.

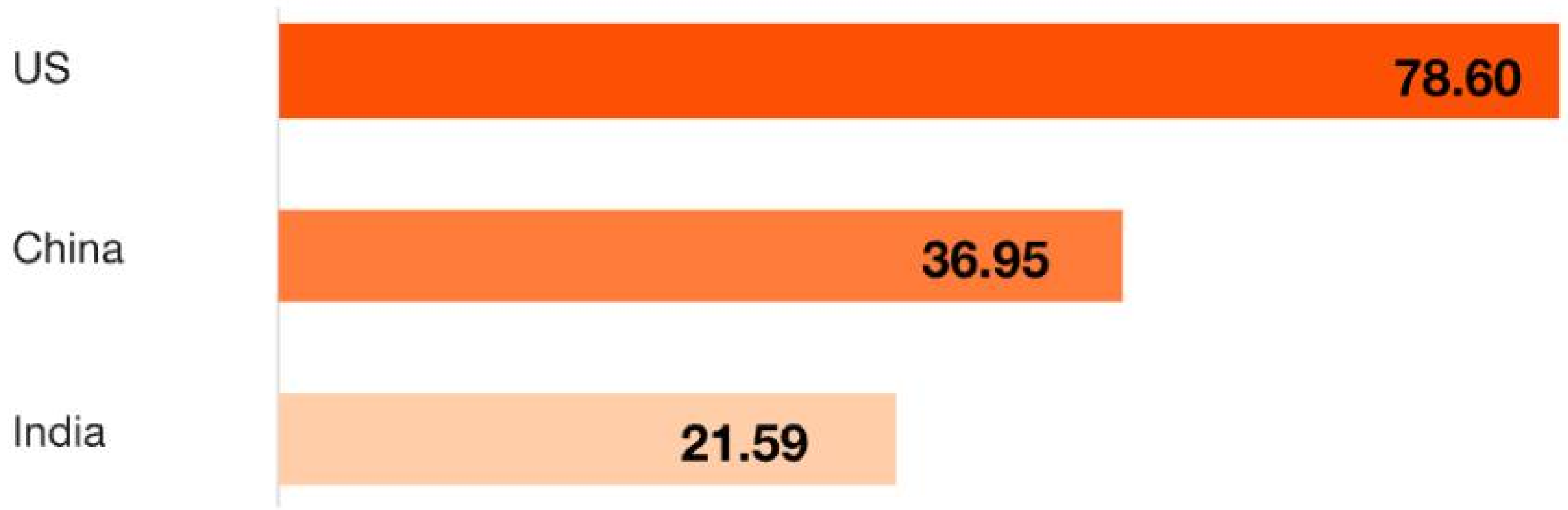
USD 10Bn

Revenue GenAI apps could reportedly generate by 2026

From a tool to a catalyst

AI is fast becoming an engine powering the future of governments and industries. In November 2025, Stanford updated its Global AI Vibrancy Tool that ranked 36 countries using data from 2017 to 2024.

Global AI Vibrancy Tool Rank



The US led the Index by a wide margin with a score of

78.60

The US' leadership came on the back of dominating research and development, economic strength, and infrastructure[15]. It also topped private investment, compute capacity, and notable model releases, with systems developed by leading companies in the field.

China came second at

36.95

China's prowess was driven by its strong research base. It led the world in AI publications, citations, and patent grants in 2024, ranked second in notable model launches, and reinforced its position with new models and a renewed national push to integrate AI across the economy.

India was placed third with a score of

21.59

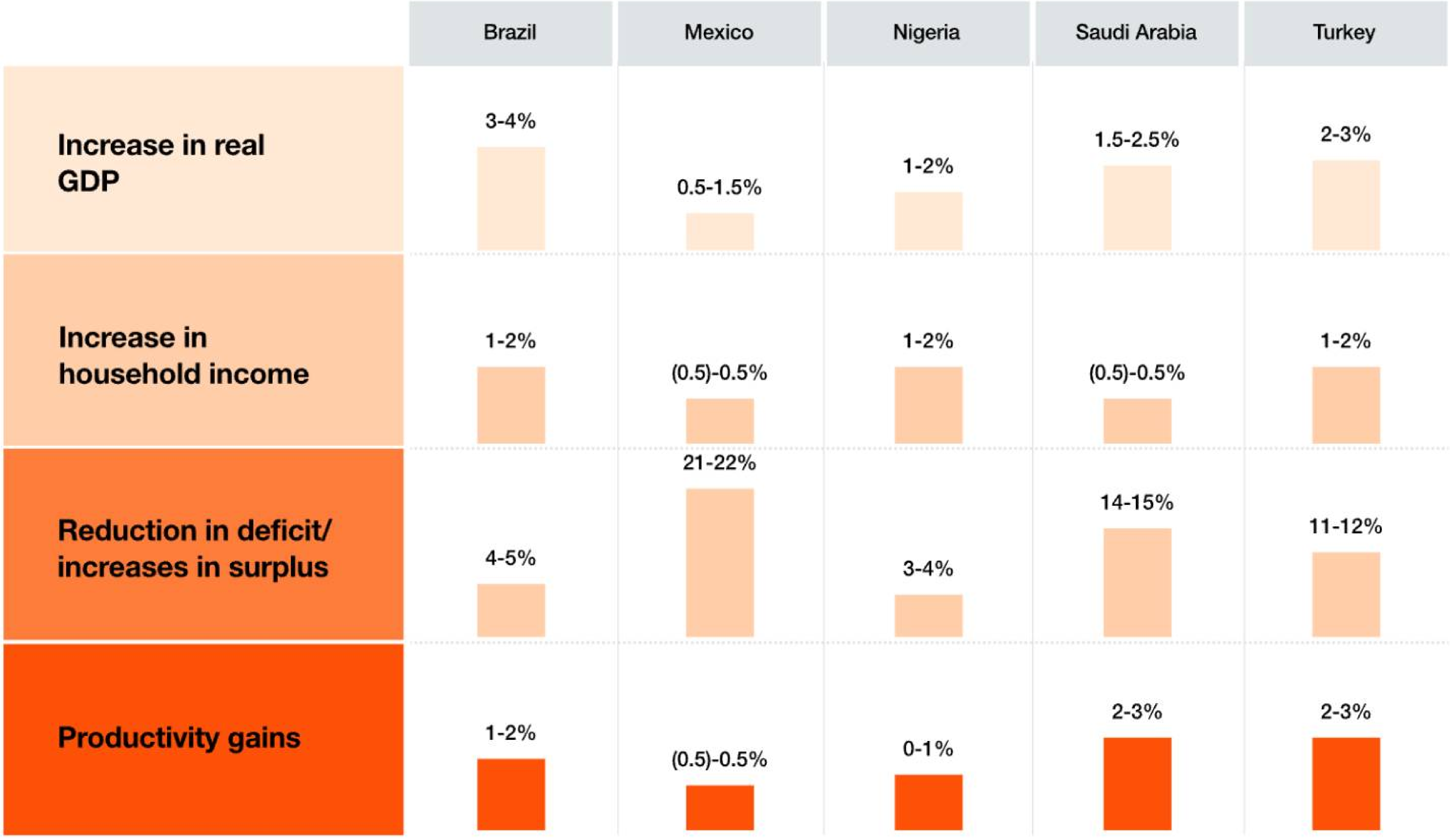
India rose sharply from seventh position in 2023; it ranks ahead of South Korea and the United Kingdom now. It also performed well on innovation and economic competitiveness, second only to the US in the latter. However, the per capita index revealed enduring gaps, with India ranking last, highlighting the challenge of converting scale into broad-based impact.[16]

Applied with intent, AI can reshape nations at scale, empowering people across geographies and socio-economic divides to do more and do better.

We believe that if governments in emerging markets act decisively, they can convert demographic momentum, rapid digital adoption, and the absence of legacy constraints into a powerful advantage, allowing them to leapfrog traditional development pathways.

A recent PwC report, ‘AI works for governments: A digital sprinters report’, notes that AI can deliver tangible public value across three fronts: improving government efficiency and fiscal health, strengthening public goods and service delivery, and accelerating economic growth and prosperity.[17] Deployed at scale, AI can contribute directly to GDP growth, productivity gains and higher household incomes. (See Figure 1)

Figure 1: Economy-wide impact of public sector AI adoption in 2035 compared to baseline in 2035



Source: PwC analysis

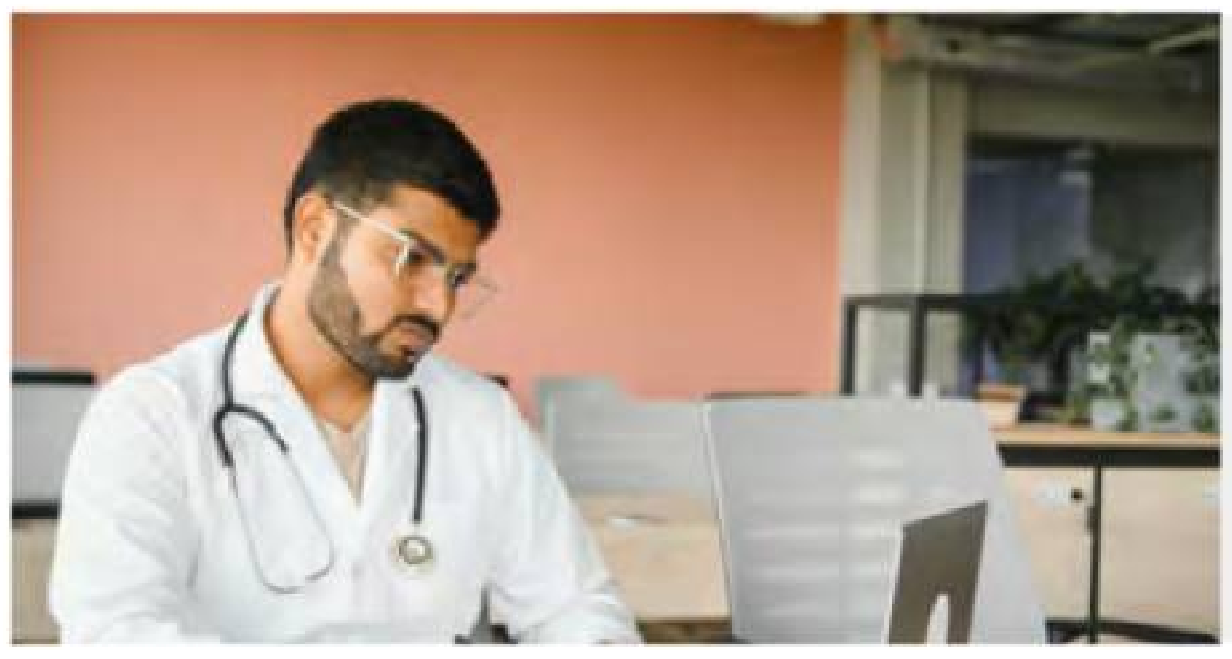
Across the public sector, use cases are already emerging.

- **In public finance**

  AI enables fraud detection, smarter audits, and data-driven procurement, strengthening fiscal stewardship.

- **In citizen services**

  Digital assistants, workflow automation, and multilingual platforms improve efficiency and access.



- **In healthcare**

  AI-powered diagnostics and triage expand reach and improve outcomes despite clinician shortages.

- **In education**

  Adaptive learning and teacher augmentation help close capacity gaps and promote equity.

In infrastructure, AI can do the following

01

Support predictive maintenance and traffic optimisation.

02

Enhance resilience through early-warning systems in disaster management.

03

Streamline justice and security through faster evidence review and targeted analytics.

These technologies, however, are not without their limitations.

While AI agents can write, deploy and debug code at speed, they can also hallucinate, miss basic errors and disrupt the systems they are meant to improve.

Code produced in minutes can still fail without human judgement, making fully autonomous developers unreliable. Further, enterprises are still awaiting ROI, especially from generative AI and agentic AI.

There are also fears that heavy spending on AI could squeeze margins, delay payback and weaken demand. This implies that a shift in investor sentiment could deflate elevated valuations, escalating worries about a circular investment loop, where the same firms fund, supply and consume AI infrastructure.

Another concern is that the infrastructure boom is driving up demand for power and water, prompting operators to turn to renewable energy, advanced cooling and unconventional locations.

Despite these limitations, what makes AI a true game changer is its capacity to democratise knowledge by breaking hierarchies, flattening organisational structures, and creating a more level playing field.

In this new era, nations that command advanced chips and supercomputing infrastructure will undoubtedly hold strategic advantage even as the bigger opportunity lies in deploying AI in ways that serve people and strengthen national priorities.

This reality underscores the need to accelerate AI's learning curve and embed it seamlessly into everyday workflows. Done right, this shift moves humans from being mere operators of technology to its primary beneficiaries, unlocking a more inclusive and productive future.

PwC's Value in Motion research estimates that AI could add up to 15% to global GDP by 2035[18], increasing annual growth by around 1% and delivering sizeable productivity gains.

The reason

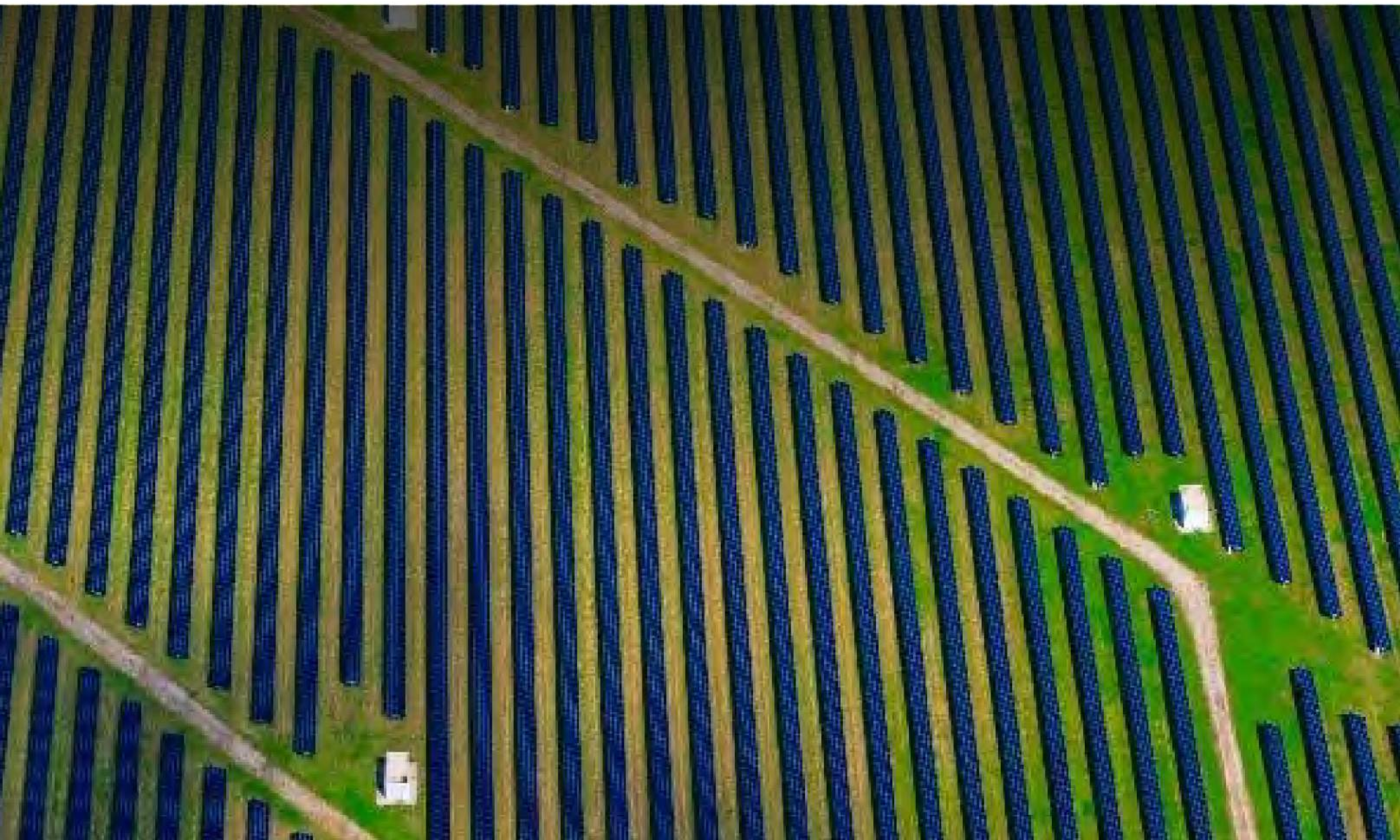
As AI moves from research labs into everyday products and services, labour productivity gains of 0.8 to 2.4% a year over the next decade could reshape sectors such as manufacturing, healthcare, finance, and agriculture.

India can lead the world on AI inclusion

The stakes are high across Asia and the Pacific that accounts for more than half of global AI users and nearly 70% of AI patents, making it what UNDP's 'The Next Great Divergence' report calls the ultimate testing ground for whether AI reduces or deepens inequality.[19]

Countries with weak connectivity, limited data, and fragile institutions risk being locked out early, leading to what the report describes as 'unequal abundance', where a few surge ahead while many are left behind. India, though, is well placed to drive an inclusive AI transition, drawing on its digital public infrastructure, expanding research base, and large technology workforce, the report adds.

The next chapters share how we can achieve this goal.



02

AI and Viksit Bharat

Core of India’s Viksit Bharat vision Pg 12

Sandboxing for AI-driven growth Pg 19

Core of India's Viksit Bharat vision

AI sits at the core of India's Viksit Bharat vision.

Towards this end, the government has already committed USD 1.15 billion to the IndiaAI Mission[20] to build national capability across infrastructure, data, talent and adoption, alongside approving 10 semiconductor plants to strengthen the electronics ecosystem. India has also identified several AI startups to develop Indian-language and voice models, a critical priority in a country where we are progressing towards universal literacy.

The AI Kosh repository, now hosting over 6,200 local datasets[21], further strengthens this innovation base. Combined with digital public infrastructure such as UPI and the Account Aggregator, AI can drive inclusion through voice-led access, stronger fraud detection, and affordable, scalable services.

It is clear that AI has the potential to drive sweeping economic changes in India, influencing multiple sectors and creating extensive new opportunities.

The challenge is to ensure that this momentum translates into measurable economic and social value across sectors. Towards making a focused effort in this direction, this report focuses on five sectors that are central to the Viksit Bharat agenda:

Agriculture

Education

Energy

Healthcare

Manufacturing

They are aligned with the government's four core Viksit Bharat pillars comprising: Yuva (youth), Garib (the underprivileged), Mahila (women), and Annadata (farmers).

Yuva	**Garib**	**Mahila**	**Annadata**
youth	underprivileged	women	farmers

Yet, there are deep, persistent challenges in these sectors that constrain productivity, access and outcomes. Many of these bottlenecks, however, are well suited to targeted AI interventions. What follows is a high-level view of the key strengths and structural gaps across these critical sectors, setting the context for where AI can deliver the greatest impact.

Key sectors

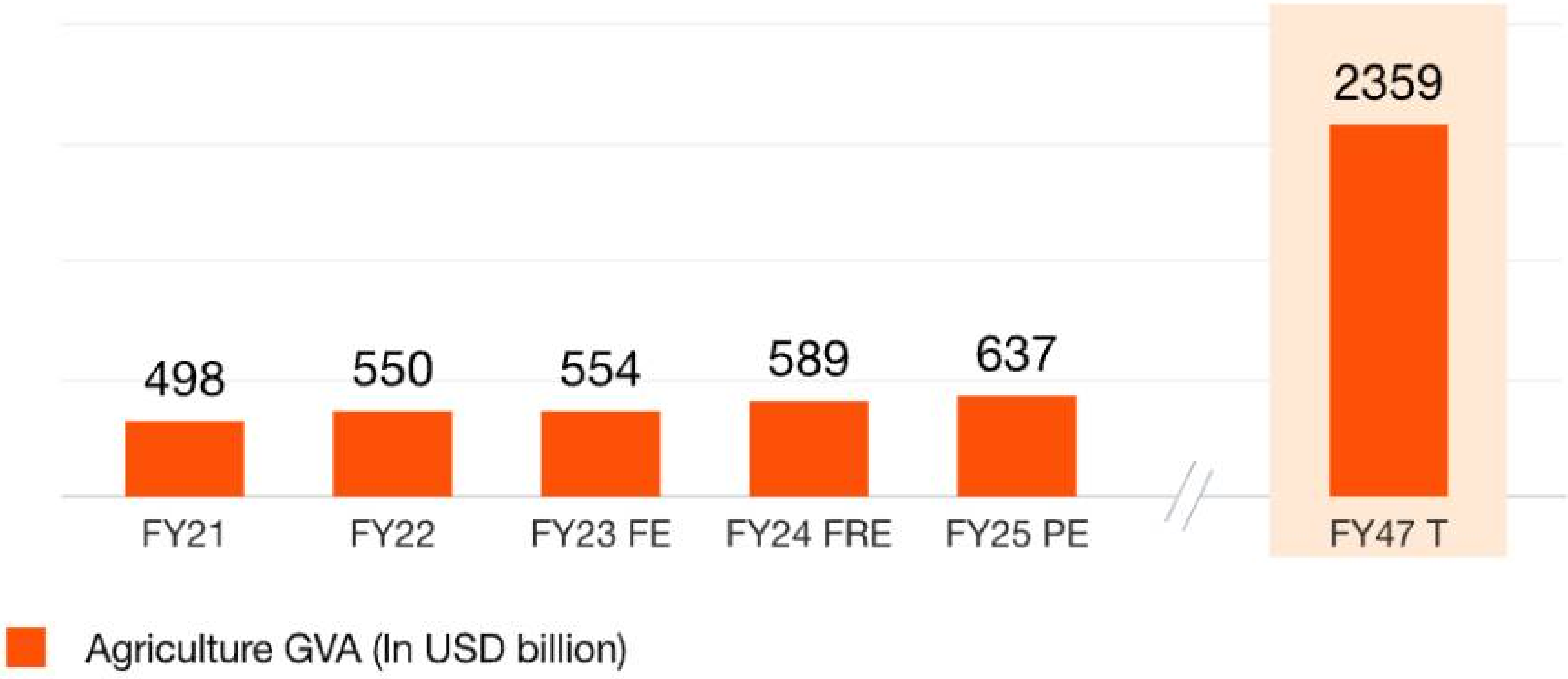
Agriculture

Employing nearly half the workforce and contributing about 18% of GDP[22], India's agriculture remains the nation's backbone. Calculations reveal the gross value addition (GVA) of agriculture has to grow from an estimated USD 637 billion in FY25 to USD 2,359 billion in FY47 to meet Viksit Bharat aspirations. (See Figure 2)

With 86% of the country's farmers being small and marginal farmers holding less than a hectare of land,[23] the sector faces productivity challenges with yield gaps of 40-50% compared to global averages.[24]

Since India's food production would need to increase 70% to feed its projected population of 1.6 billion by 2050, accelerating integration of digital technologies including AI, is vital for productivity gains and sustainability.[25]

Figure 2: India's expected agriculture growth in a Viksit Bharat scenario: FY25-FY47



Source: PwC analysis
Notes: FRE: First revised estimates | PE: Provisional estimates | T: Targeted | All figures cited are on a nominal basis

Education

As the empowerment engine for Viksit Bharat, education must expand access and quality across primary to higher education.

The Economic Survey 2023-24 noted[26]

51.25%

of graduates are employable

The Economic Survey 2024-25 reported[27]

53%	of graduates
44%	of postgraduates

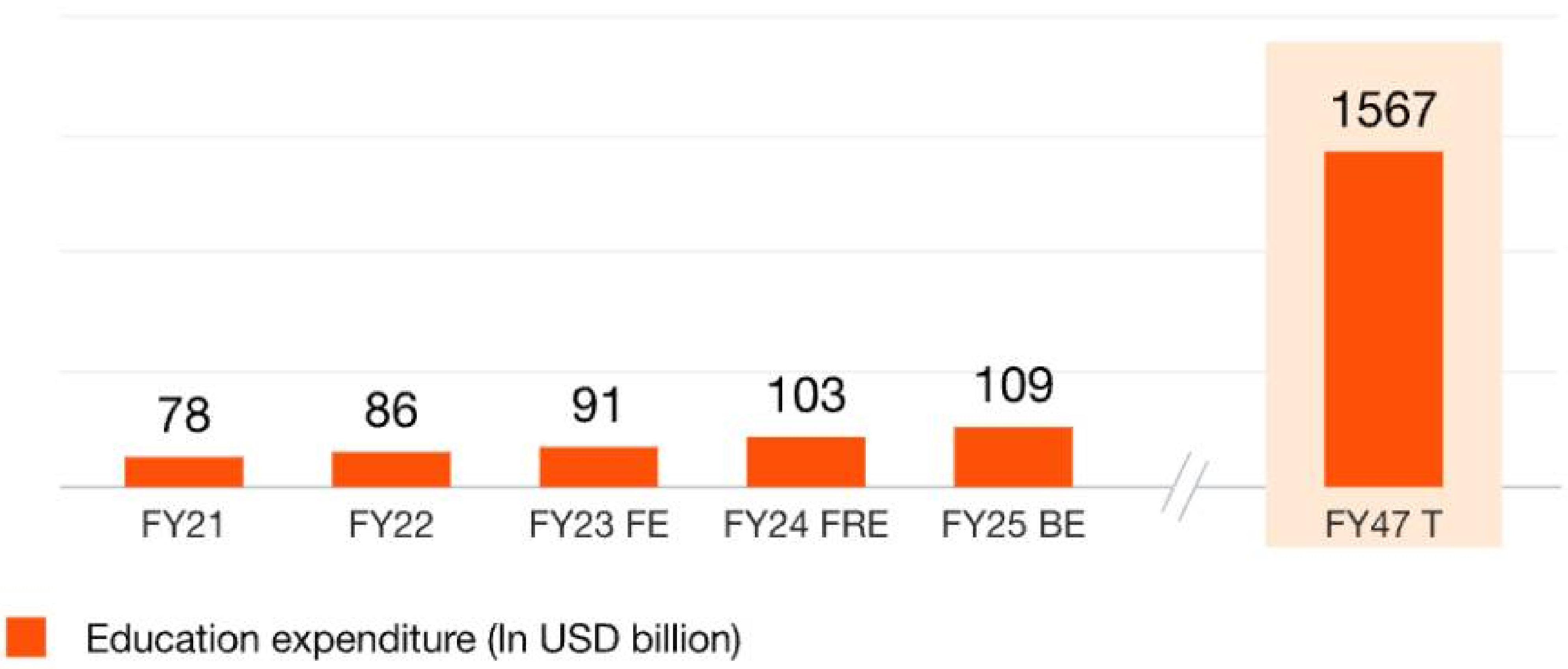
are employed in "elementary" or "semi-skilled" jobs, not justifying their education.

The Economic Survey 2024-25 added that only 8.25% of graduates are employed in roles matching their educational qualifications.

Increasing gross enrolment ratios, especially among disadvantaged groups, and investing more in multidisciplinary and skill-oriented programmes will transform India's demographic dividend into a skilled workforce, reducing urban-rural and gender disparities. That will also exponentially expand the size of the budgetary allocations to education over the next two decades requiring technologies such as AI to ensure they are meaningfully spent.

(See Figure 3)

Figure 3: India's expected educational expenditure growth in a Viksit Bharat scenario: FY25-FY47



Source: PwC analysis
Notes: FRE: First revised estimates | PE: Provisional estimates | T: Targeted | All figures cited are on a nominal basis

Energy

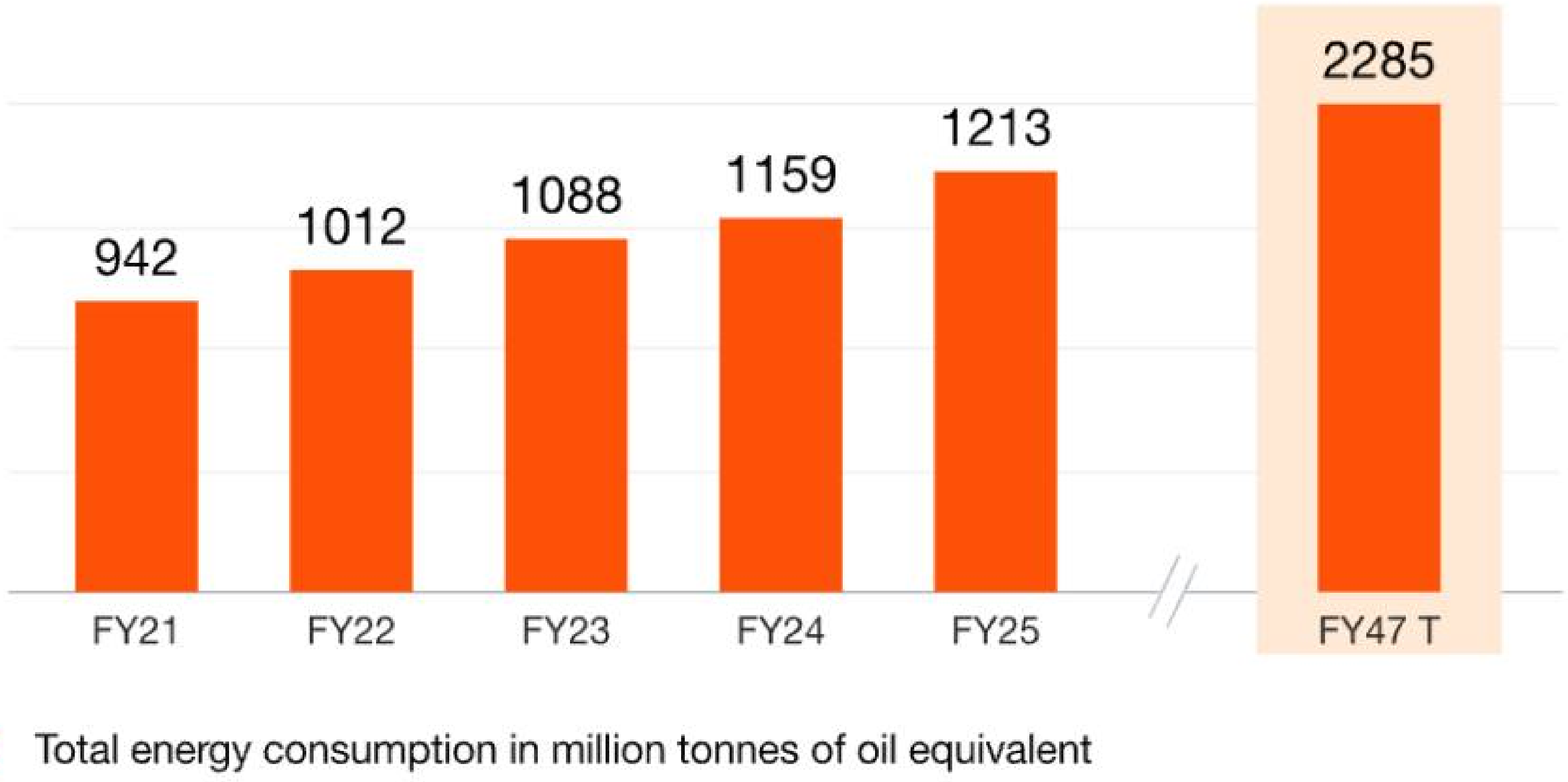
A strategic enabler for production across manufacturing and agriculture, a highly efficient and productive energy sector is going to be vital to achieve Viksit Bharat goals. Moreover, the energy sector's transition towards a green mix will be crucial to support achievement of climate goals and improve the quality of rural livelihoods.

Expanding decentralised renewable energy will unlock growth opportunities across businesses established in rural India, enhance export competitiveness in key industries, and more importantly, be essential to power data centres.

Cost- and resource-efficient universal electricity coverage and consistent supply of high-quality power to all is going to be critical for inclusive growth requiring technologies such as AI to reduce power theft.

Factoring in a healthy mix of renewable and non-renewable energy, reduced power theft and growing awareness within people around sustainable consumption, calculations reveal that total energy consumption in million tons of oil equivalent will grow at a CAGR of about 3% over the next two plus decades. (See Figure 4)

Figure 4: India's expected energy consumption growth in a Viksit Bharat scenario: FY25-FY47



Source: PwC analysis
Notes: FRE: First revised estimates | PE: Provisional estimates | T: Targeted | All figures cited are on a nominal basis

Healthcare

Only a healthy population can effectively engage with the growth challenges of a Viksit Bharat. Healthy individuals will be more productive, miss fewer workdays, and be positioned to contribute consistently to the high-speed economy. Only by achieving universal health coverage, reducing under-five mortality to single digits, ensuring mental healthcare of its youth, and reducing burden of lifestyle diseases will India stand to successfully unlock its demographic dividend.

Healthcare is also going to be vital to generate jobs.

Scaled tertiary and super-specialty care, through institutions and medical colleges attached to every district hospital, have the potential to generate high-skill jobs, retain talent, and attract medical value tourism, boosting GDP while making advanced treatment accessible beyond metros.

(See Figure 5)

Healthcare expenditure as a share of the economy is set to rise significantly

7%

of GDP by FY47

Healthcare expenditure is projected to grow from USD 120.3 billion in FY22 to over

USD 2Tn

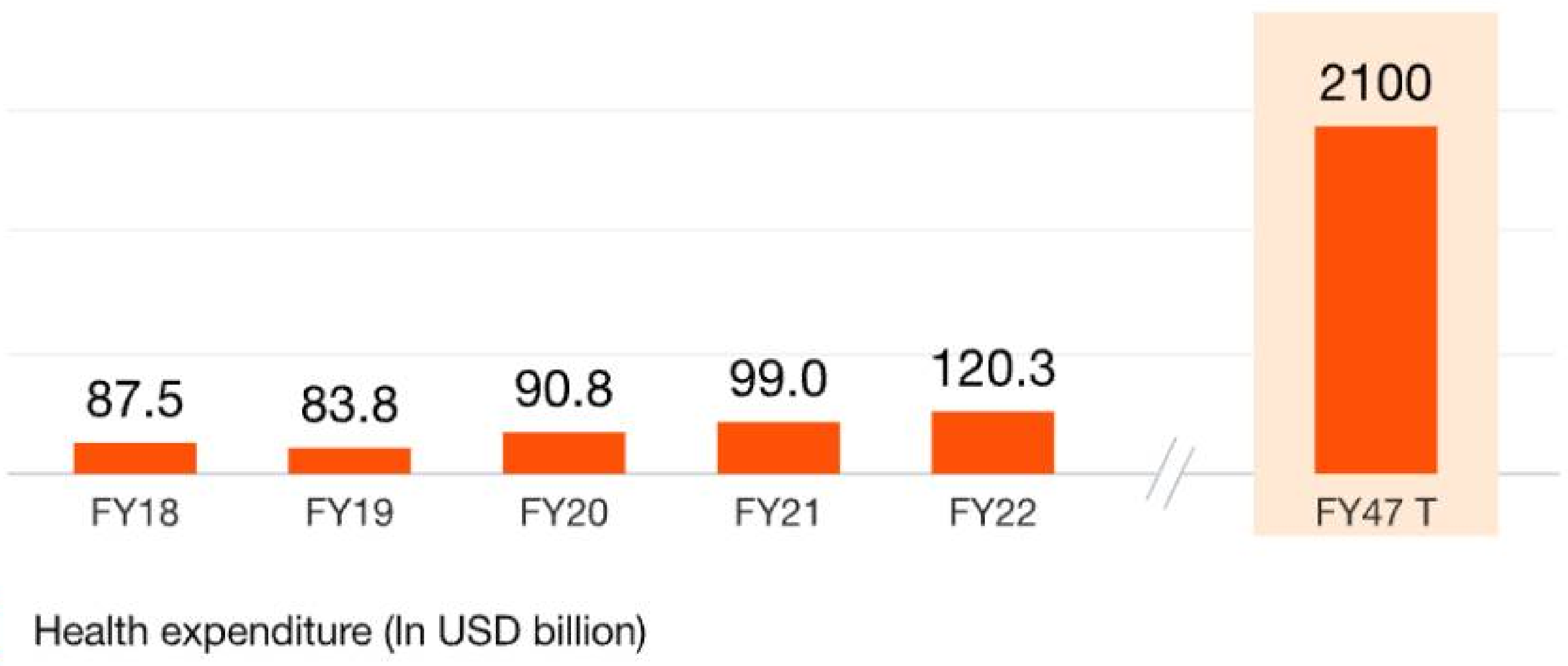
in FY47

Overall healthcare spending is expected to nearly double over the next two decades

FY22–47

Source: PwC analysis

Figure 5: India's expected healthcare expenditure growth in a Viksit Bharat scenario : FY22-FY47



Source: PwC analysis

Notes: FRE: First revised estimates | PE: Provisional estimates | T: Targeted | All figures cited are on a nominal basis

Manufacturing

Largely comprising micro-, small- as well as medium-sized enterprises, accelerated growth in manufacturing sectors such as semiconductors, solar panels, high-tech telecommunications, and electronics, among others, with digital technologies and AI will not only help India become self-reliant (Aatmanirbhar) but also significantly enhance its integration into global value chains within these strategic industries.

Manufacturing also has the potential to create gainful employment opportunities for millions of educated youth, helping India extract precious dividend from its young demography.

By prioritising women-led development and skilling millions in STEM and vocational trades, manufacturing has the potential to bridge urban-rural divides as well as slash inequality while elevating per capita incomes. The growing integration of services and manufacturing sectors will create diverse employment opportunities across the value chain developing value-added products and efficient service delivery, benefiting both urban and rural economies. Yet, making manufacturing count in the journey of Viksit Bharat is not easy.

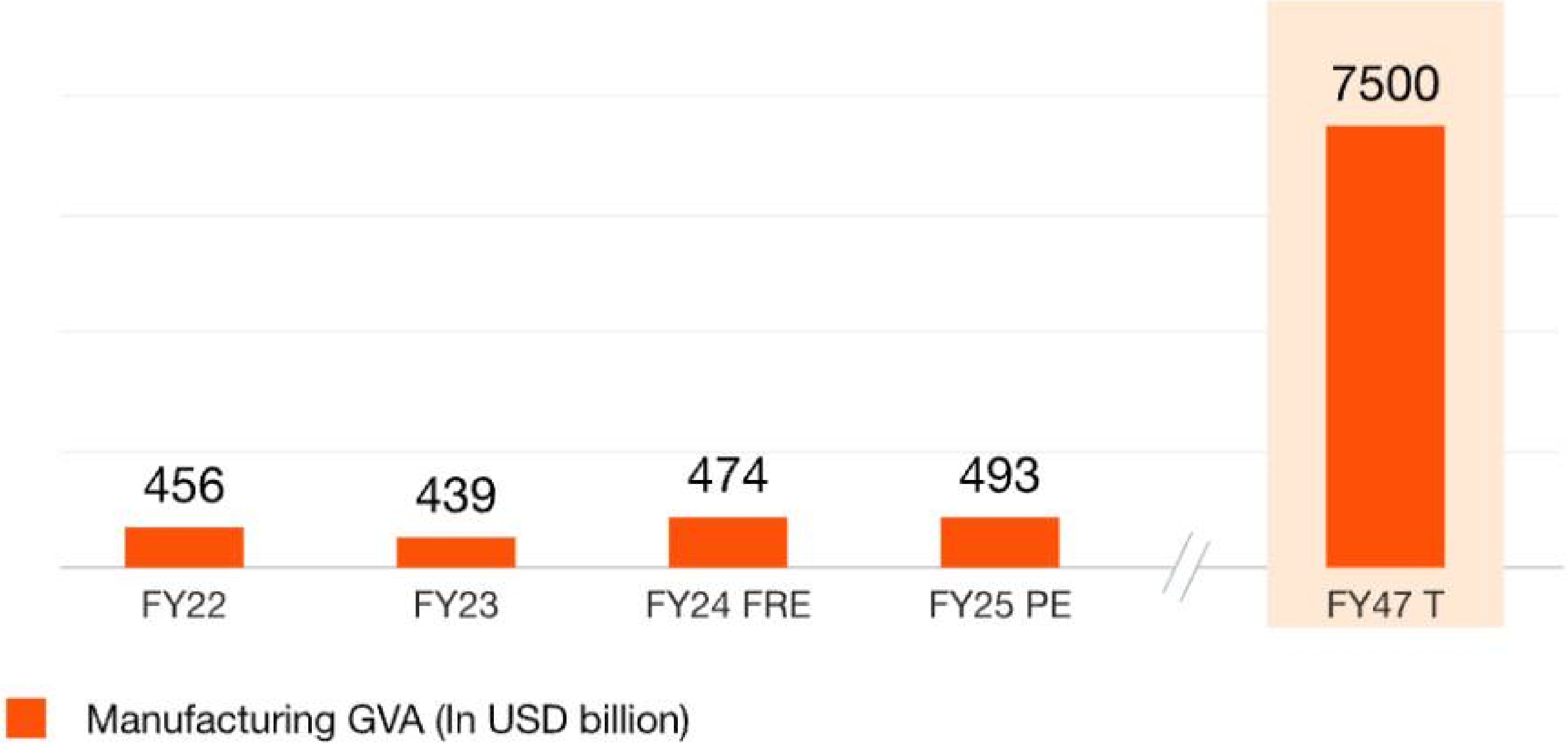
15x

Manufacturing growth

Calculations reveal that manufacturing must grow 15 times over the next 22 years to reach the aspirational target of contributing 25% to India's projected USD 30-35 trillion economy by 2047.

(See Figure 6)

Figure 6: India's expected manufacturing growth in a Viksit Bharat scenario: FY25-FY47



Source: PwC analysis
Notes: FRE: First revised estimates | PE: Provisional estimates | T: Targeted | All figures cited are on a nominal basis

To drive equitable growth within these sectors with AI, relevant stakeholders within the ecosystem would need think globally, act locally.

Applied to AI, thinking globally means grounding systems in shared principles such as:

- Safety
- Fairness
- Transparency
- Accountability

since AI's effects do not stop at borders. Acting locally implies deploying them in ways that respect local laws, languages, cultures, and socio-economic needs.

Thus, the journey could begin with building sandboxes factoring in the above-mentioned Indian conditions.

Sandboxing for AI-driven growth

AI sandboxes become critical because they help mitigate the risks, accelerate experimentation, and bridge the gap between research and real-world deployment.

A sandbox is a framework that provides a structured and safe environment for developing, testing, validating, and refining solutions and applications using real-world data and regulatory guidance and oversight.

01 Developing

02 Testing

03 Validating

04 Refining

Sandboxing in India

1 India's health ministry has also been using sandboxes under the Ayushman Bharat Digital Mission, for the testing and creation of software services and products integrated with Ayushman Bharat Health Account (ABHA) services. The National Digital Health Mission Sandbox framework has been used to test solutions for the Health Claims Exchange.[28]

2 NEP2020 enabled the creation of the National Educational Technology Forum where all stakeholders in the education sector can test Edtech products in a sandbox environment.[29]

3 The National Urban Digital Mission provides for a multi-functional sandbox intended to serve the innovation needs of the urban development sector in an integrated manner.

4 The Ministry of Electronics and Information Technology (MeitY) has set up the Open Government Data (OGD) platform, which provides access to government data for public use and includes a sandbox environment (sandbox.data.gov.in) for testing and development.[30]

The Union government is attempting to democratise AI development in India by providing access to essential resources within a secure environment.

One of the IndiaAI Mission's pillars, the dataset portal, AIKosh, provides a repository of datasets, models and use cases to enable AI innovation. It also features AI sandbox capabilities through an integrated development environment (IDE), along with tools and tutorials.

Several states have also been experimenting with AI sandboxes.

1 Karnataka	The Karnataka Innovation Authority Act provides for the creation of regulatory sandboxes in Karnataka for the testing of innovative technologies under relaxed regulatory requirements in a safe and controlled environment.[31]
2 Maharashtra	The Government of Maharashtra has launched the MahaAgri-AI Policy 2025–2029, with the objective of integrating AI, GenAI, and emerging technologies in the agriculture sector. The policy aims to create a shared DPI, featuring, among other things, an AI sandbox environment, providing a virtual testing ground for solutions.[32]
3 Gujarat	The Government of Gujarat has partnered with an American tech company to establish an AI Cluster in GIFT City, intended to support AI literacy initiatives and give colleges access to resources such as an AI sandbox.[33]
4 Tamil Nadu	An AI sandbox is a key component of Tamil Nadu's 'Safe and Ethical Artificial Intelligence Policy 2020', intended to encourage grassroots innovation and provide a testing ground for AI applications.[34]

As more AI sandboxes get built across these five sectors, it is imperative to adopt an integrated approach that connects them, to ensure that the solutions aren't fragmented and pointillistic. This approach is detailed in the next chapter of this report.

03

3A2I: A systems approach

for scalable, equitable, responsible AI

3A2I: A systems approach Pg 22

Key stakeholders Pg 24

3A2I: A systems approach

Too often, AI is deployed in silos or applied to isolated stages of a pilot, rather than being seamlessly integrated end-to-end across the value chain.

This fragmented approach limits impact, confining benefits to narrow pockets and preventing AI from functioning as a continuous learning system.

Scaling AI for development has its challenges. Lack of skilled professionals and limitations of AI tools are keeping a majority of Indian companies from scaling AI.[35]

President of India, Droupadi Murmu, underscored AI's growing role in boosting GDP, job creation, and productivity in the years ahead. She insisted, though, that the true measure of success lies in ensuring that AI's benefits reach all sections of society, especially those less fortunate.[36]

The fact is that AI cannot adapt or improve at scale without strong feedback loops. Hence, the answer lies in a systemic approach to AI deployment.

Embedding intelligence consistently across every phase of the use-case lifecycle creates a connected "central nervous system" for AI, one that learns continuously, adapts in real time, and remains aligned with human values and societal priorities.

Our 3A2I framework is guided by a simple principle: AI must be exposed to diverse environments and datasets and embedded within an architecture that integrates AI across all touchpoints.

The 3A2I framework comprises two dimensions:

01

Foundation

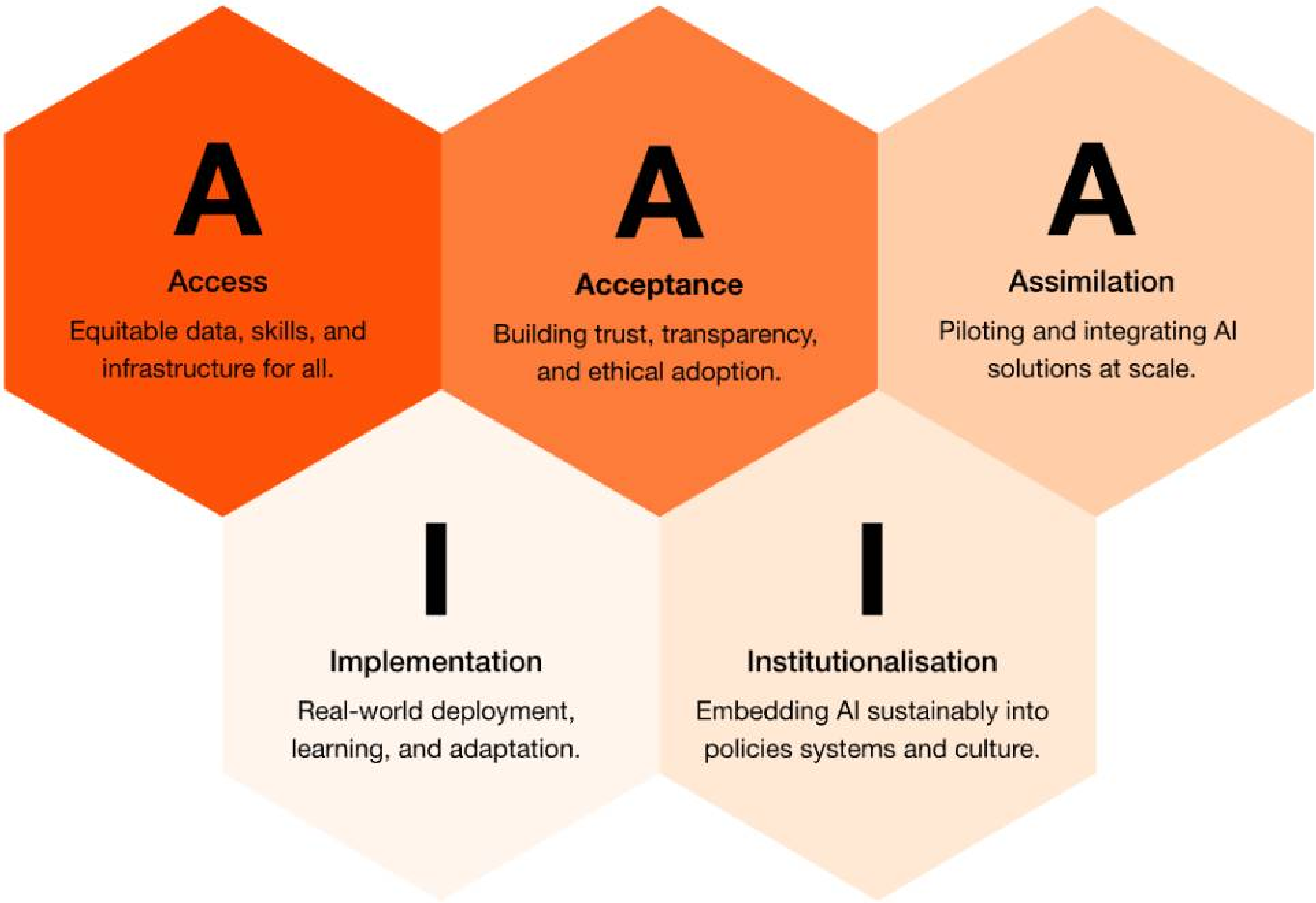
Access, acceptance, and assimilation, which represent the 3As, create the base for AI systems to learn continuously and responsibly, earn societal trust, and absorb insights and experiences across sectors.

02

Pathways to success

Implementation and institutionalisation (2I) enable practical, scalable deployment, and long-term integration of AI-driven initiatives into enduring systems.

Figure 7: The 3A2I framework


A
Access
Equitable data, skills, and infrastructure for all.
A
Acceptance
Building trust, transparency, and ethical adoption.
A
Assimilation
Piloting and integrating AI solutions at scale.
I
Implementation
Real-world deployment, learning, and adaptation.
I
Institutionalisation
Embedding AI sustainably into policies systems and culture.

A	**Access**	Access refers to providing all sectors and stakeholders with the essential resources needed to harness AI effectively. These include the availability of quality data, advanced technology, robust digital infrastructure, and a skilled workforce. Ensuring equitable access means bridging digital divides, extending connectivity to rural and underserved areas, and equipping institutions and individuals with the tools and talent necessary to build AI solutions.
A	**Acceptance**	Acceptance is about cultivating trust and encouraging positive engagement with AI innovations within communities, organisations, and among end-users. It involves addressing concerns related to data privacy, ethical use, and potential biases in AI systems while promoting transparency and inclusivity.
A	**Assimilation**	Assimilation focuses on integrating knowledge, expertise, and collaborative partnerships to develop and pilot AI applications that are relevant and effective. Efficient assimilation allows stakeholders to adapt proven pilots at scale, accelerating innovation diffusion, and ensuring that AI solutions are both contextually appropriate and scalable, thereby maximising impact.
I	**Implementation**	Implementation emphasises the practical deployment of AI solutions with minimal friction. It requires reducing regulatory hurdles, streamlining approval processes, and enabling agile methodologies that promote continuous testing, learning, and iteration. Effective implementation also involves monitoring performance, managing risks, and adapting systems rapidly in response to real-world feedback.
I	**Institutionalisation**	Institutionalisation is about embedding AI-driven initiatives sustainably within organisational structures, policies, and cultures. This includes establishing governance frameworks, ethical standards, and accountability mechanisms that ensure AI applications remain reliable, responsible, and aligned with long-term goals. Institutionalisation guarantees continuity beyond initial pilots or projects, fostering ongoing innovation, capacity building, and resilience within systems and communities.

Key stakeholders

Strengthening these building blocks demands active collaboration among three key stakeholder groups: the government, civil society, and business, with each contributing in ways that align with its unique strengths and capabilities.

Government

The government serves primarily as an enabler, exerting its greatest influence on ensuring access and fostering acceptance.

This includes making strategic investments in digital infrastructure such as broadband networks, AI-enabled cloud platforms, and open data ecosystems, accessible across regions and communities, thereby expanding the environment for AI systems to learn and evolve. In addition, the government establishes clear policies and regulatory frameworks to safeguard privacy, prevent bias, and promote ethical AI use, creating a foundation of trust for sustained deployment.

It also plays a pivotal role in advancing AI development by funding research initiatives, supporting pilot projects, setting technical standards, and streamlining regulatory processes to accelerate the transition from experimentation to scalable solutions.

Civil society

Civil society, comprising NGOs, multilaterals, research institutions, academia, and think tanks, acts as a facilitator supporting the government.

This diverse coalition plays a pivotal role at the intersection of acceptance and assimilation. It connects governments, businesses, and communities by engaging end-users, promoting AI literacy, addressing ethical concerns, and building trust. Civil society leads the design and piloting of AI solutions in varied social and cultural contexts, ensuring initiatives remain ethical, relevant, and inclusive, particularly for marginalised groups. By enabling AI to operate in diverse environments, it helps models learn under different conditions, improving their robustness.

Additionally, civil society fosters multi-sector partnerships, drives knowledge sharing, and monitors social impacts to ensure continuous improvement in AI's learning and adoption, accelerating its assimilation into society.

Business/private sector

Business/private sector assumes the role of monetiser/commercialiser, driving efforts in implementation and institutionalisation.

Building on the access and trust established by the government and civil society, businesses develop scalable AI solutions tailored to market and user needs. They are responsible for rapidly deploying these technologies and allowing them to mature in real-world environments, iterating based on continuous user feedback, and managing associated risks effectively.

Beyond innovation, businesses embed AI deeply within organisational structures, culture, and governance frameworks to ensure long-term sustainability and ethical stewardship. They also carry the responsibility of enabling inclusive growth, scaling AI benefits responsibly, so they are widely shared across society rather than concentrated among narrow interests.

Synergistic ecosystem

These elements cumulatively form the building blocks of a comprehensive, systemic model designed to build diverse learning environments and experiences. However, these blocks do not follow a rigid linear sequence. Rather, these stakeholders engage dynamically across all five building blocks, continuously providing feedback and adapting as needed.

Governments draw on insights from civil society and businesses to refine infrastructure, policies, and ethical standards. Civil society channels community perspectives and ethical considerations back to policymakers and commercial innovators. Businesses integrate regulatory guidance and societal feedback into product development and governance practices. This ongoing, iterative collaboration creates a resilient and responsive AI adoption ecosystem, capable of navigating evolving technological challenges and meeting social expectations.

Understanding the 3A2I framework in action

India’s AI journey has so far faced the universal challenge of translating fragmented successes into systemic transformation. Our 3A2I framework offers a structured approach to align capabilities, governance, and incentives, integrate AI learnings and expertise, and embed AI systematically across sectors. The following section demonstrates how this systemic approach addresses key challenges across five priority sectors, offering illustrative examples of how AI can help tackle major obstacles and drive sectoral improvement while ensuring equity.

Agriculture

Agriculture production decisions often suffer from a lack of alignment with real-time market demand.

This disconnect leads to unpredictable crop surpluses in some areas while shortages persist elsewhere, creating a cycle of excess waste, volatile prices, and suppressed incomes for farmers. Fragmented supply chains further limit farmers' access to efficient markets. This combination undermines not only individual livelihoods but also puts India's broader goals of food security, rural prosperity, and sustainable development at risk.

A strategic shift towards a demand-led agricultural model is essential for optimising India's agricultural productivity and economic outcomes. In this system, farmers have access to accurate, real-time market demand information, enabling them to make data-driven decisions regarding crop selection and production schedules that closely correspond with consumer requirements.

Concurrently, integrated and intelligent supply chains efficiently coordinate aggregation, storage, grading, and distribution, minimising post-harvest losses and stabilising prices. AI acts as the foundational technology, providing predictive analytics for demand forecasting, precision advisories, market price discovery, and supply chain optimisation. The following roadmap lays down the key steps necessary to enable a demand-led agricultural model powered by AI.

Phased roadmap based on 3A2I framework

Phase 1

Building the foundation

This phase would involve building unified digital platforms that consolidate unique farmer identifiers, geo-referenced plot data, crop details, and market information. Contract farming and direct market linkage platforms along with digital agri-services hubs managed by farmer producer organisations and cooperatives would be integrated onto this platform. The existing Electronic National Agriculture Market should be made interoperable across various mandis and direct market channels, facilitating transparent, real-time price discovery.

Recommendations

- The government could focus on integrating existing interoperable digital platforms and upgrading market systems in collaboration with state and central agricultural agencies. AI could be used to clean, standardise, and reconcile data from multiple government platforms (e.g., land records, crop insurance, mandi prices, weather, soil health). AI-based entity matching could be carried out to correctly link farmer identities, land parcels, and schemes across central and state systems.
- Involving businesses at this stage would be critical to ensure that these platforms become monetisable when fully integrated.
- Civil society actors such as farmer producer organisations, cooperatives, agricultural extension networks, NGOs specialising in digital literacy, and rural entrepreneurs would play a critical role in ensuring farmers' access to these digital platforms at the last mile. This is by facilitating participation, promoting data collection, and providing the capacity building necessary for the effective adoption of new technologies.

Phase 2

Piloting the solution

During this phase, the unified digital platform would be deployed in pilot settings and rigorously tested. Quality-linked market infrastructure and traceability protocols would likewise need to be piloted in partnership with farmers and buyer groups, including businesses. Intelligent demand-forecasting and logistics solutions, driven by data from the integrated digital platform, would be tested across diverse operating conditions.

In parallel, AI-enabled advisory tools and demand-forecasting capabilities, supported by phygital last-mile service networks, would need to be established. This approach would combine digital advisories with trusted local intermediaries, ensuring farmers receive timely, practical, and actionable market insights.

Recommendations

- The government should establish a National Agricultural Data Authority responsible for quality, privacy, and equitable accessibility of agricultural data and provide continued support and oversight for its operations.
- The government in collaboration with multilateral agencies and tech firms could continue strengthening the agricultural data infrastructure and explore intelligent methods to keep cleaning and curating the data.
- Businesses and startups in collaboration with the government could start piloting data-monetisation projects and demand as well as supply forecasting models on a crop-wise basis using machine learning models and intelligent tools including agentic AI.
- Towards enabling participation of farmers, trading communities and other stakeholders in the pilots, civil society organisations and academia could be roped in to create multilingual educational materials developed using GenAI.

Phase 3

Scaling and institutionalisation

Integrating lessons from the AI pilots and tests conducted with the integrated platform, and demand-supply infrastructure, this phase would focus on implementing these across different regions, crops, farmer groups. In this stage, conscious efforts should be made to start monetising the system created towards getting a return on investments made.

AI-driven analysis could be employed to differentiate correlation from true impact, refining which features to prioritise for scaling. AI models could be developed to automatically customise roll-out plans by region and crop, considering agro-climatic conditions, infrastructure, and digital readiness. Additionally, AI-based predictive models could estimate revenue potential across various user segments and dynamically adjust business models such as subscriptions, transaction fees, and data products in real time to optimise monetisation and sustainable growth.

Recommendations

- The government in collaboration with businesses could focus on commercial deployment and market-driven scaling of AI-powered demand and supply side services built using the AI-maintained datasets on the integrated platform.
- Suitable policy measures could be institutionalised to ensure that demand-supply solutions based on AI are responsive to evolving market dynamics and stakeholder needs.

- It is important to ensure that the platform and AI tools are supported by a robust feedback mechanism so that they keep learning from real-world situations.
- AI-driven dashboards could be built to assess the performance of the initiative as well as the commercial impact of the solutions based on the same for both beneficiaries and services suppliers.

An integrated financing strategy is vital for implementing the roadmap for transitioning Indian agriculture into a demand-led, AI-powered ecosystem.

The public sector could lay the foundation through budgets from flagship programmes such as the Digital Agriculture Mission and rural connectivity initiatives to build infrastructure, unified data platforms, and extension services. These efforts could be supplemented by technical assistance and grants from international donors to accelerate pilots and capacity building. Blended finance models with government-backed first-loss guarantees would attract private seed and angel investments in AI-driven AgriTech startups.

As the system matures, impact investors, catalytic capital providers, and development finance institutions would provide growth capital to scale AI-enabled services and marketplaces. Public-private partnerships would pool resources to develop and maintain physical infrastructure like storage, testing labs, and logistics, backed by matching grants. In the long term, combined financing from development banks, climate and sovereign wealth funds, and private impact investors would support frontier innovations and institutional capacity.

3A2I at work

This roadmap exemplifies the principles of our 3A2I framework by systematically addressing each of its foundational pillars and pathways to success. It ensures access by building interoperable digital infrastructure and establishing the National Agricultural Data Authority, thus democratising data and technology availability for all stakeholders.

The focus on developing transparent, inclusive markets and phygital service networks fosters acceptance, engaging farmers and broader communities with ethical data practices and trust-building measures. Through scalable and integrated advisory platforms, the roadmap emphasises assimilation, embedding AI solutions seamlessly into existing workflows and socio-economic contexts of smallholder farmers.

Finally, by institutionalising governance through data authorities, regulatory oversight, and outcome-based market incentives, the roadmap secures institutionalisation, ensuring sustainable and accountable integration of AI into India's agricultural systems. Together, these elements form resilient feedback loops that enable continuous learning and refinement, harmonising innovation with societal priorities.

The phased approach to technology pilots, AI-driven forecasting, and scalable market linkages drives the implementation of practical, adaptive AI tools integrated with policy frameworks for real-time responsiveness.

Education

India’s skilling ecosystem is at the brink of an opportunity to transform the nation’s workforce into a future-ready one, prepared for a technology-driven economy.

In its current form, despite multiple initiatives, improvements in access, and increased enrollment, foundational skill gaps persist, and pathways remain misaligned with labour market needs. Continuous upskilling, while necessary, is often inaccessible or not feasible.[37]

Consequently, employability is low, productivity suffers, and firms bear high retraining costs. The Economic Survey 2023-24[38] noted that only 51.25% of graduates were employable, while the Economic Survey 2024-25[39] revealed that over 53% of graduates and 44% of postgraduates are employed in "elementary" or "semi-skilled" jobs, not justifying their education. It added that only 8.25% of graduates are employed in roles matching their educational qualifications.

What India needs to do now is move to a skilling system that embraces quality over quantity, focuses on outcomes over enrolment, aligning curricula with market demand, ensures seamless movement from skilling pathways to meaningful employment, and enables lifelong learning. Guided by our 3A2I framework and using interoperable digital infrastructure, AI can drive this transformation through data collection and monitoring, real-time skills intelligence, seamless integration of inputs and feedback, and enablement of personalised learning.

Phased roadmap based on 3A2I framework

Phase 1

Building the foundation

This phase would concentrate on establishing the core digital and data-driven infrastructure needed to enable a competency-based, outcome-oriented skilling ecosystem in the country. A key priority is building an AI-enabled national database that aggregates skilling and learner information from across regions. Alongside this, an AI-powered platform would need to be developed to integrate student learning data, personalised learning pathways, labour-market intelligence, and credentialing frameworks.

AI could be used to gather data from across regions and sources—educational institutions, skills providers, businesses—and clean it, creating consistent and comparable skill profiles. Machine learning models could also be deployed to detect fraudulent or incomplete submissions, removing duplication and errors in the database. To this end, models could be trained to detect and verify submissions in real-time.

A National AI-Enabled Skills and Career Platform, leveraging and building on the existing initiatives such as Skill India Digital Hub and FutureSkills Prime, could serve as the core infrastructure for overhauling the skilling ecosystem. This platform would house the data and generate dynamic and personalised learning and career pathways, and become the foundation on which future credentialing, profile-matching, and monetisation could be carried out.

Civil society could use GenAI to run outreach campaigns to encourage participation in the foundational phase, increasing data submissions and capturing learner needs at scale. Alongside physical presence, deploying AI agents in more remote locations would help increase datasets and improve data quality and ensure that underserved groups in rural settings are represented in the database. Businesses could contribute by providing signals about emerging job roles, skill requirements, and demand patterns.

Recommendations

- The government could build the core digital platform and skills database, and use AI to clean, validate, and standardise data across regions.
- Businesses could contribute anonymised labour market data and identify emerging roles and skill needs.
- Civil society could use GenAI to support outreach campaigns, needs assessment, and learner onboarding.

Phase 2

Piloting the solution

In this phase, the integrated digital platform and AI models could be piloted in real-world settings, across selected regions and states. The AI-driven matching systems developed in Phase 1 would be tested to assess whether learners are being matched to the right skills, training programmes, and job roles. Models could be retrained based on outcomes and feedback from all sources.

Credentials would have to be stored securely, using blockchain technology in conjunction with AI, allowing learners in pilot states access to the database at any time, from anywhere. The infrastructure should also be enabled with multilingual access, increasing inclusion; further, it should be tested for automated data uploads, and correct data operations before large-scale rollout. This phase would also test how credentials and dashboards could later support monetisation models.

Businesses could participate by assessing learners integrated into the system for correct skill matching and feed learnings back into the AI model and overall system for retraining. Civil society could participate by sharing knowledge about best practices for job-skill matching, improving outcomes, and continuing to engage participants at the last mile.

Recommendations

- The government could pilot the infrastructure and models and monitor performance using AI-enabled dashboards; simultaneously, it could begin establishing data governance frameworks.
- Businesses could test candidates, share hiring feedback, and help retrain matching models.
- Civil society and academic institutions would need to support awareness, feedback collection, and trust-building during pilots.

Phase 3

Scaling and institutionalisation

This phase would scale successfully piloted models nationally and integrate them into education and labour market systems. Skilling modules could be enhanced at this stage, integrating AI into delivery and testing of skills.

Commercial deployment of the core infrastructure would include AI-driven job-matching platforms and AI models for accelerating data collection, supported by intelligent feedback mechanisms that enable continuous system learning. Education and skilling pathways would be continuously updated to align with transitions including AI adoption, green growth, and manufacturing.

Recommendations

- The government could focus on building and populating interoperable digital education and skilling platforms that can be embedded into the system.
- Businesses could scale AI-enabled learning and workforce platforms using subscription or outcome-linked models, strengthening job-readiness and productivity.
- Civil society organisations could act as trusted last-mile intermediaries, supporting learner outreach, contextualisation, and inclusion, using AI agents, dashboards, and monitoring systems to track learner outcomes, acceptance, uptake, and labour market impact.

To support the successful development and scaling of these AI-driven solutions, strategic partnerships and sustainable funding models would be essential.

Collaborative efforts involving multilateral partners and government agencies could provide critical financial backing during the platform testing and database development phases. Philanthropic and CSR capital could support outreach campaigns, and early pilots, particularly for underserved populations. As models mature, blended finance and private investment would flow into Edtech and AI-enabled skilling platforms. Over the long term, employer-funded lifelong learning models, performance-linked public incentives, and public–private partnerships would sustain scale and innovation.

3A2I at work

This roadmap operationalises our 3A2I framework by systematically addressing each pillar of successful adoption. Access is enabled through digital education infrastructure and skills platforms that democratise data and learning opportunities.

Assimilation is achieved by embedding AI-enabled learning, assessment, and career guidance into education and workforce systems. The phased pilots and feedback-driven scaling drive effective implementation, ensuring solutions remain responsive to real-world conditions.

Finally, by scaling these systems, unlocking effective fundings, and achieving full integration of these mechanisms and outcome-based accountabilities, the roadmap secures institutionalisation.

Energy

India's power sector is characterised by transmission and distribution infrastructure that drives high technical losses and operational inefficiencies.

Transmission capacity additions lag targets due to equipment shortages and regulatory hurdles, exacerbating grid congestion. Storage capacity remains insufficient to manage renewable variability effectively. Financially stressed DISCOMs are accumulating losses to the tune of USD 73-76 billion and enduring AT&C losses of around 16%.[40] With peak demand projected to rise from 250 GW in 2024 to 708 GW by 2047 and renewable capacity targets set at 500 GW by 2030, the lack of modern grid infrastructure and system flexibility threaten grid stability, growth, and universal energy access.

Addressing the financial distress of DISCOMs and the challenges of grid infrastructure requires a transformative, AI-driven approach to power sector modernisation. Real-time monitoring and advanced data analytics through AI are effective tools to optimise grid operations, enhance transmission and distribution efficiency, and reduce technical and commercial losses. Intelligent demand forecasting and dynamic balancing of renewable and conventional energy sources will improve grid stability and accommodate the growing share of renewables. Moreover, AI-powered predictive maintenance and automated anomaly detection will minimise outages and infrastructure failures.

Building on flagship initiatives such as the Revamped Distribution Sector Scheme (RDSS), Smart Meter National Programme (SMNP), Integrated Power Development Scheme (IPDS), PM-KUSUM, UDIT, and Carbon Credit Trading Scheme (CCTS), the roadmap sets a phased plan for transformation.

Phased roadmap based on 3A2I framework

Phase 1

Building the digital and AI foundation

This phase could prioritise enhancing the existing smart metering infrastructure deployed under the Revamped Distribution Sector Scheme (RDSS), which has sanctioned over 224 million smart consumer meters nationwide.[41] The focus would be on consolidating metering and billing data into unified, interoperable digital platforms enabling real-time consumption and grid performance monitoring. AI tools may be used in this phase for anomaly detection and data cleansing of early metering and grid data to ensure reliability and usability for advanced analytics.

In addition to consumer and distribution data consolidation, foundational data integration for transmission assets could be initiated. This would include digitising transmission project data, mapping right-of-way challenges, and capturing equipment inventories to prepare for AI-enabled project tracking, predictive maintenance, and optimisation tools planned for subsequent phases.

Early-stage capacity building should be initiated to prepare DISCOM personnel and regulators for AI integration. This includes the introduction of AI-based training simulations and decision-support tools designed to upskill staff and regulators, enhancing their readiness to adopt and manage emerging AI technologies effectively.

Recommendations

- The government could focus on strengthening RDSS implementation, coordinate with state DISCOMs to accelerate smart meter deployments, and begin digitising transmission asset data to support future AI tools.
- Businesses (DISCOMs, transmission operators, technology providers) should focus on data integration, piloting AI for loss reduction and demand forecasting, and initiating feasibility assessments for AI-enabled transmission project management.
- Workforce across the entire power transmission and distribution network should be taken into confidence about the measures being taken.

Phase 2

Scaling AI-driven operational efficiency and renewable integration

Building on the digital foundation, this phase could scale AI deployments to address key operational challenges. AI-powered grid congestion management and real-time monitoring should be expanded to reduce renewable curtailment and streamline dispatch. Complementary regulatory reforms would facilitate faster renewable evacuation. Efforts could accelerate storage commissioning aligned with tender processes and operational goals. This would be complemented with AI-driven optimisation of battery and pumped storage dispatch integration to enhance grid flexibility amid renewable variability.

Pilot projects employing AI applications would be launched across varied geographies and grid conditions to demonstrate impact and refine deployment strategies. Pilots could include the use of agentic AI technologies that would autonomously manage distributed energy resources such as rooftop solar, battery storage, and electric vehicle charging.

On the consumer front, AI-powered consumer engagement platforms would be deployed, providing personalised energy insights, outage alerts, and dynamic tariff recommendations, fostering active demand response participation.

Recommendations

- The government should incentivise widescale AI adoption for grid congestion relief, storage dispatch optimisation, thermal asset management, and streamline regulatory processes to support renewable integration. The government should also accelerate commissioning of battery and pumped storage assets aligned with operational targets.
- Businesses should deploy advanced AI tools for renewable dispatch management, storage coordination, and thermal asset optimisation.
- Business and the government could conduct joint workforce training programmes focused on managing modernised, AI-enabled grids and customer engagement platforms.
- Consumer organisations should be taken into confidence about the benefits of AI-managed grids and electricity-meters through publication of accessible, interactive materials and chatbots developed using GenAI and AI agents.

Phase 3

Institutionalising AI-enabled grid resilience and sustainable growth

Building on the successful pilots and scaled deployments from earlier stages, this phase would focus on expanding AI-driven solutions across the power sector. AI tools proven effective in optimising dispatch, predictive maintenance, and managing renewable, thermal, and storage assets would be scaled to ensure firm and reliable grid operations nationwide.

Multi-agency AI-coordinated platforms could be institutionalised to enhance real-time data sharing and collaboration among the Central Electricity Authority (CEA), DISCOMs, transmission operators, and regulators, enabling transparent and evidence-based decision-making.

Regulatory frameworks could incorporate continuous AI-based performance monitoring, tied to outcome-based incentives aligned with carbon reduction goals under the Carbon Credit Trading Scheme (CCTS). This phase would also deepen multi-stakeholder partnerships to promote equitable access, robust data governance, and ongoing capacity building.

Continuous feedback loops, informed by AI-driven metrics and stakeholder inputs, would support adaptive management and iterative refinement of technology and policy, ensuring the roadmap evolves in response to emerging challenges and sector priorities.

Recommendations

- The government could formalise AI-backed regulations for performance monitoring and asset management, expand financing for storage and grid upgrades, and foster partnerships to advance smart grid development.
- Businesses should fully integrate AI across grid operations, focusing on optimisation, innovation, and resilience to support a balanced energy mix.
- Multi-stakeholder bodies could oversee data governance, inclusivity, and capacity enhancement to maintain sustainable AI-driven energy systems.

A robust financing framework would be critical to driving the transformation of India's power sector into an AI-enabled, modern, and resilient energy ecosystem

The public sector could provide foundational support through flagship programmes such as RDSS, IPDS, and PM-KUSUM, focusing on smart metering, grid modernisation, and renewable integration. Technical assistance and grants from multilateral agencies and climate funds could accelerate AI pilots and capacity building. With banks showing renewed interest in lending to power sector and showing growing interest in technology providers, blended finance models with government-backed first-loss guarantees are well-positioned to attract significant early-stage private investments in AI-driven energy ventures.

As the sector matures, impact investors, development finance institutions, and catalytic capital providers could supply growth capital to scale AI platforms and distributed energy management. Public-private partnerships could mobilise resources for infrastructure upgrades, supported by matching grants and outcome-based incentives.

3A2I at work

This roadmap exemplifies the principles of our 3A2I framework by systematically addressing each of its foundational pillars and pathways to success. It ensures access by building interoperable digital infrastructure through programmes like the Smart Meter National Programme (SMNP) and the IPDS, thereby democratising data and AI-enabled technology availability for all energy stakeholders. The emphasis on transparent operations, consumer engagement platforms, early workforce engagement and equitable energy services fosters acceptance, engaging utilities, consumers, and communities with ethical data practices and trust building measures.

Through AI-driven forecasting, loss detection, and autonomous grid management tools integrated within DISCOMs' workflows, the roadmap promotes assimilation, embedding AI solutions into existing energy operations and regulatory frameworks.

The phased approach to pilot projects, AI-enabled demand-side management, and scalable renewable integration drives the implementation of adaptive, practical AI technologies supported by policy frameworks for responsive and efficient grid management.

Finally, by institutionalising governance through platforms like UDIT, regulatory oversight, and outcome-based financial incentives, this roadmap secures institutionalisation, ensuring sustainable and accountable integration of AI into India's power sector.

Manufacturing

MSMEs form the backbone of India’s economy, contributing significantly to employment, production, and exports.

However, they face immense challenges in accessing formal credit due to high-risk perceptions, lack of collateral, limited financial literacy, and complex regulatory frameworks. Banks often hesitate to lend to MSMEs owing to issues like high transaction costs, inadequate credit information, and perceived commercial unviability. Despite a gradual increase in the credit share for micro and small enterprises from 14% in September 2020 to 20% by September 2024, a vast majority of MSMEs continue to struggle with inadequate formal credit access, limiting their growth potential and overall economic contribution.[42]

A shift towards an AI-driven credit ecosystem could be a gamechanger for transforming credit access and financial inclusion for India’s MSMEs. In this system, MSMEs would benefit from comprehensive credit assessments powered by real-time data from tax records, payment histories, and supply chain activities, enabling lenders to offer tailored and timely credit solutions that match the specific needs and capacities of diverse enterprises.

Concurrently, integrated digital platforms and AI-enabled tools could streamline loan processing, risk management, and credit guarantee mechanisms, reducing delays and enhancing transparency.

AI could act as the foundational technology by delivering predictive analytics for creditworthiness evaluation, personalised loan offerings, and automated approvals, thus empowering MSMEs to access finance more efficiently and sustainably. Building on this foundation, the following phased roadmap outlines how AI-driven solutions can systematically enhance credit access for MSMEs across India.

Phased roadmap based on 3A2I framework

Phase 1

Building the foundation

This phase would focus on developing interoperable digital infrastructure that consolidates diverse data sources such as UDYAM and Udyam Assist registration portals, GST records, payment histories, and transactional data to establish comprehensive MSME credit profiles. AI would enhance data reliability and validation by efficiently identifying inconsistencies, correcting errors, and reconciling fragmented information through pattern learning and anomaly detection at scale. Co-creation of AI-powered credit platforms as digital public infrastructure would facilitate inclusive credit assessments.

Alongside, capacity-building initiatives targeting MSMEs could be launched to improve digital literacy and build trust in sharing accurate records, especially considering the informal nature of much of the MSME data.

Industry associations would play a vital role in encouraging MSMEs to participate actively and provide their records. Multilingual AI-enabled chatbots and assistants could support capacity-building by guiding MSMEs on how to maintain digital records, upload documents, and understand their credit profiles, thereby improving data quality over time. Partnerships among government agencies, FinTech firms, and academia would ensure ethical governance of AI systems and promote responsible credit risk evaluation.

Recommendations

- The government could focus on integrating existing digital MSME registries and financial databases while collaborating with FinTech firms and financial institutions to develop AI-driven credit assessment tools. Businesses should actively participate in co-developing innovative AI technologies and enable secure data-sharing agreements to support comprehensive credit profiling.
- Academia, civil society organisations, and regulatory institutions such as SIDBI should establish governance frameworks that ensure ethical, transparent AI use in MSME financing.
- Industry associations could lead multilingual credit literacy and awareness programmes to build MSME trust and encourage adoption of AI-enabled credit platforms.

Phase 2

Piloting and scaling AI-driven credit solutions

During this stage, AI-powered credit scoring models leveraging diverse data (including supply chain insights and order volumes) would need to be deployed and piloted across banks and NBFCs. The Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE)[43] would need enhancement with AI-enabled automation of risk evaluation to improve efficiency and transparency. Cluster-level digital centres equipped with AI sandboxes and localised training programmes will be established in key industrial zones to enable technology adoption among MSMEs.

Integration of digital identity frameworks (e.g., e-KYC) will streamline MSME onboarding, while shared AI-enabled service platforms offering planning, energy optimisation, quality tracking, and carbon reporting will be launched to reduce technological entry barriers.

Recommendations

- The government could pilot AI-powered credit scoring models and automate CGTMSE risk evaluation and claim settlement processes to improve efficiency and transparency. It could establish cluster-level digital innovation centres equipped with AI sandboxes and launch shared AI-enabled service platforms offering operational tools tailored for MSMEs.
- Non-banking financial companies and banks need to deploy AI underwriting platforms and develop localised training content to support MSMEs effectively using GenAI and chatbots.
- Civil society organisations could facilitate MSME participation in pilot programmes, provide local-language capacity-building initiatives, and advocate for responsible data handling and AI adoption.

Phase 3

Institutionalisation and continuous innovation

Building on the pilots, this phase would emphasise embedding AI credit assessment fully into lending systems, enabling sustainable and scalable MSME financing. Advanced AI-powered advisory services, such as chatbots and virtual assistants, could be deployed to guide MSMEs on financial management, compliance, and risk mitigation.

AI models would continually train and mature by analysing transaction patterns to detect fraud, identify early defaults, and flag high-risk borrowers ("lemons") enhancing the accuracy and reliability of credit decisions. AI and IoT-enabled insurance and risk solutions would be integrated to improve supply chain resilience and creditworthiness.

Additionally, efforts need to focus on democratising AI adoption through subsidies, cloud-based pay-as-you-go models, and targeted training, especially for micro, women-led, and underserved MSMEs. Transparent, real-time feedback loops involving stakeholders would support dynamic refinement of credit products and policies.

Recommendations

- Government agencies could institutionalise AI credit assessments within mainstream lending workflows and design subsidy and incentive programmes to encourage inclusive AI adoption among MSMEs.
- The government should support the integration of AI-enabled insurance and risk management products while enabling continuous, data-driven evaluation of policies and credit products.
- Businesses should deploy AI-powered virtual financial advisors and develop cloud-based pay-as-you-go AI tools to extend advanced credit services to diverse MSMEs.
- Financial institutions must integrate AI-IoT-based insurance offerings to strengthen MSME operational resilience and creditworthiness.
- Civil society and industry associations should organise ongoing training programmes targeting micro, women-led, and underserved MSMEs, while gathering and communicating stakeholder feedback to policymakers for product and policy refinement.

A comprehensive financing strategy emphasising coordinated public and multilateral support is essential, especially in the early stages.

Initial investments from government budgets and development partners would be critical for building interoperable digital infrastructure, enhancing data integration, and supporting large-scale capacity-building programmes for MSMEs and financial institutions. Multilateral agencies could provide technical assistance, grants, and concessional funding to accelerate pilot programmes targeting underserved regions and vulnerable MSME segments.

As AI-powered credit platforms mature and demonstrate effectiveness, public financial institutions such as SIDBI, banks, and NBFCs should progressively increase their funding through direct investments and on-lending frameworks incentivised by government-backed risk-sharing mechanisms such as the Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE).

Introducing innovative financing instruments such as outcome-based contracts, blended finance models, and priority sector lending norms adapted to AI-enabled credit solutions could attract private investment while mitigating risk. Sustained financing should also encompass ongoing model training, system maintenance, and adaptive policy evaluation to ensure resilience and scalability. This layered approach balances risk, encourages private sector participation, and promotes equitable and affordable credit access, ultimately fostering a robust, inclusive MSME financing ecosystem.

3A2I at work

This roadmap embodies our 3A2I framework by comprehensively addressing its key pillars to enhance MSME credit access through AI. It ensures access by building interoperable digital credit platforms that integrate diverse financial and alternative data sources, making sophisticated credit evaluation tools widely available to MSMEs and lenders alike.

By prioritising ethical AI governance, transparent credit processes, and multilingual literacy programmes, the roadmap builds acceptance to ensure active MSME participation in the digital financial ecosystem. Through shared AI service platforms, cluster-level digital centres, and localised training, the strategy emphasises assimilation, embedding AI-enabled credit and advisory solutions seamlessly into MSMEs' operational workflows and the broader financial network.

The phased deployment of AI-driven credit scoring, risk management, and real-time feedback loops underpins implementation, enabling continuous refinement of lending products and responsive policy adaptation. Lastly, institutionalisation is secured by embedding AI credit assessment into mainstream lending practices, supported by governance frameworks, subsidies, and inclusive incentives to sustain equitable and scalable MSME financing.

Together, these elements create dynamic learning ecosystems that align innovation with the diverse needs of MSMEs, driving inclusive growth and financial resilience.

Healthcare

Over 65% of India's population resides in rural areas, yet these regions have access to just about 30% of hospital beds and diagnostic facilities[44], resulting in significant delays in care and poor health outcomes.

A lack of integration between public and private providers further limits access to care providers, especially in rural and underserved areas. A wide urban-rural diagnostic divide limits access to essential imaging, pathology, and screening services, hindering early disease detection and continuity of care.

Deploying AI-powered telemedicine platforms and AI-enabled remote diagnostic units could bridge geographic barriers, optimise limited healthcare resources, and improve access to timely and quality care in remote areas. The following phased roadmap outlines how AI-driven solutions can effectively transform healthcare access and delivery in underserved and remote areas.

Phased roadmap based on 3A2I framework

Phase 1

Building the foundation

This phase would focus on addressing scarcity of services and fragmentation by integrating AI-enabled telemedicine platforms and mobile remote diagnostic units into rural healthcare systems. AI-powered telemedicine solutions could be embedded within existing national digital health platforms such as the national telemedicine platform, eSanjeevani, and leveraging the digital capabilities offered by the Ayushman Bharat Digital Mission (ABDM). These models could support automated symptom assessment, AI-driven triage and personalised care recommendations, reduce physician workload, and extend last mile care. Given infrastructure limitations such as unreliable internet and electricity in rural areas, the AI solutions' low-bandwidth and offline functionality would be critical to ensure accessibility and effectiveness.

Civil society organisations could play a key role by using AI-powered analytics to identify underserved areas and deploy AI-enabled digital health literacy and onboarding programmes. In parallel, businesses could develop AI models, chatbots, and voice assistants capable of identifying priority cases based on urgency and risks, routing patients to appropriate modes of care (self-care, teleconsultation, physical consultation/referral), and issuing recommendations based on patient history (accessed through ABHA IDs). Access would be driven by creating multilingual models capable of functioning in low-bandwidth settings.

Recommendations

- The government could integrate AI-driven triage and care recommendation tools within eSanjeevani to expand access and reduce provider burden.
- Civil society could enable targeted, last mile delivery, and support in onboarding citizens, using AI-powered multilingual chatbots and IVR systems tailored to underserved regions.
- Businesses should focus on developing and refining AI models for symptom assessment, triage, remote diagnostics, and decision support.

Phase 2

Piloting the solution

In this phase, AI-enabled tools could be piloted across diverse rural contexts to assess effectiveness, accuracy, and health outcomes. This phase would address fragmentation between public and private healthcare providers by integrating data and coordination mechanisms within the AI-enabled platforms to enhance continuity and quality of care.

Large-scale training programmes for healthcare providers on AI diagnostic and decision-support tools could be conducted. Businesses could develop and provide multilingual AI-powered chatbots and voice assistants integrated into government-led platforms like e-Sanjeevani, collaborating closely with government agencies during pilot implementations to ensure effectiveness and usability, especially for low-literacy and remote populations.

To ensure reliability and responsiveness to real-world conditions, models would need to undergo repeated testing and refinement using real-world data. Model performance could be assessed against predefined standards for triage accuracy, recommendation feasibility, turnaround times, and patient outcomes across geographies. Patient feedback could be integrated into the system directly through simple, multilingual post-interaction questions/surveys and grievance mechanisms. This feedback could be analysed using AI to zero in on recurring issues and retrain models for correction.

In consequent iterations, AI-enabled analytics could be used to identify aberrations in provider behaviour based on patient complaints; these, alongside human verification, can be used to create heatmaps and risk dashboards, enabling review of providers, healthcare workers, and hospitals. All this data can also be linked transparently to medical councils and regulatory bodies, ensuring that corrective action is taken and patients are not exploited.

Recommendations

- The government could support pilots in real-world contexts and monitors performance and adoption outcomes using AI-enabled dashboards.
- Civil society could enable peer learning, frontline workers training, and translate feedback from last mile healthcare workers.
- Businesses should pilot and refine multilingual AI models, chatbots, and voice assistants using real-world data.

Phase 3

Scaling and institutionalisation

Building on pilot learnings, this phase would focus on scaling AI-enabled care delivery and embedding it within real world healthcare operations, while testing models at scale. Businesses could scale AI-driven enhancements in telemedicine platforms, supported by continuous learning improvements of AI models based on real-world usage data and patient outcomes.

As AI-enabled care delivery would scale, customer-facing dashboards would be built in multiple languages, allowing patients to track consultations, referrals, prescriptions, and follow-up actions. GenAI could be used to translate medical information, instructions, and prescriptions.

Embedding AI-powered systems that analyse real-time data on user demographics, health needs, and economic status would enable personalised plans and targeted subsidies. This would support affordability while sustaining service delivery at scale.

Recommendations

- The government could enable embedding of AI-enabled solutions within healthcare workflows through governance frameworks and regulatory oversight mechanisms.
- Businesses could scale AI-enabled telehealth solutions and build multilingual customer-facing dashboards to support navigation and transparency at scale.
- Civil society could continue to keep last mile citizens engaged, increasing customer uptake, increasing monitoring to ensure systems remain effective, and continue training more workers.

Effective implementation of the healthcare roadmap outlined above requires a comprehensive and diversified financing strategy.

Early-stage funding could be supported through public investments and corporate social responsibility (CSR) contributions to pilot innovative AI-driven solutions and build foundational infrastructure. Multilateral agencies and development partners could provide technical assistance and grants to accelerate outreach in underserved areas. As AI-enabled healthcare initiatives demonstrate proven impact, attracting private sector investment, including venture capital, impact investors, and social enterprises would be essential to scaling telemedicine platforms, diagnostic tools, and advanced analytics.

Sustainable financing mechanisms such as outcome-based payments, subscription models, and public-private partnerships would ensure affordability and long-term viability. Targeted subsidies and incentives could further promote equitable access to quality care for vulnerable populations. This coordinated, phased financing approach would support a smooth progression from pilots to widespread institutional adoption.

3A2I at work

This roadmap operationalises our 3A2I framework by systematically addressing each pillar of successful adoption. Access is enabled by building AI-powered health data infrastructure and digital care platforms that expand reach through automated triage, multilingual interfaces, and low-bandwidth deployment. Acceptance is fostered through real-world pilots, transparent monitoring, and the integration of patient and provider feedback, building trust in AI-enabled care delivery. Assimilation is achieved by embedding AI tools directly into existing healthcare workflows. Phased pilots, continuous learning, and feedback-driven refinement ensure effective implementation, allowing systems to adapt to real-world usage and outcomes.

Finally, by institutionalising governance, monitoring mechanisms, and user-facing digital dashboards, the roadmap secures institutionalisation.

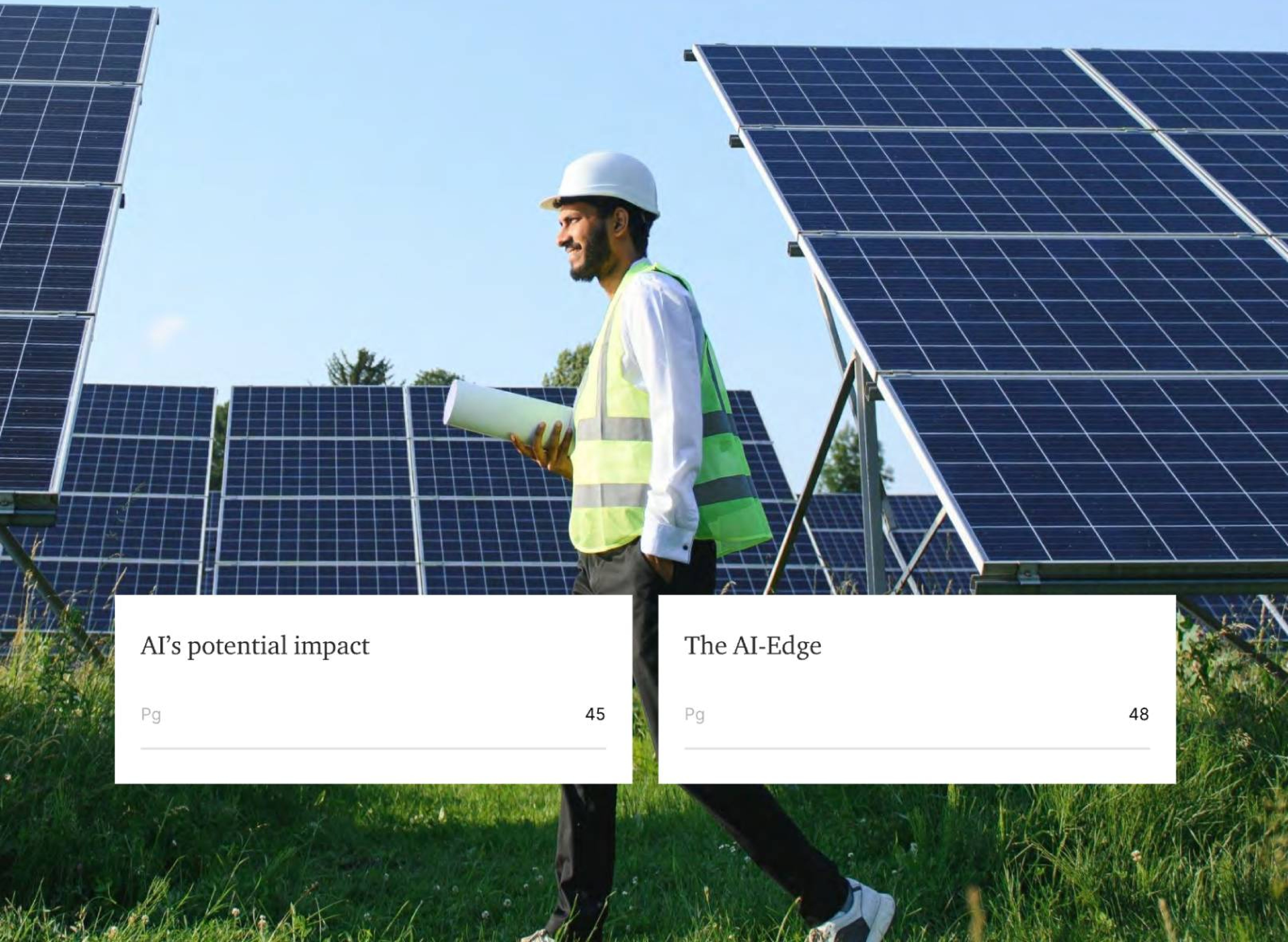
These five sector-specific roadmaps illustrate how the 3A2I framework moves from principle to practical application across varied contexts.

While each pathway differs in design and delivery, they share a common logic: expanding access, building acceptance, enabling assimilation of AI into systems, institutionalising adoption, and supporting effective implementation. Beyond addressing the critical challenges facing each sector, these pathways also demonstrate how AI can unlock efficiency gains—reducing bottlenecks that limit productivity, access, and outcomes—and better align service delivery with public needs.

The next chapter builds on this foundation to examine the economic impact of AI, quantifying potential productivity gains that can be realised when AI is deployed at scale using the 3A2I framework.

04

How AI can unlock economic value for India



AI’s potential impact Pg 45

The AI-Edge Pg 48

AI's potential impact

Our Value in Motion research reveals that AI has the potential to contribute between USD 550 billion to USD 607 billion to the five sectors - energy, education, agriculture, healthcare and manufacturing by 2035 at a nominal level.
(See Table 1)

Table 1: Potential contribution of AI to five sectors by 2035

Sector	% of total growth in 2035 due to AI	USD value potential of AI by 2035 at a nominal level
Agriculture	14.00%	139.3 – 153.9 billion
Education	28.50%	70.2 – 77.6 billion
Energy Utilities	40.50%	76.6 – 84.6 billion
Health	33.80%	29.1 – 32.1 billion
Manufacturing	19.20%	235.0 – 259.1 billion

We believe that AI's transformative potential could be unlocked with the 3A2I framework, and there is good reason for this claim. We examined AI use case pilots implemented across different parts of India within these five sectors integrating many of the 3A2I principles.

Consider these examples

Agriculture

The documented AI pilots across three major states were conducted through extensive collaboration among governments, farmers, startups and the private sector and focused on five major crops - rice, wheat, sugarcane, chilli, and cotton, representing staples, vegetables, and cash crops.

For example, computer vision assessed the chilli quality in a field, reducing waste and enhancing crop value. Farmers witnessed a 21% increase in plant growth per acre and 9% reduction in pesticide use and 5% in fertiliser use. This helped farming become more sustainable and resilient.[45]

Impact

Our calculations based on secondary data revealed that even a modest 2% digital penetration could unlock savings of USD 62.7 million per cycle across the five crops. At 25% adoption, savings could soar to USD 783.2 million.

Education

An AI platform, deployed across more than 44,000 schools in a northeastern state of India, using AI-powered facial recognition and geo-fencing to track attendance of students and teachers[46] helped real-time monitoring of students and teachers, leave requests, class mapping and transfers to enable the system to excel operationally.

By detecting fake enrolments and absenteeism, the AI initiative improved governance by ensuring accountability and data integrity and improving resource allocation.

Impact

According to our calculations, if similar AI-enabled accuracy and efficiency improvements were implemented nationwide, achieving even a 5% reduction of ghost students and teacher beneficiaries could save the country nearly USD 6.7 million. At a 25% rate of identification and reduction of ghost beneficiaries, potential savings could rise to approximately USD 33.7 million.

Energy

An AI-powered energy analytics initiative in one of the northern states flagged 136 potential theft cases[47] within a month. Rapid, accurate detection boosted booking rates to 57%,[48] reducing manual inspections and accelerating revenue recovery, making the system operationally more efficient.

Lower theft curbed excess power generation, particularly from fossil fuel sources, cutting emissions and promoting efficient energy use, thereby making the system more sustainable. Enhanced anomaly detection strengthened grid reliability, building greater resiliency within the system.

Impact

Our calculations indicate that scaling AI-based smart metering to a bare minimum, 25% of connections could save over USD 327 million, strengthening DISCOM cash flows, reducing debt, freeing up funds available for grid modernisation.

Healthcare

Deployment of AI-powered chest X-ray tools transformed TB detection; notification rates jumped from 67.8% to 90.14% in one of the largest states of India, accelerating treatment enrolment by three days and reducing dropouts.[49]

Faster, accurate detection reduced reporting delays and prioritised high-risk cases, enhancing the system's operational effectiveness. Governance improved, as AI-driven results uploaded to Ni-kshay portal enabled real-time monitoring, transparent resource allocation, and data-driven decisions. Early treatment lowered disease progression, transmission, and drug resistance, making patients more resilient.

Impact

As per our calculations, for tuberculosis, even a modest 5% increase in early detection cases could translate to savings of approximately USD 35.3 million per year, which could improve to nearly USD 176 million if the increase in early detection were to improve to 25%.

Manufacturing

A leading solar module manufacturer leveraging AI across stringing, inspection, lamination, and sorting set a national benchmark, delivering world-class quality at scale and advancing Aatmanirbhar Bharat and net-zero goals.[50]

AI-powered high-speed stringers, automated optical and EL inspections, EVA-laying robots, and real-time vision gates cut cycle times, and reduced defects, translating into improved operational efficiency and enhanced overall production performance. Real-time AI inspection helped detect microscopic defects, protecting downstream developers from failures and warranty claims-building better resiliency. As the system started automatically flagging AI-anomalies instantly, it reduced human override risks, ensuring compliance with Approved List of Models and Manufacturers (ALMM) and Bureau of Indian Standard (BIS) standards without manual paperwork.

Impact

Our calculations revealed that if AI-enabled production lines were to be used to build modules to produce 25% of 6GW—the incremental capacity of solar modules that India added during FY25—the resulting monetary savings could increase to USD 50.6 million.

The AI-Edge

As we see from the examples cited above, the 3A2I framework has the potential to help our nation edge ahead on five counts: operational excellence, sustainability, good governance, resilience, and financial discipline, the key components of what we call the AI-Edge framework.

The AI-Edge framework (See Figure 8) identifies five measurable outcomes achievable through scalable, sector-specific applications of AI technologies, quantifying the value AI can unlock.

Figure 8: The AI-Edge framework

01

Operational excellence

Optimising asset utilisation, improving ROI, and boosting quality and throughput for greater efficiency in service delivery and infrastructure.

02

Sustainability

Climate-friendly innovations and inclusive, localised solutions that ensure environmentally responsible and equitable growth tailored to diverse regional and community contexts.

03

Good governance

Enhancing transparency, accountability, and citizen participation to strengthen democratic processes and trust in AI-powered systems.

04

Resilience

Building robust systems through product and geographic diversification to withstand geopolitical risks and supply chain disruptions.

05

Financial discipline

Promoting better savings, financial independence, and prudent resource use to empower individuals and institutions economically.

This framework shifts the global AI conversation beyond pure innovation and efficiency to one that also prioritises societal value, climate responsibility and fiscal prudence.

For the Global South, it offers a practical blueprint for harnessing AI in a way that is inclusive and institutionally grounded. For advanced economies, it provides a fresh paradigm addressing rising concerns around AI's environmental footprint, ethical use and economic returns.

In doing so, the framework helps set new norms, such as judging algorithms not only by accuracy and speed, but also by how well they strengthen systems, safeguard the public interest and deliver durable, measurable value.

Epilogue

As AI rapidly changes how the world works and lives, India faces a unique moment to lead.

By tapping into AI’s transformative potential, India can pioneer a future where economic growth uplifts all communities and delivers on the vision of a Viksit Bharat that is developed, fair, inclusive, and equitable.

This report offers a focused lens on how AI can be systematically harnessed across five foundational sectors of agriculture, education, energy, healthcare, and manufacturing that are vital to India’s vision of a Viksit Bharat.

The proposed 3A2I framework, built around access, acceptance, assimilation, implementation, and institutionalisation, lays out a roadmap to unlock AI’s transformative potential responsibly and inclusively.

It highlights an estimated impact of USD 550-607 billion by 2035, reflecting not merely numbers but millions of lives improved through smarter, cleaner, and more efficient systems.

For us at PwC India, this framework is only the starting point of a much broader conversation. Realising the full promise of AI requires exploring additional dimensions beyond sector-specific applications, including the foundational enablers that will make this AI revolution sustainable and impactful.

The infrastructure underpinning AI

The digital backbone of India’s AI ecosystem must be robust, sovereign, and sustainable. Despite generating nearly 20% of the world’s data, India hosts only about 2% of global data centre capacity today.[51] Projected data centre capacity will increase five-fold to 8GW by 2030[52], raising urgent environmental concerns. Nearly half of India’s 476 GW power capacity remains thermal-based[53] and the water-intensive cooling needs exacerbate urban water stress.

Thus, it is important to explore ways to make expansion of AI infrastructure prioritise energy-efficient, renewable-powered solutions to ensure long-term environmental sustainability.

Financing is another key enabler for AI adoption

AI innovation is capital-intensive, spanning advanced data infrastructure, talent development, and regulatory compliance. Accessible and inclusive financing models are essential to empower startups, scale-ups, and research initiatives across India’s diverse innovation landscape. These models ensure that promising ideas translate into equitable economic opportunities.

The AI policy landscape demands equal attention

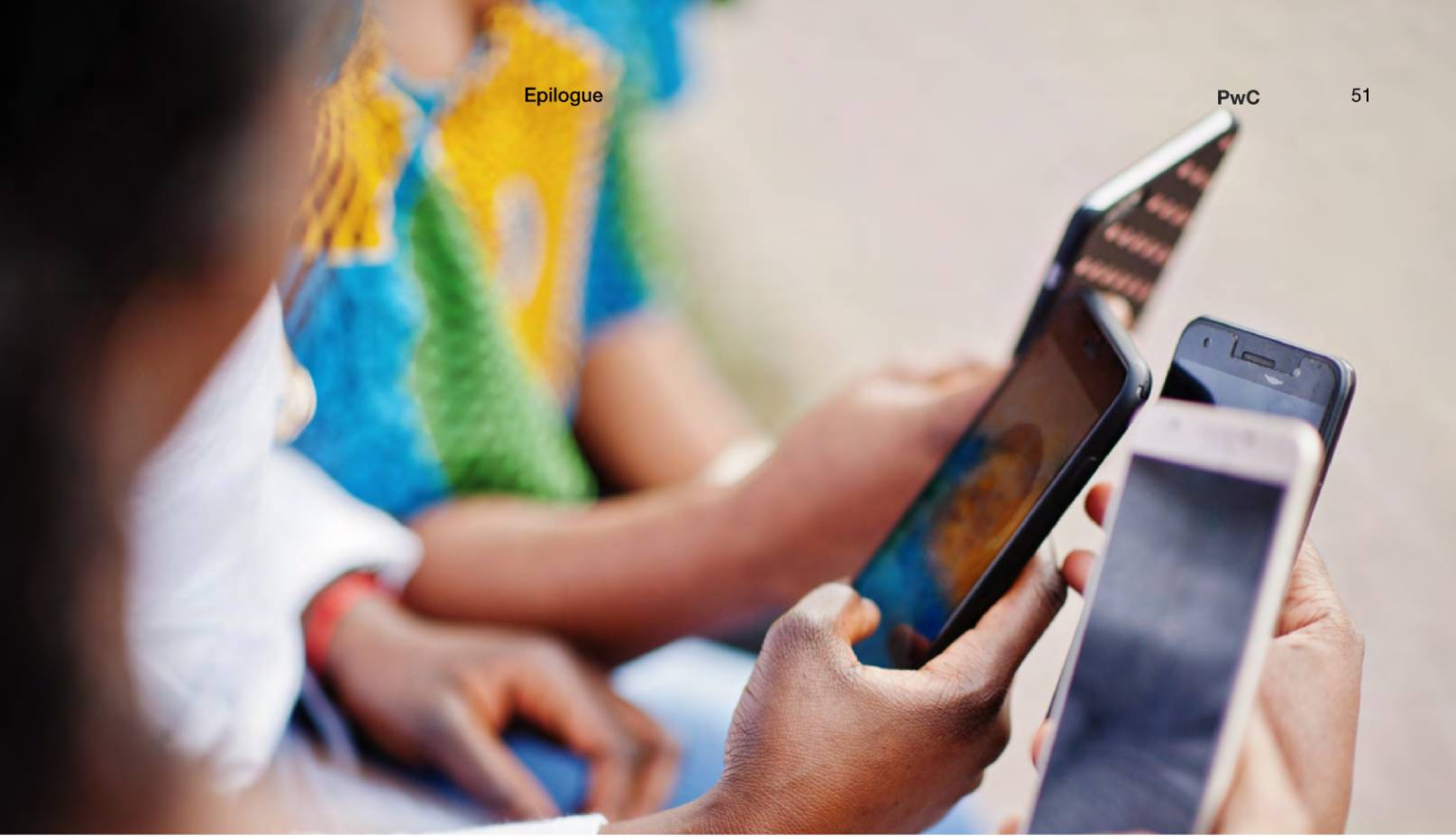
Beyond foundational AI governance that includes ethics, transparency, and data privacy, new regulatory challenges have emerged around AI’s impact on competition, copyright, and intellectual property.

A forward-looking and nuanced approach is required to balance fostering innovation with safeguarding fair market practices and creators’ rights. At PwC India, we recognise these complex dimensions and will continue to engage deeply with evolving policy frameworks to help shape a conducive environment for AI’s responsible growth.

Sectoral opportunities will continue to expand

As these foundational dimensions evolve, sectoral opportunities will continue to expand. While agriculture, education, energy, healthcare, and manufacturing remain central to India’s growth story, the services industry, which already contributes over half of India’s Gross Value Added, stands on the verge of transformation. AI-driven automation, personalisation, and innovation offer a chance to reimagine services by shifting from traditional labour arbitrage to differentiated, value-added models that broaden horizons for millions.

AI can accelerate this transition and foster a services ecosystem that creates higher value, better livelihoods, and global leadership in differentiated offerings. Even sectors such as hospitality, often overlooked as technology-light, reveal powerful potential. AI-enabled operational efficiency and personalised experiences can create jobs, stimulate inclusive growth, and bring digitally marginalised communities into India’s evolving prosperity narrative.



At PwC India, we see tremendous opportunity to deepen our understanding of these sectoral possibilities and how AI can unlock inclusive growth across India's diverse economy. As Nobel laureate Amartya Sen reminds us, development is fundamentally about expanding people's freedom and opportunities. In this light, AI must embody a deeper purpose. If AI can be extended to more people, it will increase their voice, expand economic opportunity, and advance equality. This clearly defines what AI must strive to achieve in India's journey. AI must be a technology that empowers every citizen, uplifts communities, and narrows divides.

As we stand at the crossroads, the choices we make about AI, how we build infrastructure, nurture talent, embrace innovation, and govern responsibly, will have consequences that extend far beyond GDP numbers. They will influence India's ability to unlock human potential, collapse the urban-rural divide, empower the marginalised, and foster harmony between development and sustainability.

In this vision of Viksit Bharat, AI becomes a catalyst for reimagining our future,

a future where economic prosperity goes hand-in-hand with equity, where technology respects tradition while charting new horizons, and where India's diverse voices unite in shaping an inclusive, resilient, and thriving society. By embracing AI thoughtfully and boldly, India can realise this promise and reaffirm its role as a beacon of innovation, opportunity, and shared progress for generations to come.

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