Powering India's Economic and Energy Growth: A Sustainable Approach

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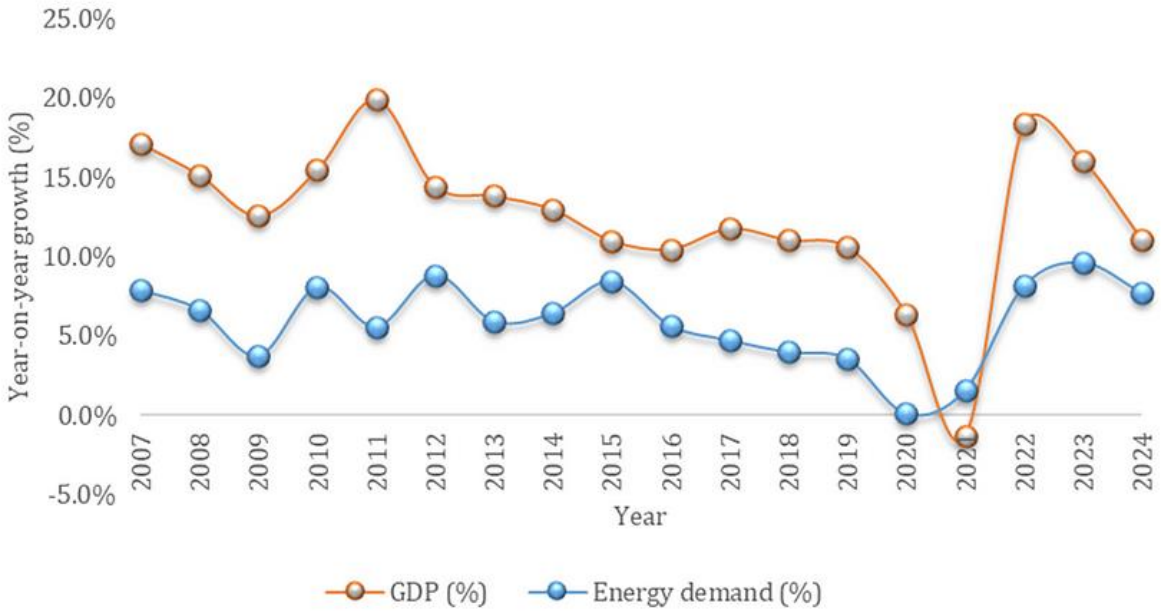
India, the fifth largest economy in the world, is ambitiously striving to achieve a USD 5-trillion economy in the near future, positioning itself among the top three global economies. This has been possible due to the remarkable growth in India's GDP over the past 18 years. As per NITI Aayog, India's GDP increased from INR 42.6 lakh crore in the financial year (FY) 2006–07 to INR 295.4 lakh crore in FY 2023–24. During the same time, India's energy demand also increased sharply from 6,24,495 million unit (MU) to 16,22,020 MU as per the Central Electricity Authority's load generation balance reports.

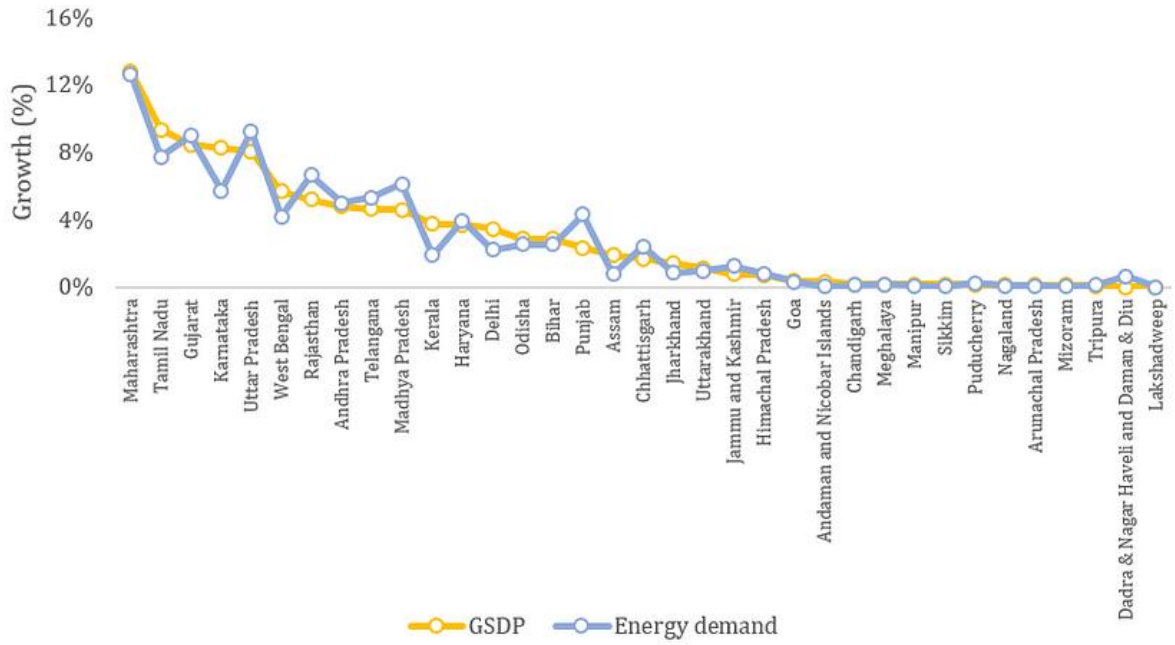


Parallel increase in GDP and energy demand from FY 2006–07 to FY 2023–24

The state scenario

As India is a diverse country with 28 states and 9 union territories, it becomes important to analyse the distinct economic performance and growth rate of Indian states. The gross state domestic product (GSDP) — a counterpart of GDP that is used at the national level — serves as a measure for this analysis.

Notably, similar to the parallel growth at the national level, states' GSDP rates are proportional to their energy demand. The figure below illustrates the contribution of each state's GSDP to India's GDP along with its corresponding share of energy demand in the country's total energy demand for FY 2023–24.

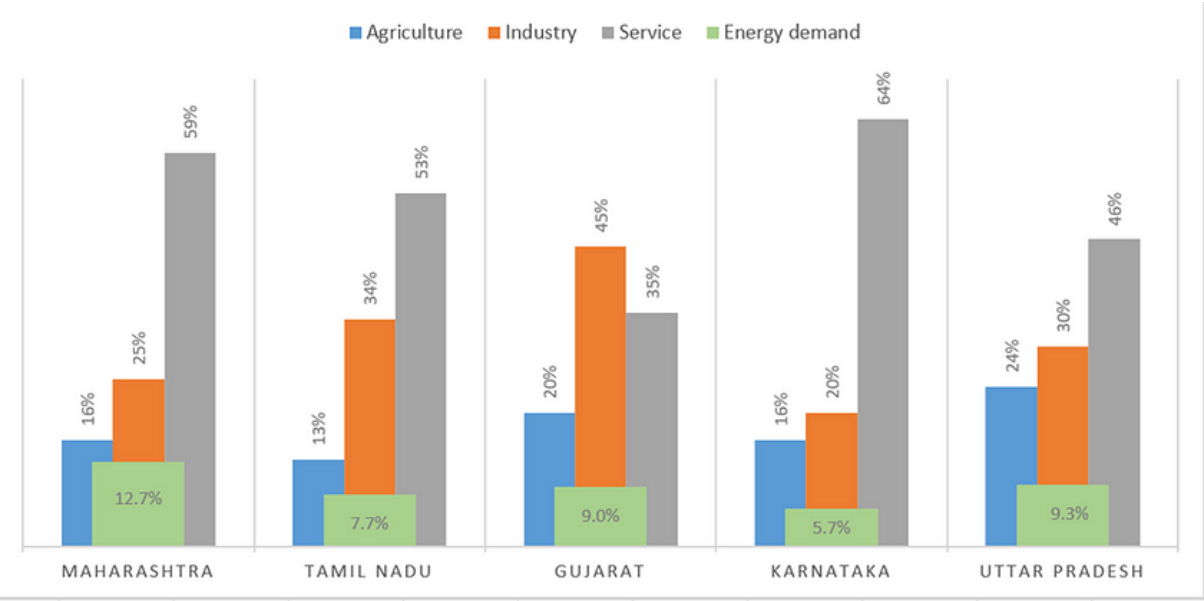


State-wise growth in GSDP and energy demand

The case of the top five GSDP states: Maharashtra, Tamil Nadu, Gujarat, Karnataka, and Uttar Pradesh

Each state, with its unique geography, demography, and climate, has distinct business activities that influence its economic growth and energy intensity. These activities can be broadly categorised under three sectors: services, industry, and agriculture. Consequently, a state's overall economic standing is defined by one or more of these sectors.

Among the top five GSDP states, Maharashtra has the highest GSDP and energy demand. In contrast, Tamil Nadu, despite having a higher GSDP share than Gujarat and Uttar Pradesh, has relatively lower energy demand. This could be due to the varying energy demand from different sectors. For example, the industrial sector is more energy-intensive than the agriculture and service sectors even when producing the same quantum of GDP. As shown in the figure below, Gujarat's industrial sector contributes the highest share (45%) to its GSDP, resulting in higher energy demand. However, in Tamil Nadu, the service sector contributes 53% to its GSDP, leading to lower energy demand compared with Gujarat. Similarly, Karnataka's service sector accounts for 64% of its GSDP, resulting in lower energy demand and higher GSDP than Uttar Pradesh, where high energy demand is driven by the agriculture sector, which contributes less to the state's GSDP.



Sector-wise contribution to GSDP for the top five states (Source: State of State Finances Report by PRS Legislative Research [Note: Percentages for Maharashtra, Gujarat, Karnataka, and Uttar Pradesh are as per FY 2022–23 data while that for Tamil Nadu is as per FY 2023–24 data])

Need for sustainable economic and energy growth

This parallel growth in the economy and energy demand at the national and state levels has come at the cost of significant environmental impacts as a major proportion of India's energy generation (55% of installed capacity in 2024) is from fossil fuels, contributing to increased greenhouse gas (GHG) emissions. On the other hand, in developed nations, growth in GDP and energy demand is independent of environmental effects owing to rising investments in renewable energy, nuclear generation, energy-efficient appliances, and enhanced transmission networks. Thus, India needs to adopt a holistic approach — by balancing the interconnected three Es: economy, energy, and environment — to support this growth sustainably.

State-wise solutions for sustainable economic and energy growth

To achieve sustainable growth, states such as Maharashtra, Tamil Nadu, and Karnataka — where the IT sector contributes majorly to the GSDP — should focus on adopting more energy-efficient appliances and renewable energy coupled with battery storage systems. Mandating corporate purchase of green energy obligations should also be explored.

In states such as Gujarat and Tamil Nadu, with a major industrial sector, flue-gas desulfurisation (FGD) units should be installed in all coal-fired power plants. The states should also comply with the retirement of old power plants. Procuring future power from upcoming nuclear power plants or setting up their own small modular reactors (SMRs) for low carbon intensity is advisable.

Further, agriculture-dominant states such as Uttar Pradesh should adopt star-rated appliances, solar agriculture feeders, and off-grid solar pumps; implement direct benefit transfers (DBTs) to avoid unnecessary energy usage; strengthen the distribution network; and ensure daytime supply through power purchase agreements (PPAs) for renewable energy.

Moving forward, states with higher GSDP should aggressively adopt emerging technologies through financial support and investments. This approach will create an environment conducive to achieving a win–win situation for both the states and the country.