



Harnessing AI and New Energy for Economic Growth

For Prelims: [Artificial Intelligence \(AI\)](#), [Ethical AI](#), [Machine Learning](#), [Large Language Models](#), [Global Partnership on Artificial Intelligence](#), [Artificial Intelligence Mission](#)

For Mains: [Artificial Intelligence \(AI\)](#), [Viksit Bharat 2047](#), [AI Stack](#), [Data Colonization](#), [Data Sovereignty](#), [Digital Public Infrastructure \(DPI\)](#), [Production-Linked Incentives \(PLI\)](#), [FAME India Scheme](#)

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Why in News?

Over the last decade, **India's GDP has nearly doubled to USD 3.5 trillion**, reflecting its status as one of the world's fastest-growing major economies.

- To further enhance growth and competitiveness, **it is crucial to prioritise [Artificial Intelligence \(AI\)](#) and new energy technologies** that can transform the entire economy.

What Are the Key Emerging Sectors for India's Economic Growth?

- **Building India's Own AI Stack:** While India's economy has **digitised significantly**, its **compute penetration remains low**. Despite huge success in Information Technology (IT) services, they **represent just 1% of the USD 30 trillion global technology industry**.
 - On the other hand **global competitors like China have rapidly accelerated investments in AI**, pouring hundreds of billions into research, infrastructure and talent.
 - India's approach to AI must **leverage its core strengths across data**, compute and algorithms.
- **Data Colonisation:** It refers to the **control and exploitation of data resources** by foreign entities, raising concerns about [data sovereignty](#) and [national security](#). India **generates 20% of the world's data, yet 80% is stored offshore**, processed into AI and imported back in dollars.
 - **India must reverse this trend by leveraging its [Digital Public Infrastructure \(DPI\)](#) to create privacy-preserving datasets.**
 - India can build on its DPI success ([Unified Payments Interface \(UPI\)](#), [Unique Identification Authority of India \(UIDAI\)](#), [Open Network for Digital Commerce \(ONDC\)](#)) to create the world's largest open source AI, grounded in Indian ethos.
- **Compute Infrastructure:** In terms of compute infrastructure, India currently has only 1GW of data centre capacity, while the global capacity is 50GW.
 - By 2030, **projections indicate that the US will reach 70GW**, China will achieve 30GW, and **India will attain 5GW** if it continues on its current path.
 - To achieve AI leadership, **India needs rapid AI adoption**, data localisation norms, incentives for global computing companies, and [Production Linked Incentive \(PLI\) Schemes for data centres](#). Deploying 50GW by 2030 will require USD 200 billion in capital which is an ambitious but achievable goal.

- **India is the world's largest hub for silicon development** and design talent, yet it lacks Indian-designed chips. It **needs industry-led chip design projects and government incentives** through research linked incentive schemes.
- **R&D on Algorithms:** As AI research **becomes increasingly closed and proprietary**, India has a unique opportunity to become a **global champion of open innovation in AI** Research and Development (R&D).
 - India can achieve this **by attracting world-class talent and the best scientists to work in India**, providing industrial-scale resources for research and offering government incentives for AI R&D.
 - By **creating a globally leading open innovation platform for AI**, India can position itself at the forefront of AI advancement while ensuring that its values and perspectives shape the future of this transformative technology.
- **New Energy Supply Chains:** The new energy paradigm is **shifting from mining and refining of fossil fuels** to advanced material sciences, particularly for **critical minerals** like lithium. This transition is reshaping the global energy landscape, and India must position itself at the forefront of this revolution.

What are the Three Pillars of New Energy Ecosystem?

- The new energy ecosystem rests on three pillars:
 - **Renewable Energy (RE) Generation:** India's **RE** capacity has **grown from 72GW in 2014 to over 175GW in 2023**, with solar capacity rising from 3.8GW to more than 88GW.
 - However, **India still lagged behind global leaders**. In 2023, China deployed 215 GW of solar energy capacity, while India installed only 8 GW. To meet its 500 GW target by 2030, **India needs to significantly ramp up its focus on renewable energy deployment**.
 - **Battery Storage:** For renewable energy to be truly effective, **India must couple it with a robust battery storage solution**. Currently, its battery storage production capacity is only 2GWh, compared to China's 1,700GWh.
 - To power its RE grid and achieve 100% EV adoption, India needs to aim for 1,000GWh capacity. This significant increase in battery storage will not only support its RE goals but also **drive down costs and improve energy accessibility across the country**.
 - **EV Sector:** In the **EV sector**, India's current auto penetration is less than **200 vehicles per 1,000 people**, with 2 million EVs sold annually compared to China's 30 million.
 - **By 2030, India should aim to become the world's largest EV market**, potentially producing 50 million EVs.
 - This **shift will create a cleaner environment**, lower transport costs for consumers and reduce the economy's overall logistics expenses.
 - At present, 90% of the new energy ecosystem—encompassing solar production, lithium cell manufacturing, midstream processing, and EV production—is concentrated in China.
 - By building its own technologies and supply chains, **India can make its economy more energy-efficient** and create tens of millions of future-ready jobs.
 - This **transition will secure its energy independence** and position it as a key player in the global fight against climate change. India's path to global leadership lies in mastering these technologies of the future.

India's Initiatives Related to Emerging Sectors

- **Building India's Own AI Stack:**
 - [INDIAai](#)
 - [Global Partnership on Artificial Intelligence \(GPAI\)](#)
 - [US India Artificial Intelligence Initiative](#)
 - [Responsible Artificial Intelligence \(AI\) for Youth](#)

- [Artificial Intelligence Research, Analytics and Knowledge Assimilation Platform](#)
- [Artificial Intelligence Mission](#)
- **Data Colonisation:**
 - [Digital Personal Data Protection Bill, 2023](#)
 - [National Data Governance Framework](#)
- **Compute Infrastructure:**
 - [National Supercomputing Mission \(NSM\)](#)
 - Cloud Computing Initiatives like [Digilocker](#)
- **R&D on Algorithms:**
 - [5G Intelligent Village](#)
 - [Quantum Encryption Algorithm](#)
- **New Energy:**
 - [International Solar Alliance \(ISA\)](#)
 - [National Electric Mobility Mission Plan \(NEMMP\)](#)
 - [Production-Linked Incentives \(PLI\)](#)
 - [FAME India Scheme \(Faster Adoption and Manufacturing of Hybrid and Electric Vehicles\)](#)

What Are the Challenges and Potential Solutions in These Emerging Areas?

Challenges	Way Forward
Infrastructure Gap	<ul style="list-style-type: none"> ▪ Significant investment needed to upgrade compute infrastructure, particularly data centers. Development of indigenous chip technology is crucial for AI hardware.
Talent Acquisition and Retention	<ul style="list-style-type: none"> ▪ Creating an environment that nurtures AI talent domestically and incentivizes their return from overseas. Competing with global tech giants for skilled professionals.
Data Privacy and Security	<ul style="list-style-type: none"> ▪ Establishing robust data governance frameworks and building trust among citizens to effectively utilize vast amounts of data generated.
Financial Constraints	<ul style="list-style-type: none"> ▪ Mobilising public and private sector resources for large-scale projects aimed at building an AI stack and transitioning to a new energy economy.
Supply Chain Vulnerabilities	<ul style="list-style-type: none"> ▪ Building a resilient domestic supply chain for critical components like semiconductors and battery materials to reduce reliance on global supply chains and achieve self-reliance.
Policy and Regulatory Environment	<ul style="list-style-type: none"> ▪ Creating a conductive policy and regulatory environment for AI and new energy sectors that balances innovation with safety, security, and ethical considerations.
Technological Complexity	<ul style="list-style-type: none"> ▪ Continuous investment in research and development to stay updated with rapid technological advancements and develop

Conclusion

As India celebrates its **political freedom gained in 1947**, the **goal for 2047 should be to achieve technological freedom**. India must **develop a unique playbook for technological advancement**, addressing its specific challenges and leveraging its strengths, using technology not only for economic growth but also for societal transformation.

Drishti Mains Question:

Q. 'India is actively working to enhance its technological and infrastructural capabilities across several key sectors.' Comment.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q1. With the present state of development, Artificial Intelligence can effectively do which of the following? (2020)

1. Bring down electricity consumption in industrial units
2. Create meaningful short stories and songs
3. Disease diagnosis
4. Text-to-Speech Conversion
5. Wireless transmission of electrical energy

Select the correct answer using the code given below:

- (a) 1, 2, 3 and 5 only
- (b) 1, 3 and 4 only
- (c) 2, 4 and 5 only
- (d) 1, 2, 3, 4 and 5

Ans: (b)

Mains:

Q. What are the main socio-economic implications arising out of the development of IT industries in major cities of India? (2022)

Q. "The emergence of the Fourth Industrial Revolution (Digital Revolution) has initiated e-Governance as an integral part of government". Discuss. (2020)

growth

