



## Climate Resilient Industrial Sector

This editorial is based on “[Mixed signals: On data and the key industrial sectors](#)” which was published in The Hindu on 07/05/2024. The article brings into picture the impact of a heatwave on India's industrial output, highlighting slowdowns in key sectors and the resilience of coal and electricity generation.

**For Prelims:** [India's core sectors](#), [Heatwave](#), [e-commerce](#), [NPCI](#), [Food processing](#), [Tejas Light Combat Aircraft](#), [Production Linked Incentive \(PLI\) scheme](#), [Jan Dhan Yojana](#), [Cyclone Amphan](#), [United Nations Economic and Social Commission for Asia and the Pacific](#), [EU's Carbon Border Adjustment Mechanism](#), [Cyclone Nisarga](#).

**For Mains:** Sectors Driving India's Industrial Growth, Major Threats of Climate Change to India's Industrial Sector.

Recent data from May 2023 reveals a **slowdown in India's core sectors**, largely due to a severe [heatwave](#). While coal and electricity production saw growth due to increased cooling needs, other sectors like **crude oil, fertilizers, and cement experienced contractions**.

The heatwave particularly impacted construction activities in northern India, affecting cement and steel demand. Persistent weakness in fertilizer production signals ongoing challenges in the agricultural sector. By implementing strategic measures to make India's industrial sector resilient to the **impacts of climate change**, the nation can navigate future hurdles and build a more sustainable industrial base for **sustainable economic growth**.

### What are the Sectors Driving India's Industrial Growth?

- **Information Technology (IT) and IT-enabled Services:** The IT sector remains a cornerstone of India's economy, expected to reach **USD 350 billion in revenue by FY 2026**.
  - India's IT industry employs over **4.5 million people** and accounts for 8% of the country's GDP.
  - Notable developments include the rapid adoption of cloud services, with the **Indian Public Cloud Services (PCS) market likely** to reach USD 13.5 billion by 2026.
- **Renewable Energy:** As of December 2023, **India ranks 4th globally for the total renewable power capacity**.
  - The country aims to achieve 500 GW of renewable energy capacity by 2030.
  - Notable projects include the **world's largest solar park in Bhadla, Rajasthan**.
- **E-commerce and Digital Services:** Indian [e-commerce](#) is expected to grow at a compound annual growth rate (CAGR) of 27% to reach **USD 163 billion by 2026**.
  - The sector has been boosted by increasing internet penetration, over **820 million active internet users**.
  - Digital payments have seen explosive growth, in the calendar year 2022, UPI processed

over **74 billion transactions**, worth Rs 125.94 trillion ([NPCI](#)).

- Companies like **Flipkart and Amazon** have expanded their reach to tier 2 and 3 cities, driving further growth in the sector.
- **Food Processing:** India has a vast agricultural base, making it a natural hub for [food processing](#).
  - With rising incomes and urbanization, the demand for processed and packaged food is growing rapidly.
  - Companies like **ITC, Britannia Industries, and Nestle** are expanding their operations in this sector.
- **Aerospace and Defense:** India's aerospace and defense sector is rapidly expanding, with the government aiming to **achieve USD 25 billion** in [defense production](#) by **2025**.
  - The country has implemented policies to promote self-reliance, including the **ban on importing 101 defense items in 2020**.
  - Notable developments include the indigenous development of the [Tejas Light Combat Aircraft](#) and the successful test of the Agni-V.
- **Pharmaceuticals and Biotechnology:** India is the world's largest provider of generic medicines, accounting for **20% of global supply by volume**.
  - The pharmaceutical industry is expected to reach **USD 130 billion by 2030**.
  - The biotechnology sector is also growing rapidly, expected to reach **USD 150 billion by 2025**, with over **5,000 biotech startups** currently operating in the country.
- **Telecommunications:** The [Telecom industry in India](#) is the second largest in the world with a subscriber base of 1.091 billion as of April 2024.
  - The ongoing 5G rollout is expected to contribute **USD 450 billion to the Indian economy by 2040**.
- **Electric Vehicles (EVs):** [India's EV market](#) is projected to reach \$206 billion by 2030.
  - The government has implemented policies like [FAME II](#) to promote EV adoption, aiming for **30% of private cars to be electric by 2030**.
  - The country is also focusing on building charging infrastructure, with plans to install **69,000 charging stations** across national highways.
- **Textiles and Apparel:** India is the world's **sixth-largest exporter of textiles and apparel**, with the domestic apparel and textile industry contributing about 2.3% to the country's GDP, 13% to industrial production, and 12% to exports.
  - Recent initiatives like the [Production Linked Incentive \(PLI\) scheme](#) aim to boost manufacturing of man-made fiber apparel and technical textiles.
- **Fintech:** India's fintech market is projected to reach \$150 billion by 2025. The country has over **6,636 fintech startups**, with digital payments leading the sector.
  - The government's initiatives like [Jan Dhan Yojana](#) have promoted financial inclusion.

## What are the Recent Government Initiatives for the Growth of the Industrial Sector in India?

- [Production-Linked Incentive \(PLI\)](#)
- [PM Gati Shakti- National Master Plan](#)
- [Start-up India](#)
- [Make in India 2.0](#)
- [Atmanirbhar Bharat Campaign](#)
- [Special Economic Zones](#)
- [National Monetisation Pipeline](#)

## What are the Major Threats of Climate Change to India's Industrial Sector?

- **Water Scarcity and Stress:** 50% of districts in India could face 'severe' water scarcity by 2050. This threatens water-intensive industries like **textiles, power generation, and agriculture**.
  - A report by [NITI Aayog](#) suggests that water scarcity could cost India up to **6% of its GDP by 2050** if left unaddressed
- **Extreme Weather Events:** Increasing frequency and intensity of extreme weather events pose significant risks to industrial infrastructure and operations.

- Cyclones, floods, and heatwaves can disrupt supply chains, damage facilities, and halt production.
- [Cyclone Amphan of 2020](#) resulted in **USD 14 Billion** economic losses in India: UN report
- **Rising Temperatures:** Higher temperatures reduce worker productivity and increase cooling costs for industries.
  - India is expected to lose around **5.8% of daily working hours due to rising temperatures by 2030**, leading to erosion in productivity and lower collection of fiscal revenue. ([United Nations Economic and Social Commission for Asia and the Pacific](#))
- **Supply Chain Disruptions:** Climate change is increasing the vulnerability of global and local supply chains, posing a significant threat to India's industries.
  - Extreme weather events can **disrupt transportation networks**, damage storage facilities, and affect raw material availability.
  - The automobile sector, which relies heavily on just-in-time manufacturing, is particularly vulnerable.
- **Regulatory and Market Pressures:** Increasing global focus on climate action is leading to stricter regulations and changing market dynamics.
  - Industries face pressure to reduce their carbon footprint and adopt sustainable practices.
  - The [EU's Carbon Border Adjustment Mechanism](#), for instance, could significantly impact India's export-oriented industries like steel and chemicals.
- **Shifting Disease Patterns and Healthcare Industry:** Climate change is altering the geographic distribution and prevalence of various diseases.
  - This shift presents complex challenges for **India's pharmaceutical and healthcare industries**.
  - For instance, rising temperatures are expanding the range of vector-borne diseases like **malaria and dengue**.
  - This requires the healthcare sector to **rapidly adapt its research, drug development, and healthcare delivery systems**.
    - The pharmaceutical industry may need to reallocate resources to develop new treatments and vaccines, potentially disrupting existing business models.
- **Climate-Induced Migration and Labor Market Disruptions:** Climate change is expected to trigger significant [internal migration in India](#).
  - This mass movement poses challenges for industries in both origin and destination areas.
  - Rural industries may face labor shortages, while urban industries could struggle with rapid population influx, potentially leading to social tensions and pressure on urban infrastructure.
- **Changing Atmospheric Chemistry and Industrial Processes:** Increasing CO2 levels and changing atmospheric composition due to climate change can directly impact certain industrial processes.
  - For example, the cement industry, which **contributes about 8% to India's CO2 emissions**, may face challenges in cement curing processes as higher CO2 levels can affect concrete strength and durability.
  - Similarly, the chemical industry may need to adapt synthesis processes that are sensitive to temperature and humidity changes.
    - These subtle changes could necessitate significant R&D investments and process modifications across various manufacturing sectors.
- **Coastal Industrial Corridors at Risk:** India's major industrial corridors along the coast face severe threats from sea-level rise and increasing cyclone intensity.
  - In 2020, [Cyclone Nisarga](#) forced the shutdown of operations at **Jawaharlal Nehru Port Trust**, India's largest container port, disrupting supply chains nationwide.

## What Measures can be Implemented to Enhance the Climate Resilience of India's Industrial Sector?

- **Industrial Symbiosis Parks:** Develop specialized industrial parks where different industries collaborate to utilize each other's waste and byproducts.
  - For example, **a steel plant's waste heat could power a textile factory**, while a food processing unit's organic waste could fuel a biogas plant.
  - This approach not only reduces waste and emissions but also creates a more **resilient ecosystem less dependent on external resources**.

- **Climate-Responsive Architecture for Factories:** Mandate and incentivize the construction of climate-adaptive industrial buildings. This could include:
  - **Self-shading structures** that adjust based on sun position
  - **Green roofs** and walls that provide natural cooling and capture rainwater
  - Underground factories in heat-prone areas to maintain stable temperatures
  - Floating factories in coastal areas to adapt to sea-level rise
- **Artificial Intelligence-Driven Climate Risk Management:** Develop an [AI system](#) that integrates real-time climate data, long-term projections, and industrial operations data. This system could:
  - Predict **specific climate risks for individual factories**
  - Automatically adjust production schedules based on weather forecasts
  - Optimize supply chains in real-time to avoid climate-related disruptions
  - Suggest **location-specific adaptation measures**
- **Decentralized Micro-Grid Networks:** Encourage industries to form decentralized, climate-resilient energy networks. \
  - Each factory in the network would have its **own renewable energy generation (solar, wind, biomass)** and storage capabilities.
  - These micro-grids would be interconnected, allowing energy sharing during disruptions.
- **Vertical Integration of Agriculture and Industry:** Promote the development of vertically integrated agro-industrial complexes.
  - These would combine climate-controlled **vertical farming with food processing industries**, reducing transportation needs and increasing resilience to agricultural disruptions.
  - For example, create a multi-story complex that grows tomatoes on upper floors and produces ketchup on lower floors, all powered by [rooftop solar](#).
- **Underground Water Banking System:** Implement a nationwide network of underground aquifer recharge and storage facilities.
  - During monsoons, excess water would be pumped into these aquifers, creating vast underground reservoirs. Industries could then draw from these reserves during dry periods.
    - This system would be particularly beneficial in water-stressed regions like **Gujarat or Tamil Nadu**.
  - Integrate smart sensors and blockchain technology to manage water credits and ensure fair distribution among industrial users.

**Drishti Mains Question:**

Discuss the impact of climate change on industrial activity in India and suggest measures to enhance the resilience and sustainability of the industrial sector.

**UPSC Civil Services Examination, Previous Year Questions (PYQs)**

**Prelims**

**Q. In the 'Index of Eight Core Industries', which one of the following is given the highest weight? (2015)**

- (a) Coal production
- (b) Electricity generation
- (c) Fertilizer production
- (d) Steel production

**Ans: (b)**

**Mains**

**Q.1** “Industrial growth rate has lagged behind in the overall growth of Gross-Domestic-Product(GDP) in the post-reform period” Give reasons. How far are the recent changes in Industrial Policy capable of increasing the industrial growth rate? **(2017)**

**Q.2** Normally countries shift from agriculture to industry and then later to services, but India shifted directly from agriculture to services. What are the reasons for the huge growth of services vis-a-vis the industry in the country? Can India become a developed country without a strong industrial base? **(2014)**

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