# CURRENTLY — 20TH & 21ST SEPTEMBER 2026

**1. U.S., Denmark and Greenland Reach Agreement ‘to Strengthen Security’** — *The Hindu* — **GS-2:** Arctic Geopolitics, International Relations, Security

**2. Ways to Conquer Plastic Waste and Produce Useful Materials** — *The Hindu* — **GS-3:** Plastic Waste, Circular Economy, Waste-to-Energy, Green Hydrogen

**3. Experts Warn of Devastating El Niño Impacts on India** — *The Hindu* — **GS-1/GS-3:** El Niño, Indian Monsoon, Climate Change, Biodiversity

**4. The Paradox of Self-Reliance: India-China Trade Dynamics** — *Data Point* — **GS-2/GS-3:** India-China Relations, Trade, Manufacturing, Supply Chains

**5. Missing Measure in India’s Magnet Mission** — *The Hindu* — **GS-3:** Critical Minerals, Rare Earths, Permanent Magnets, Advanced Manufacturing

**6. Campaign to Reduce the Intake of Salt** — *The Hindu* — **GS-2:** Public Health, Nutrition, Hypertension, Non-Communicable Diseases

**7. Russia, West Asia Energy Sites Hit, India Has a New Problem: Sulphur** — *The Indian Express* — **GS-3:** Fertiliser Security, Sulphur, Agriculture, Energy Security

# U.S., Denmark and Greenland reach agreement 'to strengthen security'

Deal aims to bar U.S. adversaries from building bases on Greenland; U.S. has 'permanent control' over the island's security, says Trump; Denmark insists on sovereignty and territorial integrity; signing expected next week at UN General Assembly

**Reuters**
COPENHAGEN

The U.S., Denmark and Greenland said late on Friday they had reached an agreement for Washington to develop a significant military presence on Greenland, while prohibiting U.S. adversaries from building their own bases on the island.

U.S. President Donald Trump said the deal would give Washington "permanent control" over the Arctic island's security, leaving its precise scope unclear.

On Saturday, Denmark and Greenland said any agreement with the U.S. would not compromise Greenland's sovereignty. Key details of the agreement have not been made public.

Deal follows months of tension over Donald Trump's threats to seize Greenland. A protest against the U.S. leader in capital Nuuk. AP

Denmark and Greenland expressed hope that a deal, which is expected to be signed during the UN General Assembly next week, would end months of uncertainty triggered by Mr. Trump's threats to seize control of Greenland. "Next week could be a good week - for Greenland, Denmark,and the U.S.," Denmark's Foreign Minister Lars LokkeRasmussen said on Saturday.

"A time of uncertainty will hopefully give way to a binding agreement that strengthens security in the Arctic and the North Atlantic, and thereby our shared security within NATO and Europe - while respecting the (Danish) Kingdom's red lines," he said.

Greenland's Prime Minister Jens-Frederik Nielsen said on Saturday that the proposed deal "recognises the sovereignty and territorial integrity of our Kingdom and the right of the Greenlandic people to self-determination."

**'Permanent control'**

Mr. Trump said on Truth Social that under a deal, "the U.S will FOREVER have the complete ability to do what is necessary in Greenland in order to secure and defend the security of Greenland, and the United States of America."

The deal "gives the U.S. permanent control over security, and all other needs, in Greenland," Mr. Trump said, adding that no adversary would ever be permitted to have a base or military presence in Greenland without U.S. approval.


# 1. Greenland: Strategic Importance in Arctic Geopolitics

**Source:** Reuters, September 19, 2026 | **GS:** GS-2 — International Relations, Arctic Geopolitics, Security

## Context

- Greenland has become a major geopolitical focus after **U.S. President Donald Trump repeatedly pressed for greater U.S. control over the island**. Denmark and Greenland opposed any transfer of sovereignty.

- The latest **U.S.–Denmark–Greenland security understanding** provides for expanded U.S. military involvement while maintaining Danish sovereignty and Greenlandic self-determination.

## 1. Greenland: Basic Facts

- **World's largest island**, located between **North America, Europe and the Arctic**.
- About **80% of its area is covered by the Greenland Ice Sheet**.
- It is a **self-governing part of the Kingdom of Denmark**; Denmark retains responsibility for defence and foreign affairs.
- Its population is only around **56,000**, making it extremely sparsely populated.

## 2. Why Greenland Is Strategically Important

- **Location:** Its position in the Arctic and North Atlantic is important for surveillance, maritime security and defence between North America and Europe.
- **Military:** The United States operates the **Pituffik Space Base**, giving Greenland importance for missile warning and space surveillance.
- **Critical minerals:** Greenland has deposits of rare earth elements and other critical minerals; **24 of the European Union's 34 critical raw materials** have been identified there.
- **Arctic routes:** Declining sea ice is increasing the strategic importance of Arctic maritime routes.
- **Great-power competition:** Its location and resources have increased interest from the United States, Russia and China.

## 3. Economic Potential and Challenges

- **Fisheries:** The mainstay of Greenland's economy.
- **Mining:** Critical minerals could diversify the economy and reduce dependence on Danish financial support.
- **Constraints:** Harsh climate, remoteness, limited infrastructure and high extraction costs restrict large-scale mining; only **two mines were active as of January 2026**.
- **Climate change:** Melting ice creates environmental risks while gradually improving access to some areas.

## 4. Significance of the Current Development

- **Arctic security:** Greater U.S. presence strengthens surveillance and defence capabilities.
- **Resource security:** Critical minerals add an economic and strategic dimension.
- **Sovereignty:** The issue highlights the balance between **strategic security interests and Greenland's right to self-determination**.

- **Geopolitics:** Greenland demonstrates how **climate change, resources and military competition are converging in the Arctic**.

# Ways to conquer plastic waste and produce useful materials

SPEAKING OF SCIENCE

D. Balasubramanian

Since their synthesis by the chemist Leo Hendrik Baekeland and the explanation of their structure by Nobel laureate Hermann Staudinger, and their use since the 19th century, plastics have become convenient materials for daily use and are preferred over glass, which breaks easily. Plastics are manufactured by industry and used every day for their convenience by people, and much more in cities and suburbs than in rural villages.

A vast amount of this material is used by the consumer and most of it is thrown away as waste after a single use. India contributes more than 6.5% of the world's plastic use. According to official estimates, the country's plastic waste amounts to about 4.1 million metric tonnes per year. However, the Central Pollution Control Board (CPCB) has found that India generates 26,000 tonnes of plastic waste every day, which leads to 9.5 million tonnes a year. The major polluters are the cities and their suburbs, although several hundred tonnes of waste are generated in the rural areas as well, where it remains largely uncollected.

The CPCB, the non-profit group Plastics-India Foundation, which works on reducing, reusing and recycling plastics, and several private companies have been involved in collecting and reusing discarded plastics to recycle them to produce bottles that can hold oils and medically safe materials such as drugs and body lotions. Recycling has also involved making plastic chairs, tabletops, and window-panes. Plastics like Teflon and Nylon are being used for packaging consumer goods. Plastics are also used in countries such as Australia and Canada to make bank notes, rather than using paper for the purpose. In India, we still use paper currencies, although our credit and debit cards and PAN and Aadhar cards are made with plastic.

Bundles of plastic waste after being segregated at Jothi Nagar Centre in Thoothukudi, Tamil Nadu, on September 6. N. RAJESH

Plastic wastes are also used to produce fuel using high heat in a process called pyrolysis.

In this connection, the technologist P. Sahasrabuddhe of Pune had collected domestic waste, including plastics, from his home and produced a gas for cooking called 'Vaayu'. Mr. Sahasrabuddhe now runs a factory that manufactures this gas and supplies them to hotels and users. Likewise, a firm in Hyderabad produces cooking gas from vegetable wastes and discarded plastics across the city. Several other cities across India have also been successful in doing so.

Plastic wastes can also produce hydrogen gas, which can be oxidised to generate clean energy. A recent paper from University of California, Los Angeles, researchers (*PNAS* 123 (28) e2537552123) showed how hydrogen can be produced from plastic waste using heat and atmospheric carbon dioxide as the fuel. This hydrogen, when combined with oxygen in the atmosphere, generates electricity.

A waste-to-energy plant in Karnataka has burnt some of Bengaluru's garbage and generated electricity. Similarly, Ujjwal Pal's group at the CSIR-Indian Institute of Chemical Technology, Hyderabad, has shown how to produce hydrogen from sea water using catalysts. It should be possible to do the same with the water in rivers and that stored in dams. A group from Columbia University has also reported a way to produce hydrogen from seaweed as the biomass (*Nat. Commun.* 11, 3783 (2020)).

Generating hydrogen from plastic waste and seaweeds is thus useful as well as possible.

The Indian Railways also recently demonstrated a long-distance railway service that used hydrogen as fuel, instead of coal. The nuclear power plant in Kalpakkam in Tamil Nadu has also been producing hydrogen gas by heating copper chloride.

*dbala@lvpei.org*

6. निरंतर उत्पन्न किए जा रहे फेंके गए ठोस कचरे की विशाल मात्राओं का निस्तारण करने में क्या-क्या बाधाएँ हैं? हम अपने रहने योग्य परिवेश में जमा होते जा रहे जहरीले अपशिष्टों को सुरक्षित रूप से किस प्रकार हटा सकते हैं?

(उत्तर *150* शब्दों में दीजिए)

What are the impediments in disposing the huge quantities of discarded solid wastes which are continuously being generated? How do we remove safely the toxic wastes that have been accumulating in our habitable environment?

(Answer in *150* words) 10

---

# 2. Plastic Waste: From Generation to Resource Recovery

**Source:** *The Hindu* — Speaking of Science
**GS:** GS-3 — Environment, Waste Management, Circular Economy, Science & Technology

## Context

- India generates around **26,000 tonnes of plastic waste daily**, creating challenges of collection, segregation, recycling and disposal.
- The emerging approach is to treat plastic waste as a **recoverable resource** rather than only as an environmental burden.

## 1. Plastic Waste in India: The Problem

- India generates nearly **9.5 million tonnes of plastic waste annually**.
- **Urban areas** are major sources, while inadequate collection and segregation in several areas allow plastic to enter landfills and the environment.
- Mixed and contaminated plastic is particularly difficult to recycle, resulting in **loss of material value**.

## 2. Recycling: Recovering Material Value

- Properly segregated plastic can be recycled into **bottles, furniture, packaging, window panes and other products**.
- Recycled plastic is also finding specialised uses, including **bank cards and identity cards**.
- Recycling reduces the demand for **virgin plastic** and supports a **circular economy**.

## 3. When Recycling Is Difficult: Energy Recovery

- Plastics that are unsuitable for conventional recycling can be considered for **energy recovery**.
- **Pyrolysis** uses high temperatures with little or no oxygen to convert plastic into **liquid fuels and combustible gases**.
- Plastic-rich waste can also be processed through **waste-to-energy systems** to generate electricity.

## 4. Emerging Technology: Converting Waste into Hydrogen

- Research is exploring the conversion of **plastic waste into hydrogen**, using heat and atmospheric carbon dioxide.
- Hydrogen can subsequently be used for **electricity generation and other energy applications**.
- Other potential hydrogen feedstocks, including **seaweed and water**, are also being investigated.

## 5. Building a Sustainable Plastic-Waste Chain

- **Reduce and reuse:** Prevent plastic generation wherever alternatives are practical.
- **Segregate at source:** Ensure recyclable plastic reaches appropriate processing facilities.
- **Recycle first:** Prioritise material recovery where technically and economically feasible.
- **Recover energy from residual waste:** Use pyrolysis and waste-to-energy for suitable non-recyclable streams.
- **Extended Producer Responsibility:** Make producers responsible for collection, recycling and environmentally sound end-of-life management.
- **Environmental safeguards:** Ensure strict controls on emissions and residues from thermal and chemical conversion technologies.

# Experts warn of devastating El Niño impacts on India

**The Hindu Bureau**
BENGALURU

As many as 188 of India's scientists and ecologists jointly published an appeal to fellow researchers and field practitioners to prepare for the effects of El Niño – a global weather phenomenon that dampens the monsoon and leads to extreme hot and dry conditions in the subcontinent.

In the Pacific Ocean where El Niño originates, temperatures have steadily risen above the 0.5 degree Celsius threshold, reaching 2.6 degree Celsius in August.

Projections report possible anomalies of up to 4 degrees Celsius, which is higher than at any time in the past 1,000 years, based on reconstructions from coral cores, they said.

El Niño started in May and its main effects are expected to be felt in the northern hemisphere (including India) from November onwards into the next year, they said, suggesting a 'Super' El Niño. Over the coming months, the signatories warned, India's natural systems are likely to experience a range of potentially devastating impacts as a result of El Niño.

"These include widespread bleaching and mortality of coral, an increase in wildfires, and the death of large rainforest trees. With a high probability of drought and extreme heat conditions, this year's El Niño is likely to be catastrophic for India's farmers, fishers and shepherds as well. In addition though, more subtle impacts on India's nature – including delayed fruit production or changes in animal behaviour – could be equally important, but may be much less visible unless you are specifically looking for them," they said.

Projections report temperatures rising by up to 4 degrees Celsius based on reconstructions from coral cores. SPECIAL ARRANGEMENT

The "Call to Action" urges scientists to take advantage of the warning signs and mobilise as a community to document and study the impact of this event on India's nature, arguing that better science and documentation are essential to preparing India for a climate resilient future.

Jayashree Ratnam, scientist, National Centre for Biological Science, said in a release: "The coming year will be a litmus test for tropical forests and trees in India. Huge forest trees may appear indestructible, but in the Western Ghats, many of them are already near the limit of the heat they can tolerate. Large trees are especially susceptible to extended droughts. Trees in cities are also vulnerable because of the urban 'heat island' effect. It is vital to understand how the coming El Niño will impact trees and other plants – as these are the foundations on which all other life depends."

**'Scary projections'**

"I have witnessed the devastating impacts of El Niños on India's coral reefs before, and it is heartbreaking. Coral reefs can be remarkably resilient but they need at least a decade after every major die-back of coral to show significant recovery. The last major El Niño was in 2024, and barely two years after that event, the projected scale and intensity of the heat wave that is currently headed our way is truly scary," said Rohan Arthur, marine biologist, Nature Conservation Foundation.

Roxy Mathew Koll, climate scientist, Indian Institute of Tropical Meteorology, also said India's monsoon season is closing with a rainfall deficit, but the impacts may not end there. "They can creep into the seasons ahead and cascade through depleted soil moisture and water storage, land and marine heatwaves, stressed crops and livelihoods, forest fires, coral bleaching and less visible ecological changes. We must document these changes as they unfold, but also safeguard the ecosystems that remain and reduce the pressures already weakening them," he said.

**Q16.** असामान्य जलवायवी घटनाओं में से अधिकांश एल-नीनो प्रभाव के परिणाम के तौर पर स्पष्ट की जाती हैं । क्या आप सहमत हैं ?

Most of the unusual climatic happenings are explained as an outcome of the El-Nino effect. Do you agree ? 10

# 3. El Niño: Growing Risks for India's Climate and Ecosystems

**Source:** *The Hindu*, September 2026
**GS:** GS-1 — Climatology, Indian Monsoon | **GS-3:** Climate Change, Biodiversity, Disaster Management

## Context

- **188 Indian scientists and ecologists** have called for greater preparedness for the possible impacts of a strong El Niño, warning that its effects could extend beyond the monsoon to **forests, coral reefs, agriculture and livelihoods**.
- Pacific Ocean temperatures have already risen well above the El Niño threshold, raising concerns about a potentially **strong or "Super" El Niño**.

## 1. El Niño: Current Situation

- **El Niño:** Periodic warming of the central and eastern tropical Pacific Ocean that can weaken the Indian monsoon and alter global weather patterns.

- Pacific temperatures were around **2.6°C above the baseline in August**, significantly above the **0.5°C threshold** used to identify El Niño conditions.
- Projections suggest temperature anomalies of **up to 4°C**, based on reconstructions from coral records, with major effects expected in the Northern Hemisphere from **November onwards**.
- Scientists have warned that the coming event could be particularly significant for India's **weather and natural ecosystems**.

## 2. Impact on India's Monsoon and Livelihoods

- **Monsoon:** El Niño generally increases the risk of **below-normal rainfall and drought** in India.
- **Agriculture:** Reduced rainfall and extreme heat can cause crop stress, lower yields and increase irrigation requirements.
- **Fisheries:** Changes in ocean temperature and marine ecosystems can affect fish distribution and fishing communities.
- **Pastoral livelihoods:** Heat and water stress can affect livestock and grazing systems.
- **Cascading effects:** A rainfall deficit can lead to depleted soil moisture and water storage, followed by **heatwaves, crop stress and livelihood losses**.

## 3. Impact on Forests, Coral Reefs and Biodiversity

- **Coral reefs:** Higher ocean temperatures can trigger **coral bleaching and mortality**; major bleaching events have already occurred, including in 2024.
- **Tropical forests:** Extreme heat and drought can increase **tree mortality and forest-fire risk**, particularly in vulnerable ecosystems such as the Western Ghats.
- **Urban vegetation:** Trees in cities face additional stress because of the **urban heat-island effect**.
- **Wildlife:** Changes in temperature and food availability can alter **animal behaviour and ecological cycles**, even where the impacts are less visible.

## 4. Preparedness and Way Forward

- **Early warning:** Strengthen climate and seasonal forecasting to support timely decisions in agriculture, water management and disaster preparedness.
- **Ecosystem monitoring:** Document changes in **coral reefs, forests, wildlife and vegetation** during and after El Niño events.
- **Climate-resilient agriculture:** Promote drought-tolerant crops, efficient irrigation and local water conservation.
- **Ecosystem protection:** Reduce existing pressures on forests, coral reefs and other ecosystems to improve their resilience.
- **Science-based planning:** Strengthen collaboration among scientists, government agencies and local communities for evidence-based climate adaptation.

# The paradox of self-reliance: India-China trade dynamics

While India is steadily building its manufacturing capabilities, that expansion remains deeply embedded in China-centric, import-dependent supply chains

DATA POINT

**Surendar Singh**

After the bilateral meeting between Prime Minister Narendra Modi and Chinese President Xi Jinping on the sidelines of the BRICS summit in Delhi on September 12, India said the two leaders had underlined the need to address each other's concerns, including "structural trade imbalance and supply chain issues". This assumes significance as the widening trade deficit with China reveals a central paradox in India's ambitious Atmanirbhar Bharat mission to bolster domestic manufacturing and reduce dependence on global supply chains, with China as the implicit target.

India is steadily building its manufacturing and export capabilities. However, that expansion remains deeply embedded in China-centric, import-dependent supply chains – creating what may be called the "assembly trap" of self-reliance. Bilateral trade touched $167.6 billion in 2025 but has become asymmetric, with imports from China rising much faster than India's exports **(Chart 1)**.

Exports to China remained broadly stagnant between 2021 and 2025, while imports rose sharply by about 71% from $87.5 billion to $149.5 billion in the same period – highlighting persistent structural weaknesses in India's manufacturing and trade competitiveness. Nearly 70% of India's imports from China are intermediate goods and another 22% capital goods **(Chart 2)**. This composition shows that the India-China trade deficit is not simply a consequence of Indian consumers buying Chinese finished products. It reflects deeper structural asymmetries in manufacturing capability and technological dependence, with India's reliance on Chinese supply chains extending into the manufacturing system as inputs, components and semi-processed goods.

The trends in India's top five import categories from China between 2021 and 2025 **(Table 1)** reveal that this reliance has deepened rather than diversified, despite initiatives such as Make in India and the Phased Manufacturing Programme (PMP). The combined value of the top five categories of imports rose from $19 billion in 2021 to $34.6 billion in 2025 – close to one-fourth of total imports from China, showing that India's import basket has become more concentrated in a few electronics-related categories. That telecom equipment, laptops and integrated circuits remain in the top five shows that India's electronics assembly is still structurally exposed to Chinese supply chains.

India has emerged as a major hub for mobile phone assembly, but the share of imported parts and components has risen sharply from 3.3% of the import basket in 2022 to 10.1% in 2025 **(Chart 3)** – revealing the contradiction in that success story: it has been shaped, at least so far, by downstream assembly rather than by a deep domestic component ecosystem.

Imports of sophisticated inputs and capital goods can facilitate industrial upgrading, but they become problematic when the dependence turns structurally persistent and domestic firms fail to build capability in semiconductors and other precision components. In order to resolve such structural and capability challenges, the focus must shift from incentivising assembly to building domestic technological capability, innovation, supplier networks and component ecosystems. The response should not be blanket restrictions but calibrated tariffs on parts and components, designed to nurture segments of domestic manufacturing value chains.

India should focus on enhancing access to global value chains while building domestic capabilities, so that critical technological dependencies do not harden into strategic vulnerabilities.

## Structural asymmetry

The data for the charts were sourced from the World Integrated Trade Solution (WITS), developed by the World Bank in collaboration with the United Nations Conference on Trade and Development (UNCTAD). Surendar Singh is an Associate Professor at O.P. Jindal Global University, Sonipat. Views expressed in this article are personal

**CHART 1:** India's exports to China has remained broadly stagnant between 2021-2025, while imports rose sharply from $87.5 billion to $149.5 billion in the same period, resulting in the widening trade deficit

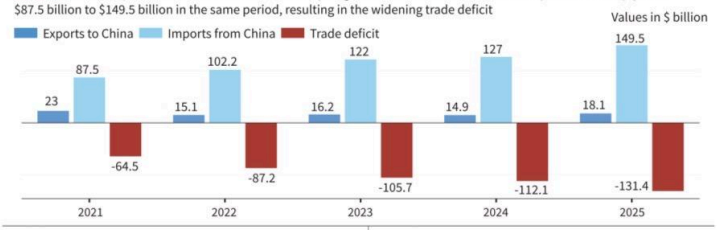



**CHART 2:** Intermediate and capital goods accounted for the major share of different categories of India's imports from China in 2025, as shown in this chart

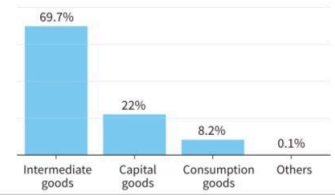



**CHART 3:** The share of India's imports of components, used for manufacturing mobile phones, from China has risen

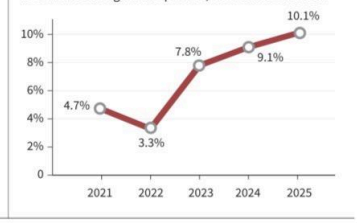



**TABLE 1:** India's import basket from China has been persistently concentrated in a few electronics-related categories rather than becoming more diversified over the years, indicating India's continued reliance on China for its manufacturing

**India's top five imports from China ($ billion)**

| Year | Total imports ($ bn) | Product groups | Top five imports ($bn) | Share |
|---|---|---|---|---|
| 2021 | 87.5 | Laptops, telecom parts, LED/solar cells, ICs and transmission | 19.0 | 21.7% |
| 2022 | 102.2 | Laptops, ICs, Telecom parts and Li-ion batteries | 19.0 | 18.6% |
| 2023 | 122.0 | Telecom parts, ICs, laptops, LED/solar cells and mobile phones | 26.3 | 21.5% |
| 2024 | 127.0 | Telecom parts, laptops, ICs, LED/solar cells and mobile phones | 29.5 | 23.3% |
| 2025 | 149.5 | Telecom parts, laptops, ICs, mobile phones and silver | 34.6 | 23.2% |

# 4. India–China Trade: The Paradox of Self-Reliance

**Source:** *Data Point*

**GS:** GS-2 — India–China Relations | GS-3 — Manufacturing, Trade & Supply Chains

## Context

1. India is expanding domestic manufacturing under **Atmanirbhar Bharat** and the **Production Linked Incentive (PLI) Programme**.
2. However, this expansion remains heavily dependent on **Chinese intermediate goods, components and capital goods**, creating a gap between domestic production and domestic value addition.

## 1. Widening Trade Imbalance

1. **Exports to China:** fell from **$23 billion (2021)** to **$18.1 billion (2025)**.
2. **Imports from China:** rose sharply from **$87.5 billion** to **$149.5 billion**.
3. **Trade deficit:** more than doubled from **$64.5 billion** to **$131.4 billion**.
4. **Total bilateral trade:** reached around **$167.6 billion in 2025**.

## 2. Nature of India's Dependence

1. **Intermediate goods:** accounted for **69.7%** of imports from China in 2025.
2. **Capital goods:** constituted another **22%**, showing dependence on Chinese industrial machinery and production equipment.
3. **Consumer goods:** accounted for about **8.2%**.
4. The **top five import categories** increased from **$19 billion in 2021** to **$34.6 billion in 2025**, around **23.2% of total Chinese imports**.
5. Major imports include **telecommunication equipment, laptops, integrated circuits, LED/solar cells and mobile-phone components**.

## 3. Manufacturing Paradox

1. India is increasingly manufacturing and assembling **finished products domestically**, particularly in electronics.
2. However, critical **components, machinery and intermediate inputs** continue to be sourced from China.
3. This can increase India's **assembly capacity without a proportionate increase in domestic value addition**.
4. Therefore, self-reliance cannot be measured only by the growth of finished-product manufacturing; **domestic component and technology capabilities** are equally important.

## 4. Implications for Atmanirbhar Bharat

1. **Supply-chain vulnerability:** disruption in Chinese supplies can affect Indian manufacturing.
2. **Limited domestic value addition:** high imported-input dependence reduces the domestic share of production value.
3. **Technology dependence:** dependence on imported components can also translate into dependence on external technological capabilities.
4. **Import restrictions alone are insufficient:** without competitive domestic alternatives, restrictions can increase production costs.
5. **Strategic resilience:** critical supply chains need both domestic capacity and diversified international suppliers.

## 5. Building Genuine Manufacturing Capability

1. **Deepen component manufacturing:** semiconductors, electronics components, machinery and precision equipment.
2. **Improve PLI outcomes:** link incentives with **domestic value addition, technology transfer and supplier development**.
3. **Diversify imports:** develop alternative sources for strategically important inputs.
4. **Strengthen domestic firms:** improve access to technology, finance, skills and infrastructure.
5. **Integrate with global value chains:** build globally competitive manufacturing rather than pursuing complete import substitution.

# Missing measure in India's magnet mission

**Suvajit Banerjee**

Fellow at the National Council of Applied Economic Research (NCAER), New Delhi in the research vertical of Computable General Equilibrium Modelling and Policy Analysis. Views are personal

**Sovini Mondal**

Research Analyst at the NCAER in the research vertical of Computable General Equilibrium Modelling and Policy Analysis. Views are personal

**Sanjib Pohit**

Professor and Thematic Lead at the NCAER in the research vertical of Computable General Equilibrium Modelling and Policy Analysis. Views are personal

Most Indians know the parable of several blind men trying to describe an elephant. One touches its trunk and believes it is a snake. Another feels its leg and insists it is a pillar. None is entirely wrong, yet none sees the whole animal.

India's strategy for advancing its cutting-edge technologies, aimed at becoming a global manufacturing leader, carries the risk of making a similar mistake. From EV motors and semiconductor fabrication facilities to precision manufacturing machineries, at the heart of each lies an unassuming component: the high-performance permanent magnet. They serve as the silent operating system of industrial acceleration.

Magnets are not all the same. Ferrite, Alnico and Samarium-Cobalt magnets continue to serve important industrial applications. Yet Neodymium-Iron-Boron (NdFeB) magnets have become the backbone of energy transition and advanced manufacturing because no other commercially available permanent magnet combines comparable magnetic strength with such a high power-to-weight ratio. Recognising its importance, India has begun strengthening its critical minerals and rare earth element strategy through initiatives such as the National Critical Mineral Mission, overseas mineral acquisitions, expanded geological exploration, and PLI schemes.

However, China's tight export controls on rare-earth magnets and materials in April 2025 not only revealed the deep-seated vulnerabilities in global industrial value chains, but also the limits of our understanding. For India, the primary vulnerability does not stem from a shortage of critical minerals; rather, it lies in the absence of a comprehensive framework to pinpoint where strategic technological dependence is cultivated, accumulated and propagated throughout the permanent magnet value chain.

The strategic question is not simply whether India possesses rare-earth resources or whether imports from China can be reduced. The real policy challenge is understanding what happens in between

## The journey of a magnet

Consider a simple example. India's Annual Survey of Industries estimates the domestic permanent magnet market at around ₹750 crore. Yet international trade statistics indicate import values several times larger than that entire reported market. The gap may reflect differences in statistical coverage, industrial classification or supply-chain accounting. Whatever the explanation, policymakers face a troubling reality: they cannot confidently explain where all these magnets enter the economy or how they move through it. In other words, parts of India's permanent magnet economy appear to exist without being fully visible in statistics.

Unlike other products, permanent magnets pass through a long technological journey. Geological exploration leads to mining. Mining feeds mineral processing. Processing enables chemical separation. Separation produces oxides, which are refined into metals, transformed into alloys, engineered into magnetic materials, and finally manufactured into finished magnets. Each stage demands different scientific knowledge, industrial capability and technological maturity. This is why discussions on critical minerals frequently miss the real point. The strategic question is not simply whether India possesses rare-earth resources or whether imports from China can be reduced. The real policy challenge is understanding what happens in between.

Although India has developed capabilities across several stages of permanent magnet manufacturing, the country still lacks a systematic way of identifying where those capabilities are globally competitive, where critical gaps persist, and how dependence accumulates across production stages. India's statistical system provides only a partial picture of what is mined, imported, manufactured.

One way to bridge this gap is through an Integrated Techno-Economic Mapping (ITEM) framework which presently is a missing piece in India's industrial policy toolkit. Such a framework brings together information on engineering and economic measurement to show how a permanent magnet is built, from minerals in the ground to the finished products that power advanced manufacturing. More importantly, it would identify where industrial capability should be built, where technological partnerships become essential, and where domestic investment would yield the greatest strategic return. A country may secure mineral resources yet remain dependent if it lacks processing and manufacturing capabilities.

Bridging this measurement gap is not an academic exercise; it is an industrial imperative.

# 5. Missing Measure in India's Magnet Mission

**Source:** *The Hindu*
**GS:** GS-3 — Critical Minerals, Rare Earths, Advanced Manufacturing

## Context

1. India is expanding its critical-mineral and rare-earth capabilities, but lacks a complete picture of its **permanent-magnet value chain**.
2. The key gap is identifying **where India remains technologically and industrially dependent**, from mineral processing to finished magnets.

## 1. Permanent Magnets: Basic Understanding

1. **Permanent magnets** retain magnetism without continuous external electricity.
2. Major types include **Ferrite, Alnico, Samarium-Cobalt (SmCo) and Neodymium-Iron-Boron (NdFeB)**.
3. **NdFeB magnets** are particularly important for **electric vehicles, wind turbines, industrial motors, robotics and advanced electronics** because of their high magnetic strength and low weight.

## 2. What Are Rare-Earth Magnets Made Of?

1. **NdFeB magnets:** mainly **neodymium, iron and boron**.
2. **Dysprosium and terbium** may be added to improve high-temperature performance.
3. Therefore, magnet manufacturing requires capabilities beyond mining, including **rare-earth separation, metal production, alloying and magnet engineering**.

## 3. India's Resource–Manufacturing Gap

1. India has significant rare-earth resources, but **resource availability does not automatically create manufacturing capability**.
2. The value chain includes **mining, processing, separation, rare-earth oxides, metals, alloys and finished magnets**.
3. Dependence can therefore persist at the **processing or manufacturing stage**, even when minerals are available domestically.
4. China's **2025 restrictions on rare-earth magnets and related materials** highlighted the strategic importance of downstream capabilities.

## 4. The Data Gap

1. India's **Annual Survey of Industries** estimates the domestic permanent-magnet market at around **₹750 crore**.
2. International trade data indicate import values several times higher than the reported domestic market.
3. Existing statistics do not adequately show **where magnets enter the economy, which industries use them and where imported components are embedded in larger products**.
4. This makes it difficult to identify the precise points of **technological dependence and industrial vulnerability**.

## 5. Integrated Techno-Economic Mapping (ITEM)

1. **ITEM** would integrate **engineering, manufacturing, trade and economic data** across the complete magnet value chain.
2. It would identify:
    - domestic manufacturing capabilities;
    - critical technological gaps;
    - import-dependent stages;
    - areas requiring investment;
    - opportunities for technology partnerships.
3. It would help policymakers move from **mineral-resource mapping to value-chain mapping**.
4. The same approach can be applied to other **critical-mineral-based strategic technologies**.

# Campaign to reduce the intake of salt

Salt, as an essential electrolyte, sits at the centre of human well-being, but being most prone to overuse and misuse, the condiment remains at the heart of illness as well. When Tamil Nadu Health Minister K.G. Arunraj took salt to the floor of the Assembly, he dragged it willy-nilly into public discourse. He announced plans to launch a multi-pronged mission to reduce salt intake, turning attention to the right quantities and forms that must be consumed. The Minister's speech made it clear that the government's plans were not merely about a dietary tweak, but instead, a recalibration of how well-being is perceived.

Salt, in the right proportions, facilitates hydration, nerve signalling, muscle function, digestion and also has a role to play in stress physiology. However, in excess, or in ultra processed foods, it can have a deleterious impact on health, increasing the risk of stroke, heart disease and kidney strain over time.

Surveys by the Indian Council of Medical Research show that in India, men consume an average of 8.9 gms daily, while women consume about 7.1 gms. The WHO, which recommends keeping the intake under 5 gms of salt per day, released a set of guidelines in January 2025, recommending the use of lower-sodium salt substitutes.

In Tamil Nadu, hypertension is a major public health concern. A 2024 study by Selvavinayagam T.S. et al showed that adult prevalence of hypertension in Tamil Nadu hovered around 33.9 %, much above the national average of 28.5 %. There is a direct link between consuming excess salt and hypertension – consuming too much salt causes the body to retain extra water, which increases blood volume and puts higher pressure on the artery walls, leading to clinical hypertension.

Ramya Kannan

Cutting down salt is a simple change that can make a major difference to cardiovascular health — less salt today can mean lower blood pressure, fewer heart attacks, and fewer strokes tomorrow

**Action plan**

The State government's plan is comprehensive. For the first time, a Statewide survey using urine samples will scientifically measure salt consumption. Salt will be gradually reduced in government-run kitchens, including the Nutritious Meal Programme, ICDS centres, government hospitals and hostels. The feasibility of introducing a low-sodium salt substitute will be examined. This will be backed by a State-wide awareness campaign on how to read labels on packages, tasting before adding salt, and using natural flavour enhancers. Researchers of a randomised, double-blind, controlled trial reported in the *American Journal of Clinical Nutrition* in 2021, wrote that replacing salt with a reduced-sodium, added-potassium salt substitute is an acceptable and effective dietary intervention for lowering systolic blood pressure in persons with hypertension in rural India.

The State also intends to step up its hypertension control activities through its community health outreach programme Makkalai Thedi Maruthuvam and other public health care institutions. People diagnosed with hypertension will receive systematic counselling and anti-hypertension drugs. There is evidence that such closely-monitored health interventions succeed.

The Sapiens Health Foundation has welcomed the new salt reduction campaign of the Tamil Nadu government. Its founder Rajan Ravichandran says, "This is a wonderful surprise, we have been knocking at many doors to bring in awareness of salt reduction in the public health sector. It can be very powerful in changing the way people consume salt. We just have to go back to 2005, where the campaign initiated by Graham MacGregor of the World Action on Salt, Sugar and Health, resulted in a reported 30% reduction of salt in bread, in the U.K.".

G. Sengottuvelu, senior interventional cardiologist, Apollo Hospitals, explains further, "Excess salt is one of the most important and preventable contributors to high blood pressure, heart attack and stroke." His argument is that Indians' preference for salty food is largely an acquired habit, often beginning in childhood, and the palate can adapt when salt is gradually reduced. Cutting down salt is a simple change that can make a major difference to cardiovascular health – less salt today can mean lower blood pressure, fewer heart attacks, and fewer strokes tomorrow.

As Tamil Nadu rolls out its programme, hopefully with scientific vigour and cultural sensitivity, other States will do well to watch and emulate. If it is possible to cut down hypertension, cardiovascular disease, and kidney disease with adjusting the size of a single pinch, then, why not?

*ramya.kannan@thehindu.co.in*

# Missing me

Most Indians know the parable of several blind men trying to describe an elephant. One touches its trunk and believes it is a snake. Another feels its leg and insists it is a pillar. None is entirely wrong, yet none sees the whole animal.

India's strategy for advancing its cutting-edge technologies, aimed at becoming a global manufacturing leader, carries the risk of making a similar mistake. From EV motors and semiconductor fabrication facilities to precision manufacturing machineries, at the heart of each lies an unassuming component: the high-performance permanent magnet. They serve as the silent operating system of industrial acceleration.

Magnets are not all the same. Ferrite, Alnico and Samarium-Cobalt magnets continue to serve important industrial applications. Yet Neodymium-Iron-Boron (NdFeB) magnets have become the backbone of energy transition and advanced manufacturing because no other commercially available permanent magnet combines comparable magnetic strength with such a high power-to-weight ratio. Recognising its importance, India has begun strengthening its critical minerals and rare earth element strategy through initiatives such as the National Critical Mineral Mission, overseas mineral acquisitions, expanded geological exploration, and PLI schemes.

However, China's tight export controls on rare-earth magnets and materials in April 2025 not only revealed the

## 6. Campaign to Reduce the Intake of Salt

**Source:** *The Hindu*

**GS:** GS-2 — Health, Nutrition, Public Health

## Context

1. Tamil Nadu has launched a **multi-pronged campaign to reduce salt intake** and address the growing burden of hypertension and cardiovascular diseases.
2. The strategy combines **measurement of salt consumption, reduction of sodium in institutional food, dietary awareness and hypertension management**.

## 1. Salt: Essential but Harmful in Excess

1. Salt mainly provides **sodium**, an essential electrolyte required for **fluid balance, nerve transmission and muscle function**.
2. The problem arises when sodium intake consistently exceeds the body's requirement.
3. Excess sodium causes the body to **retain more water**, increasing blood volume.
4. Higher blood volume increases pressure on artery walls, contributing to **high blood pressure or hypertension**.

## 2. Health Effects of Excessive Salt Intake

1. **Hypertension:** Persistent high sodium intake can raise blood pressure and is a major modifiable risk factor for hypertension.
2. **Heart disease:** Long-term hypertension increases the workload on the heart and raises the risk of cardiovascular disease.
3. **Stroke:** High blood pressure damages blood vessels and increases the risk of both major forms of stroke.
4. **Kidney damage:** The kidneys regulate sodium and fluid balance; prolonged high blood pressure and excessive sodium intake can contribute to kidney damage.
5. **Fluid retention:** Excess sodium can cause the body to retain water, contributing to swelling and increased blood volume.
6. **Higher long-term mortality risk:** Because hypertension contributes to cardiovascular and kidney diseases, excessive sodium intake has wider implications for premature mortality.

## 3. India's Salt Consumption

1. The **Indian Council of Medical Research (ICMR)** data cited in the discussion estimate average daily salt consumption at around **8.9 g for men** and **7.1 g for women**.
2. The **World Health Organization (WHO)** recommends **less than 5 g of salt per day** for adults.
3. Thus, average consumption remains substantially above the recommended level.
4. In Tamil Nadu, a **2024 study** cited in the discussion reported adult hypertension prevalence of around **33.9%**, compared with the cited national average of **28.5%**.

## 4. Tamil Nadu's Intervention

1. **Measuring salt intake:** Statewide urine-sample surveys will scientifically assess population salt consumption.
2. **Institutional food:** Salt will be progressively reduced in government kitchens, hospitals, hostels and nutrition programmes.
3. **Child nutrition:** The **Nutritious Meal Programme** and **Integrated Child Development Services (ICDS)** centres will be used to promote healthier dietary habits.
4. **Hypertension management:** People diagnosed with hypertension will receive counselling and appropriate treatment through public-health institutions.
5. **Behavioural awareness:** People will be encouraged to read food labels, taste food before adding salt and use natural flavour enhancers.

## 5. What More Can Be Done?

1. **Food reformulation:** Gradually reduce sodium levels in processed foods, bakery products, packaged snacks and ready-to-eat meals.
2. **Clear labelling:** Make sodium content easier to identify through prominent front-of-pack nutrition information.
3. **Healthier public meals:** Introduce sodium standards for food supplied in schools, hospitals, hostels and government nutrition programmes.
4. **Salt substitutes:** Promote suitable **reduced-sodium, potassium-added salt substitutes**, with appropriate medical guidance.
5. **Early intervention:** Integrate salt-reduction counselling with routine **blood-pressure screening at Primary Health Centres**.
6. **Continuous monitoring:** Periodic urine-sodium surveys can measure whether population-level interventions are actually reducing salt intake.
7. **Behavioural change:** Begin dietary education early through schools, families and community health workers because food preferences are often established during childhood.

## 6. Evidence for Salt Reduction

1. A **2021 randomised controlled trial** published in the *American Journal of Clinical Nutrition* found that a reduced-sodium, potassium-added salt substitute helped lower systolic blood pressure among people with hypertension in rural India.
2. International experience, including the **United Kingdom's Action on Salt** programme, shows that reformulating commonly consumed foods can also reduce population salt exposure.
3. Therefore, effective salt reduction requires both **individual behavioural change and changes in the wider food environment**.

# Russia, West Asia energy sites hit, India has a new problem: Sulphur

## Prices up three times in one year, affecting availability of major complex fertilisers

**Harish Damodaran**
*New Delhi, September 20*

INDIA HAS staved off a potential food crisis by importing enough urea and liquefied natural gas to enable domestic production of high-nitrogen fertiliser.

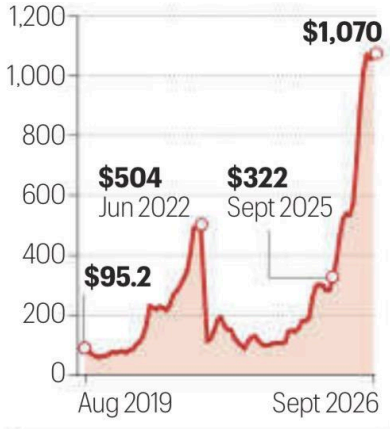
But there is another critical commodity, sulphur, whose soaring prices — again, linked to the escalating West Asia and Russia-Ukraine conflicts — is impacting the availability of di-ammonium phosphate (DAP), single super phosphate (SSP) and other major complex fertilisers.

Since the start of this year, landed (cost plus ocean freight) prices of sulphur imported into India have doubled to $1,050-1,100 per tonne. The main reason: Ukrainian long-range drone and missile attacks on Russian oil refineries and gas complexes and Iran, likewise, targeting the energy infrastructure of Saudi Aramco, QatarEnergy and

»CONTINUED ON PAGE 2

**• Average import price of sulphur**

($ per tonne, cost & freight to India)




# 7. Russia, West Asia Energy Disruptions: India's New Sulphur Problem

**Source:** *The Indian Express* — 20 September 2026
**GS:** GS-3 — Fertilisers, Agriculture, Energy Security, Global Supply Chains

## Context

1. India has maintained supplies of **urea and Liquefied Natural Gas (LNG)** for domestic fertiliser production, but a new vulnerability has emerged in **sulphur**.
2. Rising sulphur prices are affecting the production economics and availability of **Di-Ammonium Phosphate (DAP), Single Super Phosphate (SSP) and complex fertilisers**.

## 1. Sulphur: Why Is It Important?

1. About **90% of global sulphur production is obtained as a by-product** of petroleum refining and natural-gas processing; only around **10% is directly mined**.
2. Around **70 million tonnes** of sulphur is consumed globally each year, with the **fertiliser sector accounting for about 60%**.
3. Sulphur is converted into **sulphuric acid**, which is essential for processing rock phosphate into plant-available forms.
4. Without sulphur and sulphuric acid, production of **DAP, SSP and major NPK complex fertilisers** becomes difficult.

## 2. India's Sulphur Requirement

1. India consumes around **3.8–3.9 million tonnes (mt) of sulphur annually**.
2. The **fertiliser sector alone accounts for about 2–2.1 mt**, making it the dominant domestic user.
3. Indian fertiliser companies obtain some sulphur from **domestic oil refineries**, while sulphuric acid is also available from **metal-smelting complexes**.
4. However, **the bulk of India's sulphur requirement is imported**, creating exposure to international prices and geopolitical disruptions.

## 3. The Price Shock

1. Imported sulphur previously cost **below $200/tonne** for much of the period from late 2022 to early 2025.
2. By **December 2025**, landed prices had crossed **$500/tonne**.
3. By September 2026, the price had reached around **$1,050–1,100/tonne**.
4. The industry reported prices of about **$1,070/tonne for sulphur** and **$330–350/tonne for sulphuric acid**; both had briefly reached around **$1,150 and $420/tonne**, respectively.

## 4. Why Has Sulphur Become Expensive?

1. **Russia–Ukraine conflict:** Ukrainian attacks on Russian oil refineries and gas facilities have affected sulphur availability.
2. **West Asian conflict:** Energy infrastructure in **Saudi Arabia, Qatar and Iran** has also faced disruption.
3. Since sulphur is largely a **by-product of oil and gas processing**, disruption to refineries and gas-processing facilities directly affects sulphur supply.
4. **Export restrictions:** Russia has restricted sulphur and sulphuric-acid exports to protect its domestic fertiliser production.

## 5. The Electric Vehicle Connection

1. Geopolitical disruptions are not the only reason for higher prices; **demand for sulphuric acid has also increased**.

2. Sulphuric acid is increasingly used to extract **nickel from laterite ores** and produce **Mixed Hydroxide Precipitate (MHP)** used in electric-vehicle batteries.
3. Nickel-related sulphuric-acid demand increased from **3.5 mt in 2021 to 16 mt in 2025**.
4. Thus, the transition towards **electric vehicles and clean technologies** is itself creating additional demand for sulphuric acid.

## 6. Impact on India's Fertiliser Security

1. India has domestic phosphatic-fertiliser manufacturing capacity, but it depends on imported **sulphur and rock phosphate**.
2. India's domestic phosphoric-acid production capacity is around **2.2 mt**, against a requirement of **4.3–4.5 mt**.
3. This phosphoric acid supports production of roughly **15–16 mt of phosphatic fertilisers**.
4. Around **2.6–2.8 tonnes of sulphuric acid** are required to produce one tonne of phosphoric acid.
5. Therefore, higher sulphur prices can increase the **cost of DAP, SSP and other phosphatic fertilisers**, adding pressure on fertiliser subsidies and agricultural input costs.

## 7. What Can India Do?

1. **Diversify imports:** Reduce concentration of sulphur sourcing from geopolitically vulnerable regions.
2. **Increase domestic recovery:** Recover more sulphur from Indian petroleum refineries and industrial processes.
3. **Strategic supply planning:** Maintain adequate buffers and long-term supply arrangements for critical fertiliser inputs.
4. **Improve nutrient efficiency:** Promote soil testing, balanced fertilisation and precision application to reduce excessive dependence on individual fertilisers.
5. **Integrate supply-chain monitoring:** Monitor **energy, sulphur, phosphoric acid and fertiliser markets together**, since disruption in one can affect the entire chain.
6. **Long-term resilience:** Strengthen domestic capacity for phosphatic fertilisers while securing reliable overseas sources of rock phosphate and other inputs.