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1. India's Research Funding: Towards a Unified and Accountable R&D Ecosystem

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Source Newspaper: Financial Express

GS Subject: GS-III — Science & Technology | Energy | Infrastructure | Manufacturing

Why India's R&D system needs a map of where funds really go

India does not have a system that can tell funders, researchers, or the public details like who is being funded, by whom, for what, and whether that funding has already been given elsewhere; while the NITI Aayog has proposed a unified streamlining system, it still fails to address a key problem

Moumita Koley

A recent report by the NITI Aayog, about 'Ease of Doing R&D in India' revealed some uncomfortable truths about the research and development ecosystem in the country. Together with a companion survey with inputs from more than 400 institutional leaders and 850 scientists, the report said that close to 80% of funding under the Anusandhan National Research Foundation (ANRF) – the flagship research funding body – is concentrated in the IITs. This is despite the ANRF's mandate to support a wider base of universities and research bodies than the traditional funding model has managed.

There are also concerns that multiple Central agencies are possibly funding similar research areas, resulting in overlap and what the report calls "inefficient" use of public money.

These findings point to a common underlying gap: India does not have a system that can tell funders, researchers, or the public who is being funded, by whom, for what, and whether that funding has already been given elsewhere.

The NITI Aayog's response to this gap is the Unified Project Management System (UPMS) – a system to streamline the planning, funding, monitoring, and evaluation of public R&D projects across Ministries and Departments.

This proposed solution sounds good; however, it does not directly address an important problem.

PIDs and metadata

The technical term for what is missing is 'PIDs and metadata infrastructure'. In plain language, it means every research grant in India will need a permanent, unique, machine-readable identifier called a persistent digital identifier (PID). This is like how a PAN number identifies a taxpayer or an IMEI number identifies a mobile phone.

Each PID should then be attached to a standard set of details called the metadata: which agency gave the money, to which institution, to which named researcher, what amount, over what period, and in which field. Finally, there is a linking system that will allow officials to track these details using the PID.

So every time a scientist publishes a paper and includes the PID in it, the system can track and evaluate the outcome of public funding. At least this is the idea.

Right now, a lot of this information exists within Indian funding agencies – but it is scattered across dozens of separate agency databases, in inconsistent formats, and often as free text rather than structured data. A researcher's name might appear one way in a Department of Science and Technology (DST) record and slightly differently in a Council for Scientific and Industrial Research (CSIR) database – and this difference can be enough for an automated system to not tell that they are the same person. An institution might be listed as "IISc, Bangalore" in one dataset and "Indian Institute of Science, Bengaluru" in another, leading to a similar problem.



Currently, information about the use of public funding for research lies scattered across dozens of separate agency databases, in inconsistent formats, and often as free text rather than structured data. Representative image. TALHA HASSAN/UNSPLASH

Multiply such inconsistencies across thousands of grants a year and one can see that the result is an information that does not provide a reliable picture of how research funding is being used.

Other countries' solutions

This is not a new problem and India does not have to solve it from scratch. A global, non-profit infrastructure setup called the Grant Linking System already exists to do exactly this. It was built by the open digital infrastructure organisation Crossref. Its registry is called 'Research Organisation Registry' (ROR), built by a different organisation.

The system works through a small number of PIDs, each solving one piece of the puzzle. First, a funder ID identifies the funding agency in detail – the division, department, and even ministry if required. A similar ROR ID identifies the institution receiving the funding. Finally, an 'ORCID' identifier – familiar to Indian researchers today since most scientific journals today ask for it – identifies the individual researcher, so that funding data can be aggregated per person.

Since 2020, Crossref has also extended its system to include a grant DOI: a permanent identifier for the grant itself, which can be linked to whatever comes out of it – papers, patents, data.

Taken together, these four identifiers plus the metadata allow a funder or an independent analyst to ask questions that are nearly impossible to answer in India today. For example, how many different agencies have funded near-identical proposals? Which fields are receiving disproportionate investments relative to the national priorities? Does a small number of institutions or researchers account for a large share of the total

funding? This is why many research funders have adopted this system, with more than 2 lakh grants registered on it worldwide. The scale of the underlying problem this system solves is also well-documented. One 2013 analysis of U.S. funders used automated

text-matching software to scan several lakh federal grant applications and estimated that duplicate or substantially overlapping funding may have cost the U.S. nearly \$70 million. In a more recent analysis, in 2020, analysts checked nearly 20,000 competitive grants in Denmark and found that funds were getting concentrated among a small group of individual researchers and a narrow set of research topics.

This is similar to the pattern the NITI Aayog report flagged for Indian funding agencies – and painstakingly so.

Two ways forward

Policymakers considering how to act on NITI Aayog's findings face two broad options. One is to build an entirely new, India-specific system from the ground up – a sovereign national grant registry, developed and maintained independently. This has the appeal of full control: India will own the infrastructure outright and could tailor it precisely to its own agencies and federal structure, including State research schemes that a global system might not naturally prioritise. The second option is to plug into the existing global non-profit infrastructure, requiring India's funding agencies to become members of – and consistently deposit data with – the Crossref ecosystem that many research funders already use worldwide. This can be implemented faster since the technical standards and governance already exist,

and are maintained by an international community rather than by a single Indian agency operating alone. It would also make India's publicly funded research immediately visible and comparable within the same global dataset used to study research funding everywhere.

There is also a practical middle path: using the technical infrastructure of PID generators and funders' own governance structure. Specifically, we can learn from systems that have worked elsewhere, such as the U.K. 'Gateway to Research' portal and the European Union's Community Research and Development Information Service (CORDIS) and Open Access Infrastructure for Research in Europe (OpenAIRE). They run their own government-owned portals as the single point of entry for funding agencies, and the portals generate identifiers fully compatible with the global Crossref/ROR/ORCID standards.

This gives national governments political ownership and the ability to require all domestic agencies to comply – while also ensuring that the resulting data speaks the same language as the rest of the world's research infrastructure.

For India, this hybrid model would mean a single national portal – one that the NITI Aayog has already proposed, called UPMS, and which Central and State funding agencies must use. The UPMS system can internally mint Crossref-compatible grant DOIs and link every record to ROR and ORCID identifiers. Then, it will be much easier to check for duplicate records, fund concentration, and so on.

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- 2.(a) लोक निधियों का प्रभावी उपयोग विकास के लक्ष्यों को प्राप्त करने हेतु निर्णायक है। लोक निधियों के अल्प उपयोग एवं दुरुपयोग के कारणों का समालोचनात्मक परीक्षण करते हुए उनके निहितार्थों की समीक्षा कीजिए। (150 शब्द)

Effective utilization of public funds is crucial to meet development goals. Critically examine the reasons for under-utilization and mis-utilization of public funds and their implications. (150 words)

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1. India's Research Funding: Towards a Unified and Accountable R&D Ecosystem

Source: The Hindu

GS: GS-III — Science & Technology | Research & Development | Governance

Context: India's expanding public research investment needs a stronger system for **coordinating funding, widening institutional access, tracking grants and measuring research outcomes.**

1. Present Status of R&D Funding

- A **NITI Aayog assessment**, based on inputs from **400+ institutional leaders and 850 scientists**, highlights gaps in India's research-funding architecture.
- Nearly **80% of Anusandhan National Research Foundation (ANRF) funding** is concentrated in the **Indian Institutes of Technology (IIT) system**, indicating the need to strengthen research capacity and funding access across a broader institutional base.
- Research funding is administered through multiple **Ministries, Departments and agencies**, with information maintained through separate systems.

2. Key Challenges in the Existing System

- **Fragmented data:** Different agencies maintain funding information in different formats, preventing a consolidated view of national research expenditure.
- **Limited traceability:** It is difficult to establish the complete link between **funding agency, grant, researcher, institution, project and outcome.**
- **Risk of duplication:** Lack of cross-agency visibility can result in overlapping or duplicate research funding.

- **Uneven institutional participation:** Concentration of funding can restrict the development of research capabilities beyond established centres.

- **Weak outcome assessment:** Funding and expenditure are easier to record than their conversion into **publications, patents, technologies and societal applications**.

3. **Government's Response: Strengthening the R&D Ecosystem**

- **Anusandhan National Research Foundation (ANRF):** Established under the **ANRF Act, 2023**, to strengthen research and innovation and promote greater collaboration among academia, research institutions and industry.

- **Research, Development and Innovation (RDI) Fund:** A **₹1 lakh crore, six-year initiative** aimed at encouraging private-sector investment in research, development and innovation, particularly in high-impact and emerging technologies.

- **National Quantum Mission (NQM):** With an outlay of **₹6,003.65 crore for 2023–24 to 2030–31**, it seeks to build national capabilities in quantum computing, communication, sensing and related technologies.

- These initiatives expand India's **funding and institutional capacity**, but effective coordination and tracking of public research investment remain essential.

4. **Unified Project Management System: Integrating the Funding Cycle**

- The proposed **Unified Project Management System (UPMS)** seeks to bring publicly funded R&D projects under a common digital architecture across Ministries and Departments.

- It can integrate the complete project cycle: **Proposal → Evaluation → Approval → Funding → Monitoring → Research Output → Outcome**

- Linking researchers, institutions, grants and research outputs would make it easier to identify **duplication, funding concentration, research gaps and project outcomes**.

- The system should therefore function as an **interoperable architecture connecting existing databases**, rather than merely becoming another standalone portal.

5. **International Best Practices**

- **United Kingdom — Gateway to Research:** Provides consolidated information on publicly funded research and its outcomes.

- **European Union — CORDIS (Community Research and Development Information Service):** Provides structured information on European Union-funded research and innovation projects.

- The common lesson is the importance of **standardised data, interoperability and searchable research information**.

6. **Why Reform Matters**

- **Efficient use of public funds:** Reduces duplication and improves allocation.
- **Research equity:** Improves visibility and access to funding opportunities for universities and emerging institutions.
- **Administrative efficiency:** Reduces repetitive procedures and allows researchers to focus more on scientific work.
- **Innovation outcomes:** Strengthens the pathway from **public R&D investment to patents, technologies, commercialisation and societal applications**.
- **Strategic capability:** Better R&D governance strengthens India's capacity in critical and emerging technologies.

7. **Way Forward**

- Create a **national interoperable R&D funding architecture** connecting major funding agencies.
- Adopt common **metadata standards and persistent identifiers** for researchers, institutions, grants and research outputs.
- Expand competitive funding beyond established institutions while retaining **peer-reviewed, merit-based selection**.
- Introduce **outcome-based evaluation** alongside financial monitoring.
- Simplify procedures and ensure **time-bound grant approval and fund disbursement**, while protecting intellectual property and strategically sensitive research.

Tap household savings for growth



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Households need to be incentivised to increase their long-term savings in financial assets that have the risk-return characteristics they seek

IF INDIA IS to grow at the rate the government wants, it will need to invest more and invest wisely. A long list of financial sector reforms to make this possible are desirable and feasible, as I argued in my last column. The current process of identifying and implementing financial sector reforms has been going on for almost two decades, although earlier efforts began soon after the original trade and industry reforms of 1991. But the cost of capital in India is considerably higher than it needs to be. This reinforces the point that financial sector reforms in India have to do more. What is effectively a penalty or tax for India's firms that seek productive investment was more tolerable when the global cost of capital was unusually low. That situation has changed, so reducing the investment cost penalty in India is becoming more urgent.

Many governments are running higher deficits than before the Covid pandemic, and there is an enormous demand for funds to finance a rapid buildout of AI infrastructure. India will have to work harder to attract foreign investors than in the recent past. Perceptions of increased geopolitical risks, mostly the result of decisions taken by the current US administration, will encourage capital to stay closer to home. India also has to tap domestic sources of capital. The government invests in key components of public infrastructure, though it is a net dissaver. Firms also invest from their retained earnings. Both

also rely on the savings of the population at large, that is, households.

The Raghuram Rajan report of 2008 formed the basis for later financial sector reforms, especially when Rajan became RBI governor in 2013. A month before he stepped down from that job in 2016, a Committee on Household Finance, headed by Tarun Ramadorai, was established, and submitted its report the next year. Many of that committee's recommendations echoed other ideas for financial sector reform — streamlining regulation, improving financial sector technology and adopting it more widely, improving financial literacy, and so on. But a core emphasis of the report was the desirability of shifting household savings from physical assets to financial assets.

The underlying idea is, of course, that when households put money into bank accounts, pension funds, stock markets, and insurance policies, this money becomes potentially available to private firms that can make productive investments. There is no guarantee that this will occur, but if household savings are locked away as gold jewellery, that potential is zero. Physical holdings of gold by households are culturally important, so changing that behaviour will take time. But in any case, the largest cat-

egory of physical assets within household savings is real estate — that is, housing. Like gold, real estate is a traditional hedge against inflation. This is true not just in India. As long as rental and sales markets for housing function well (so that buildings do not sit empty), having a better housing stock can have major positive welfare consequences, so sacrificing those benefits for investment in private sector firms comes at a cost.

A major development in India has been the opening up of housing finance, so that households do not have to wait most of their lifetimes to save enough to buy or build a house. This has contributed to a fall in the net savings of households, since they are borrowing more to have their own places to live. But households are now also able to buy a wider range of goods and services on credit. What they can do depends on their income levels, of course. Buying a vehicle or a refrigerator on credit may also have significant positive welfare effects, so these new opportunities for "consumption smoothing" should not be dismissed. These kinds of consumptions can also increase individual productivity, although this is hard to measure.

Given all these nuances, if the government wants to make household savings a bigger part of the investment

needed to finance growth, what can it do? The answer, in the abstract at least, is surprisingly simple. Households will save if they have opportunities to do so that have low transaction costs, low risk, and reasonably high returns. Indian policymakers can do much more, and act much more quickly, to expand the options for pension plans and "defined contribution" retirement savings plans. Providing tax advantages for retirement savings is an important part of this policy imperative.

The Ramadorai committee also emphasised the importance of new and expanded vehicles for retirement savings. The details of making this happen are non-trivial — new risks can arise for savers and for the custodians of these funds if institutional design is deficient. But there is so much domestic and global experience to draw on, that institutions and policies can be crafted and implemented quickly. Well-designed retirement savings plans will compete more effectively with physical assets as destinations for household savings.

To the extent that individuals are rational economic decision-makers, the current state of household savings in India is a message to the government that its policy mix is not what it should be. Households need to be incentivised to increase their long-term savings in financial assets that have the risk-return characteristics they seek. This increased saving can help finance the growth that the government is seeking.

Households will save if they have opportunities to do so that have low transaction costs, low risk, and reasonably high returns

2. Household Savings: Channelising Domestic Wealth into Productive Investment

Source: Financial Express

GS: GS-III — Indian Economy | Financial Sector | Investment

Context: India's rising investment requirements and relatively high cost of capital make it essential to **mobilise household savings into productive financial assets** that can finance investment and sustain growth.

1. Why Household Savings Matter

- Households are a major source of domestic savings and therefore an important source of **capital for investment**.

- During **FY2012–FY2023**, households contributed an average **64% of India's total domestic savings**, highlighting their central role in financing the economy.
- Household savings can be channelled through **banks, insurance, pension funds, mutual funds and capital markets** into infrastructure, businesses and other productive activities.

2. The Shift from Physical to Financial Assets

- Household wealth has traditionally been concentrated in **real estate and gold**, reflecting their perceived security, inflation-hedging capacity and tangible nature.
- In **FY2022–23**, around **70% of household savings went into physical assets**, indicating considerable scope for greater financialisation.
- However, the trend towards financial assets is strengthening: the share of **equity and mutual funds in annual household financial savings rose from about 2% in FY2012 to over 15% in FY2025**.
- The objective is therefore not to eliminate physical-asset investment, but to provide **financial instruments offering competitive risk-adjusted returns, liquidity, simplicity and trust**.

3. Key Barriers to Financialisation

- **Financial literacy**: Limited understanding of financial products and risk-return trade-offs restricts informed participation.
- **Risk and trust**: Tangible assets are often perceived as safer and easier to understand.
- **Complexity and transaction costs**: Complicated products and procedures discourage long-term financial investment.
- **Retirement security**: Households require reliable long-term instruments capable of providing adequate post-retirement income.

4. Financial-Sector Reforms and Emerging Trends

- Financial-sector reforms since **1991** have strengthened financial markets, regulation, technology and financial intermediation.
- The **Raghuram Rajan Committee (2008)** and the **Committee on Household Finance chaired by Tarun Ramadorai (2017)** emphasised financial inclusion, financial literacy and better financial products.
- Increasing participation in capital markets indicates a gradual shift towards financial assets; however, this needs to become a **broader and more stable household savings trend**.

5. Why Financialisation Matters for Growth

- **Lower cost of capital:** A larger domestic pool of investible funds can improve the availability of capital for productive investment.
- **Long-term financing:** Pension and insurance savings can provide patient capital for infrastructure and other long-gestation projects.
- **Capital-market deepening:** Greater household participation broadens the investor base for equity and debt markets.
- **External-sector resilience:** Strong domestic savings reduce dependence on volatile foreign financing.
- **Household security:** Well-regulated financial assets can combine **wealth creation, liquidity and retirement security**.

6. Way Forward

- Expand **pension, insurance, equity, bond and mutual-fund products** suited to different household risk-return preferences.
- Strengthen **financial literacy and investor awareness** so that households can make informed choices.
- Reduce transaction costs and simplify financial products to improve accessibility.
- Strengthen **consumer protection, regulation and grievance redressal** to build trust in financial markets.
- Encourage long-term retirement savings through well-designed **pension and defined-contribution instruments**.
- Ensure financial assets provide **competitive risk-adjusted returns**, allowing financialisation to occur through informed household choice rather than forced diversion from physical assets.

Our Central Asia strategy needs less romance, more realism



RAJA MANDALA
BY C RAJA MOHAN

WHEN THE Soviet Union dissolved in 1991 and five new republics emerged in Central Asia, there was extraordinary enthusiasm in Delhi about reconnecting with a region that had deep historical ties with India. But India's lack of direct access, limited national capabilities, and persistent geopolitical headwinds have complicated that engagement.

India was not alone in imagining a grand reconnection between Central and South Asia. After the 9/11 attacks, the Bush administration bet that Afghanistan's long-term stability could be secured by reconnecting the two regions. In 2006, Washington reorganised the State Department to bring the Central Asian states together with Afghanistan and the Subcontinent in a new South and Central Asian bureau. The hope was that Afghanistan could become a natural bridge between the two regions. That vision proved difficult to realise amid Afghanistan's internal and external conflicts and the enduring tensions between India and Pakistan.

Prime Minister Narendra Modi, who travels to Central Asia this week for a bilateral visit to Uzbekistan and the Shanghai Cooperation Organisation summit in Kyrgyzstan, will find a region very different from the one he toured in 2015. Four broad trends stand out.

The first is the growing geopolitical agency of Central Asia. Long viewed as five vulnerable landlocked states — Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan — on the periphery of Russia and China, they are acquiring greater internal coherence. Since 2018, the five have met regularly at the summit level in the consultative meetings of the heads of state of Central Asia. They have now signed a friendship treaty among themselves and plan to give it some Real Creator IAS Edition <https://whatsapp.com/channel/0029Van2VRb6RGJOKH6oBd0F>



ILLUSTRATION: C R SASIKUMAR

organisational substance and turn the region into a genuine Central Asian community. The Central Asian Five invited Azerbaijan to form the C-6 that links Central Asia more closely to the Caucasus and Türkiye.

Equally important has been the settlement of the long-running border disputes in the Fergana Valley among Uzbekistan, Kyrgyzstan, and Tajikistan. Growing intra-regional trade has reinforced the new political cooperation. Central Asia is becoming more of a region in its own right rather than merely the sum of five post-Soviet republics.

Second is the diversification of great-power relations. The traditional "Great Game" framework — external powers competing for control over a passive Central Asia — is utterly inadequate. In 2025, Central Asian leaders held summits with the EU, China, Russia, the United States and Japan. Central Asia has never been more courted — and perhaps never less amenable — to exclusive relationships.

Russia remains an important partner in security, but the Ukraine war and China's rising economic influence have weakened Moscow's former dominance. Washington has returned with a new emphasis on commerce, critical minerals and energy corridors. Europe, Japan and others are also expanding their engagement. Central Asia's answer

India cannot match China's infrastructure spending, Russia's geographic advantages or Türkiye's direct access across the Caspian. Nor does it need to. Sustained political attention should be matched by a practical economic agenda

is the familiar "multi-vector" strategy — not unlike India's own multi-alignment. It engages all and commits exclusively to none.

The third trend is Central Asia's growing entanglement with the Greater Middle East. Although predominantly Muslim, the region's political and cultural orientation was long shaped by its Russian and Soviet past. That balance is changing. At the Central Asian summit with the US in Washington last November, Kazakhstan announced its accession to the Abraham Accords. Azerbaijan, Kazakhstan and Uzbekistan signed the charter of Trump's Board of Peace at Davos in January. Gulf capital has become increasingly important across Central Asia. Türkiye has transformed the Organisation of Turkic States from a largely cultural forum into an instrument for wider political, economic and defence cooperation.

The Iran war has complicated Central Asia's traditional southern access to the open seas and increased the importance of alternative routes westward across the Caspian towards Azerbaijan, Türkiye and the Mediterranean. The region's geopolitical horizons are widening well beyond the old Russian-Chinese framework.

Fourth is the diminution of the Afghan question. The much-feared export of revolution after the Tali-

ban's return to power five years ago has not materialised. Central Asian states including Tajikistan, which was most fearful of the Taliban, have moved towards pragmatic engagement with Kabul. Meanwhile, they have cracked down hard on the radical forces at home. But new problems are arising, for example on the management of the shared waters of Amu Darya.

Where does all this leave India?

Delhi enjoys considerable goodwill in Central Asia, but geography continues to constrain its ambitions. India has no direct land access. Pakistan blocks the obvious overland route, while Afghanistan remains unstable. Chabahar and the International North-South Transport Corridor offered an alternative, but the growing conflict between Iran and the US has complicated their prospects. India's one hard-built connectivity node in the region now sits idle.

The changing regional dynamic therefore calls for a less romantic and more modest Indian approach.

India cannot match China's infrastructure spending, Russia's geographic advantages, Europe's financial resources or Türkiye's direct access across the Caspian. Nor does it need to. Sustained political attention should be matched by a practical economic agenda focused on areas where India can contribute. Delhi must also consider whether greater diplomatic flexibility towards Pakistan, Türkiye and Azerbaijan can improve its room for manoeuvre in the region.

Above all, India must recognise the political character of the new Central Asia. Its states do not want another patron; they want multiple partnerships that expand their room for manoeuvre. Modi's visit should be less about grand schemes and more about ensuring a modest, sustained and steadily expanding Indian presence in a Central Asia that is increasingly confident of playing its own game.

The writer is contributing editor on international affairs for The Indian Express. He is a distinguished professor at the Motwani Jadeja Institute of American Studies, Jindal Global University, and holds the Korea Foundation Chair on Asian Geopolitics at the Council for Strategic and Defence Research, Delhi

10. मध्य एशिया, जो भारत के लिए एक हित क्षेत्र है, में अनेक बाह्य शक्तियों ने अपने-आप को संस्थापित कर लिया है। इस संदर्भ में, भारत द्वारा अश्गाबात करार, 2018 में शामिल होने के निहितार्थों पर चर्चा कीजिए।

(उत्तर 150 शब्दों में दीजिए)

A number of outside powers have entrenched themselves in Central Asia, which is a zone of interest to India. Discuss the implications, in this context, of India's joining the Ashgabat Agreement, 2018.

(Answer in 150 words) 10

3. India–Central Asia Relations: From Historical Ties to Strategic Realism

Source: The Indian Express — Editorial

GS: GS-II — International Relations | Central Asia | Geopolitics | Connectivity

Context: Central Asia is gaining greater **strategic autonomy and geopolitical importance**, but India's engagement remains constrained by geographical isolation and inadequate connectivity, necessitating a more **pragmatic, multi-dimensional and interest-driven approach**.

1. Central Asia: An Emerging Strategic Space

- The five republics — **Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan** — have strengthened their strategic autonomy since the **dissolution of the Soviet Union in 1991**.
- Growing **intra-regional cooperation, trade and border settlement**, along with regular consultations among the five states, indicate increasing regional cohesion.
- The region is increasingly following **multi-vector diplomacy**, maintaining partnerships with **Russia, China, Türkiye, the European Union, the United States, Japan and West Asian countries**.

2. Why Central Asia Matters to India?

- **Geostrategic Location:** Central Asia lies at the intersection of **Russia, China, South Asia, West Asia and Europe**, making it important to India's broader **Eurasian strategy**.
- **Connectivity:** Access to Central Asia can connect India with **Eurasian markets** and help overcome its geographical disadvantage through **Chabahar Port and the International North-South Transport Corridor (INSTC)**.
- **Energy Security:** The region possesses significant **hydrocarbon resources**, while Kazakhstan is particularly important for **uranium supplies**.
- **Critical Minerals:** Central Asia offers opportunities for diversifying India's supply chains for **critical and strategic minerals** required for clean energy and advanced technologies.
- **Regional Security:** Cooperation is important against **terrorism, extremism, drug trafficking and transnational organised crime**, particularly in the context of Afghanistan.
- **Economic Opportunities:** Scope exists for Indian **pharmaceuticals, healthcare, Information Technology (IT), education, agriculture and engineering services**.
- **Strategic Autonomy:** Central Asian states' multi-vector approach creates space for India to emerge as a **reliable additional partner** without demanding exclusive alignment.
- **Multipolarity:** Greater Indian engagement can contribute to a more **balanced and multipolar Eurasian order**.

- **Civilisational Linkages:** Historical connections through the **Silk Routes, Buddhism, Sufism, trade and cultural exchanges** provide a foundation for contemporary diplomacy.

3. **India's Core Constraint: Connectivity Deficit**

- India has **no direct land access** to Central Asia; Pakistan blocks the most direct overland route.
- Afghanistan presents additional **security and political constraints** to establishing a direct land corridor.
- India has therefore pursued **Chabahar Port in Iran** and the **INSTC** as alternative connectivity mechanisms.
- However, geopolitical tensions involving Iran create uncertainty, demonstrating the need for **diversified and commercially viable connectivity corridors**.

4. **Changing Regional Power Balance**

- **China:** Strong advantage in **infrastructure financing, trade and connectivity**, giving it substantial economic influence.
- **Russia:** Retains importance in **security, defence and historical ties**, although its relative influence has been affected by the Ukraine conflict.
- **Türkiye:** Expanding political, cultural, economic and defence engagement through the **Organisation of Turkic States**.
- **European Union, United States and Japan:** Growing engagement provides Central Asian countries with greater **strategic options and bargaining space**.
- The region is therefore shifting from a Russia-dominated space towards a **competitive but multi-aligned geopolitical order**.

5. **Afghanistan: Security Challenge and Potential Connectivity Link**

- Central Asian states remain concerned about **terrorism, extremism and instability** originating from Afghanistan.
- At the same time, several have adopted **pragmatic engagement with the Taliban** to protect their security and economic interests.
- A stable Afghanistan could eventually provide a **South Asia–Central Asia connectivity bridge**, but security concerns remain significant.

6. **Emerging Regional Issues**

- **Water Security:** The **Amu Darya** and other transboundary water systems are becoming important sources of potential regional tension.
- **West Asian Linkages:** Growing engagement with **Iran, Gulf countries and Türkiye** is expanding Central Asia's strategic options.
- **Caspian Connectivity:** The **Caspian Sea–Azerbaijan–Türkiye–Mediterranean** route is becoming increasingly relevant to Eurasian trade and connectivity.

7. **India's Comparative Advantage**

- India cannot realistically match **China's infrastructure capacity, Russia's geographical advantage or Türkiye's direct access to the region.**
- India should therefore focus on sectors where it has genuine comparative advantages:

Pharmaceuticals | Healthcare | Information Technology | Education | Capacity Building | Development Partnerships

- The objective should be to convert India's **political goodwill and civilisational connect into tangible economic and strategic outcomes.**

8. **India's Existing Engagement Framework**

- **India–Central Asia Dialogue:** Provides a platform for cooperation on **trade, connectivity, security, culture and development.**
- **Chabahar Port:** Provides India with an alternative gateway to Central Asia while bypassing Pakistan.
- **International North-South Transport Corridor:** Provides a potential multimodal route connecting India with **Iran, Central Asia, Russia and European markets.**
- **Shanghai Cooperation Organisation (SCO):** Provides a multilateral platform for India's engagement with all five Central Asian republics.

9. **Way Forward**

- **Diversify connectivity:** Strengthen Chabahar and the INSTC while developing alternative routes through the **Caspian region and Caucasus.**
- **Deepen economic engagement:** Move from diplomatic goodwill to greater **trade, investment and private-sector partnerships.**
- **Strengthen security cooperation:** Expand cooperation on **Afghanistan, terrorism, extremism, drug trafficking and transnational crime.**

- **Leverage comparative advantages:** Prioritise healthcare, pharmaceuticals, digital technology, education and capacity building.
- **Practise flexible diplomacy:** Respect Central Asian states' strategic autonomy and multi-vector foreign policy.
- **Ensure sustained engagement:** Combine political outreach with long-term projects, institutional mechanisms and measurable outcomes.

Is English a foreign language in India?



Apoorvanand
Professor in the Hindi department of the University of Delhi



Ganesh Devy
Former professor of English and the man behind the People's Linguistic Survey of India project

PARLEY

The Supreme Court has been discussing linguistics this month while hearing challenges to the CBSE's three-language formula, which mandates that two of the three languages must be native Indian languages, a category that does not include English. The top court had wondered whether it was correct to treat English as a "non-indigenous" language, given its long history in the country, and its role as a link language in governance and higher education. So should English be considered a foreign language in India? Apoorvanand and Ganesh Devy discuss the question in a conversation moderated by **Priscilla Jebaraj**.

Is English a foreign language in India?

Apoorvanand: No. It came from outside the geography that we define as India now. But it has been Indianised. We cannot now say that English is foreign to the soil because it's being used in different forms and for different purposes by people across India.

Ganesh Devy: Hindi and English are born of the same Indo-European language family. One part of that family came to us 3,500 years ago; that was Sanskrit and one of the descendants of Sanskrit is Hindi. Another part came through Europe 400 years ago, in the 17th century. So, they both belong to the same root language, and both of them have come to us at different times.

In fact, the only major indigenous language in India is Tamil as it does not come from outside. But for that reason, we cannot impose Tamil on all students. Similarly, we cannot impose English or Hindi. So in India, the language question cannot simply be seen in terms of which is foreign, which is indigenous.

The history of English in India includes both imperialism and the freedom movement, Macaulay and Gandhi. How has this complicated the issue?

GD: Macaulay's minute is relatively recent, dated 1835; the East India Company had started using English in India almost 230 years before that. The interaction between English and other languages started in the 17th century and intensified during the 18th century. In the 19th century, the English governors in Calcutta, Bombay, and Madras insisted on teaching children in native languages, that is, the regional languages. Elphinstone very clearly gave written instructions to teach children in Gujarati and Marathi in the Bombay presidency. But by 1835, the East India Company was thinking of how to bring in legislation to replace Persian, which had been kind of a national language connecting India for several centuries, and that is when Macaulay came in.

AP: English came as a language of traders and



A semi-open class in a school in New Delhi on January 24. R.V. MOORTHY

missionaries and gradually became the language of the administration and the state, but then it also became the language of education. We see an elite being formed through English and also the formation of nationalism or nationalist ideas through English. So that's a very complex journey. We cannot treat English as a simple imposition on Indians. Indians adopted it, domesticated it, and then used it against those who had colonised India. It became a language of liberation for many communities who did not have access to education or knowledge for generations.

English has become the language of aspiration and status. How does that impact social and political dynamics?

GD: The creation of an English-speaking elite has to be seen in the historical context of an earlier experience, where Sanskrit had formed an elite which brought in the *varna* system. The English language created an elite in India who tried to change that system and make India a modern society. Moreover, in India, in order to get a good job one often needs to migrate outside one's State. And as soon as migration is involved, the need for English is enhanced.

AP: English is connected with social mobility as well as geographical mobility. No other language gives you this advantage.

According to the 2011 Census, 10% of the Indian population speak English, and the numbers are only increasing. Has this resulted in the suppression of other Indian languages or has it spread multilingualism?

AP: It would be very simplistic to make a direct cause and effect relationship, because multi-linguality is a feature of India and there are different reasons for which people use different languages at different levels. In my Delhi classroom, the students are largely from the so-called Hindi belt. But for most of them, their home or street language is actually Bhojpuri or Braj or Avadhi or Maithili. So there are many languages which live side-by-side,



We cannot treat English as a simple imposition on Indians. Indians adopted it, domesticated it, and then used it against those who had colonised India. It became a language of liberation for many communities

APOORVANAND

performing different functions.

Being a teacher of Hindi, I regret that Hindi is in fact erasing many languages, which had a very rich tradition and which are living languages such as Maithali or Braj or Avadhi or Dondari or even Adivasi languages, because the state is not investing in them. They have now become oral languages, pushed to the margins, while all attention goes to Hindi. It's Hindi imperialism in Hindi areas; Hindi is a coloniser.

What is the impact of the rise of English as well as Hindi on other languages?

GD: First, let me say that the Census of India is not at all a clear mirror as far as language is concerned. For example, if a language is spoken by less than 10,000 persons, the Census says it is not a language. Then, if you look at how many individuals are studying in universities in India, the total figure at any given time in the last 10 years would be about four crore. Each one of them know English as a second language because English is the language of higher education, and yet the Census does not reflect those figures.

Hindi has been gulping other languages. In the Census itself, some 56 other languages are included as subsets of Hindi. There is a language called Pawri which is spoken by the Pawra Adivasi community, on the border of Maharashtra and Madhya Pradesh, who do not understand Hindi at all. Yet that is shown as a subset of Hindi. It is the same with Tamil, Kannada and Marathi. All smaller languages are being shown as subsets of larger languages and that comes from the state's desire to have some kind of linguistic unity. India is made of many languages and that is the fundamental truth. Just last week, in Maharashtra, rickshaw drivers and taxi drivers were on strike because there is a compulsion that they have to pass an examination in Marathi, based on grammar. Why would a taxi driver need Marathi grammar? He has functional Marathi. Indians speak a lot of functional languages. They speak English, not as the British do, but as a functional language. They speak Hindi all over India as a functional language.

And I think we should never forsake the beauty of having multiple functional languages in our pocket, in our hearts, and in our brains. But there is also a vested interest in English in India from English language publishers and English medium schools. They bat for the continuance of English partly out of commercial

interest. I don't agree with that.

AP: On the CBSE and their stress on a three-language formula, and the insistence of policymakers that they want children to learn the mother tongue – all this is farcical because people know that all these policymakers are sending their own children to English medium schools and that English is social capital, cultural capital, and capital in real terms.

There's also a significant amount of Indian literature written in English today, including works in translation. And of course, films and the Internet freely mix languages. How does that change the debate?

GD: In the 6th, 7th, and 8th centuries, many Indians produced books in Sanskrit. Then, in the 15th and 16th centuries, India was producing more books in Persian. Today, India is producing more books in English than they produce in England. But our desi languages have still survived.

So the production of books, movies, and songs in a certain language is not necessarily an indication of a profound fundamental cultural shift. There are just two small questions to be asked to anybody who is writing English fiction or non-fiction. The first is, when that person goes into any spiritual space, is their prayer also in English? The second question is, is the audience only Indian or is it a global audience? The answers to these two questions will reveal the exact significance of the shift.

By the way, the English came here and had an impact on many things. But Indian music remains Indian music. We have internalised but not replaced. So, our cultural reception of English culture has been calibrated, granular, and is not wholesale as in Australia, U.S. or in Canada where native cultures were wiped out.

AP: I would disagree with that. For example, in my daughter's generation or the generation after, their first love in music is through English and not "Indian music". I don't see any problem in that and I don't see them as culturally uprooted. Would we say that this young generation or those bands which sing only in English are not culturally Indian? It's a very complex concept and the whole anxiety about maintaining nativity and creating a difference between what is indigenous and what is foreign is also problematic. Therefore, I would like to argue that English has made India its home. Those who want to declare that it's a foreign language, in fact, want to hide the fact that Hindi colonises other languages and so do Tamil and other languages, when you create these as meta languages and others as sub languages.



To listen to the full interview
Scan the code or go to the link
www.thehindu.com

4. English in India: Colonial Legacy, Social Mobility & Multilingualism

Source: The Hindu

GS: GS-I — Indian Society & Culture | GS-II — Education & Governance

Context: The **Supreme Court's discussion on the three-language formula** has revived the debate over English's status in India, where it functions as a language of **education, employment, governance and social mobility** alongside diverse Indian languages.

1. **Historical Evolution — Colonial Origin, Indian Appropriation**

- **Colonial introduction:** English expanded through **trade, administration and education** under British rule.
- **Macaulay's Minute, 1835:** Strengthened English in the colonial education system.
- **Post-colonial appropriation:** Indians transformed English from a colonial instrument into a language of **education, political expression, literature and opportunity**.

2. **Social Mobility — Language as Economic Capital**

- **Education & employment:** English provides access to **higher education, professional jobs and global opportunities**.
- **Social capital:** English proficiency increasingly functions as a form of **economic and cultural capital**, particularly in urban and professional spaces.
- **2011 Census:** Around **10% of India's population reported knowledge of English**, with the number increasing over time.

3. **Multilingualism — India's Linguistic Reality**

- **Functional multilingualism:** Indians often use different languages for different purposes — **mother tongue for community life and English for higher education/professional communication**.
- **Complementarity:** English need not replace Indian languages; the objective should be **multilingual proficiency**.

4. **Key Concern — Linguistic Inequality**

- **Access gap:** Unequal access to quality English education can reproduce **socio-economic inequality**.
- **Language preservation:** Excessive dominance of English can place smaller and indigenous languages under pressure.

- **Balanced approach:** English should expand opportunities without becoming a **gatekeeper** for education and employment.

5. Three-Language Formula — Policy Challenge

- **Demand for English:** Strong parental demand reflects its perceived link with **employment, social mobility and global connectivity**.
- **Policy balance:** Language policy must simultaneously promote **Indian languages, English proficiency and linguistic diversity**.

6. Way Forward — Multilingual India

- **Quality multilingual education:** Strengthen mother-tongue/regional-language learning while ensuring effective English proficiency.
- **Translation & technology:** Expand translation and **Artificial Intelligence-enabled language technologies** for wider access to knowledge.
- **Protect linguistic diversity:** Support **tribal, indigenous and minority languages** through documentation and education.

Salmonella infections: why India needs to look beyond typhoid and diarrhoea

Athira Elissa Johnson

Salmonella is often linked to food poisoning, diarrhoea and typhoid. But the infection can range from mild gastroenteritis that gets better on its own to a serious bloodstream infection, and therefore, say experts, deserves more attention than it is currently being given.

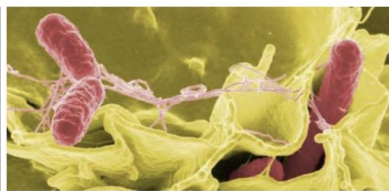
Salmonella is a group of bacteria that can cause different infections. Typhoid and paratyphoid or enteric fever, are caused by Salmonella Typhi and Salmonella Paratyphi. The problem, however, is broader than typhoid. Non-typhoidal Salmonella infections, which often cause gastroenteritis, may go undiagnosed because many people recover without testing. At the same time, antibiotic resistance is making serious infections harder to treat.

Why infections turn serious
Non-typhoidal Salmonella commonly causes gastroenteritis, with diarrhoea, stomach cramps, fever and sometimes vomiting. It is

often linked to poultry, eggs and other animal-based foods. Most healthy people recover with supportive care, but the infection can become serious and spread to the bloodstream. "Salmonella should not be seen as only a cause of diarrhoea," said Sweatha Kumar, associate consultant, infectious diseases, Rela Hospital, Chennai. "In some patients, especially young children, older adults and those living with other illnesses or weakened immunity, it can become invasive and life-threatening."

Suresh Kumar D., senior specialist in infectious diseases, Apollo Speciality Hospitals, Vanagaram, Chennai, said the actual burden of non-typhoidal Salmonella is difficult to estimate as many mild infections are never diagnosed.

Both typhoid and non-typhoidal Salmonella infections spread through the faecal-oral route, but their sources are different. For typhoid, humans are the reservoir. Non-typhoidal Salmonella has a wider ecology, involving animals, food and the environment. Poultry,



Preventing infections: Typhoid conjugate vaccines, safer water and sanitation, food safety and antimicrobial stewardship all have a role in reducing infections. WIKIMEDIA COMMONS

eggs, meat and other animal-derived foods can be sources. Transmission can also occur when raw meat contaminates ready-to-eat food during preparation.

"Contamination can occur at multiple points, from farms, slaughterhouses and food processing to transportation, storage, restaurants and finally the household kitchen," Dr. Sweatha said. "That is why Salmonella is very much a One Health problem

involving humans, animals, food and the environment."

Food handlers can play an important role in transmission, as those carrying the infection can contaminate food and potentially expose many people to the bacteria. But food safety cannot depend only on individual food handlers. The wider system needs better training, sanitation, refrigeration, monitoring and enforcement. While the Food Safety and Standards Authority of

India has surveillance and testing systems, gaps remain, particularly in the large informal food sector.

At the household level, it is important follow: washing hands, using safe water, cooking poultry and eggs thoroughly, refrigerating perishable foods appropriately and keeping raw meat separate from ready-to-eat food.

Challenges and way forward

The major concern is the growing antimicrobial resistance in Salmonella. India has seen a major shift in the resistance pattern of S. Typhi. A recent study in *PLOS Neglected Tropical Diseases* said, culture-confirmed isolates from 1977 to 2024 found that fluoroquinolone resistance rose sharply, reaching 85% in 2015-19, and remains high despite a subsequent decline.

"The emergence and spread of extensively drug-resistant typhoid shows what can happen when resistance accumulates across multiple antibiotic classes," Dr. Sweatha said, "It can leave clinicians with very limited treatment options."

Experts say the answer is not to simply use stronger antibiotics. Blood culture is the main test for suspected typhoid and should ideally be done before antibiotics are started. The Widal test has limitations and should not be used alone to diagnose typhoid. For uncomplicated non-typhoidal Salmonella gastroenteritis, treatment mainly involves adequate fluids and electrolyte replacement. Antibiotics are usually reserved for severe or invasive infections and people at higher risk of complications.

Prevention remains as important as treatment. The World Health Organization recommends typhoid conjugate vaccines for children from six months of age; however, this not yet part of India's universal immunisation programme.

The challenge is to treat the infections that genuinely require antibiotics while preventing the infections that can be prevented in the first place.

(athira.elissa@thehindu.co.in)

5. Salmonella Infections: Beyond Typhoid to a One Health Approach

Source: The Hindu

GS: GS-II — Health | GS-III — Science & Technology | Public Health

Context: India needs to broaden its response to **Salmonella infections beyond typhoid**, particularly non-typhoidal Salmonella, amid **under-diagnosis, food-borne transmission and rising antimicrobial resistance (AMR)**.

1. **Salmonella: A Wider Public-Health Problem**

- **Typhoidal Salmonella:** *Salmonella Typhi* and *Salmonella Paratyphi* cause **enteric/typhoid fever**, with humans as the primary reservoir.
- **Non-typhoidal Salmonella (NTS):** Commonly causes **gastroenteritis**, but can become invasive and cause potentially life-threatening bloodstream infections.
- **Under-diagnosis:** Many mild NTS infections recover without testing, making their **true disease burden difficult to estimate**.

2. **Transmission — Food-Borne & One Health Risk**

- **Animal reservoir:** Unlike typhoidal Salmonella, NTS has a wider ecology involving **animals, food and the environment**.
- **Food chain:** Poultry, eggs and meat can act as sources; contamination can occur from **farm → processing → transport → storage → restaurant/household**.
- **Food handlers:** Infected handlers can contaminate ready-to-eat food, making **food safety and hygiene** critical.
- **One Health:** Effective control requires simultaneous action across **human health, animal health, food systems and the environment**.

3. **Why Infections Become Serious**

- **High-risk groups:** Young children, older adults and immunocompromised individuals face greater risk of **invasive and life-threatening infection**.
- **Clinical progression:** NTS can move beyond gastrointestinal disease into the **bloodstream**, particularly in vulnerable populations.

4. **Antimicrobial Resistance — Major Emerging Threat**

- **Fluoroquinolone resistance:** A recent study of **culture-confirmed isolates from 1977–2024** found resistance increased sharply, reaching **85% during 2015–19**, and remained high despite a subsequent decline.

- **Treatment challenge:** Increasing resistance across multiple antibiotic classes can leave clinicians with **limited therapeutic options**.

- **Key lesson:** The growing resistance of Salmonella demonstrates why **antibiotic stewardship and surveillance** must accompany treatment.

5. India's Gaps

- **Surveillance deficit:** India has testing and surveillance systems, but important gaps remain, particularly in the **large informal food sector**.

- **Food-safety enforcement:** Control cannot depend only on individual food handlers; it requires stronger **sanitation, refrigeration, monitoring, training and regulatory enforcement** across the food chain.

- **Diagnostic limitation:** **Blood culture** remains the preferred test for suspected typhoid before antibiotics where feasible; the **Widal test has significant limitations and should not be used alone** for diagnosis.

6. Prevention & Way Forward

- **Food safety:** Strengthen hygiene, safe water, proper cooking of poultry/eggs, refrigeration and separation of **raw and ready-to-eat food**.

- **AMR stewardship:** Reserve antibiotics primarily for **severe/invasive infections and high-risk patients** in uncomplicated NTS gastroenteritis; focus on rational antibiotic use.

- **Integrated surveillance:** Strengthen monitoring across **humans, animals and the food chain** under the **One Health framework**.

- **Vaccination:** The World Health Organization recommends **typhoid conjugate vaccines from 6 months of age**, but these are **not yet part of India's Universal Immunisation Programme**.

- **Early detection:** Expand laboratory capacity and **culture-based surveillance** to identify emerging resistance and guide treatment.

A.P. to become third subsea hub on data centre buildout

The State is witnessing investments from tech giants Microsoft and Google, which are building fresh subsea cable infrastructure, currently concentrated in Mumbai and Chennai

Aroon Deep
NEW DELHI

As a result of data-centre buildout in Andhra Pradesh and Telangana, the former's coastline will soon hold new landing stations for subsea cables, which connect global internet with India.

On one hand, Microsoft is participating in a consortium with firms like Lightstorm and Singaporean telco Singtel to land the 3,600 km India-Southeast Asia (I-2SEA) Submarine Cable System, and Google has the globe-spanning America-India Connect system, which will land in Visakhapatnam, where the tech giant's datacentre complex is being built.

"As part of this AI hub... we're bringing in multiple new subsea cables that will land on the coast of Andhra Pradesh around the Vishakhapatnam area," Alexander Smith, a Google executive who oversees several of the firm's physical infrastructure projects in the Asia Pacific region, told *The Hindu* in an interview on Thursday.

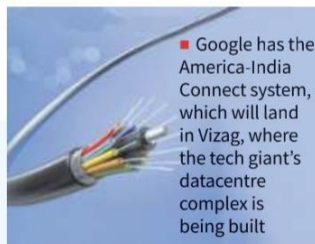
"That will mean that essentially India will have, after Mumbai and Chennai, a third digital international subsea gateway... connecting India directly with Southeast Asia, so Singapore and a couple of the other main markets, down into Australia and right around into the Middle East and Europe and

Network busy

A.P.'s coastline will soon hold new landing stations for subsea cables, which connect global internet with India

■ Essentially India will have a third digital international subsea gateway connecting India directly with Southeast Asia

■ Microsoft is part of a consortium with firms like Lightstorm and Singtel to land the 3,600 km I-2SEA Submarine Cable System



■ Google has the America-India Connect system, which will land in Vizag, where the tech giant's datacentre complex is being built

beyond. So this will... make India and Vizag in particular one of the most connected places in the world," Mr. Smith added.

Lightstorm CEO Amajit Gupta said in an interview with *The Hindu* in June that I-2SEA "connects South-east Asia, specifically Singapore and Malaysia, to the east coast of India," and that the cable system, which also connects to Chennai, "provides a brand new corridor to South Asia" from South East Asia, where a lot of infrastructure serving Indian enterprises and consumers continues to reside.

The cable system is set to be ready for service in Q4 2029. Mr. Gupta said that new cable buildout in a fresh location was key to preserving Indian internet connectivity from a strategic standpoint.

"If you peel the onion and look at the cables which connect the east coast of India... most of these are pretty old cables," he said. "They are easily about 8, 10, 12, 15

years old... [they] are filled with capacity and are also rapidly running into end of life." Mr. Gupta said that there were geopolitical derisking tailwinds driving these investments. "I don't need to tell you what's happening in West Asia, which means people are beginning to think, hey, now this is getting so dangerous, why can't we flush the traffic out to the eastern coast of India so that at the least I have resilience and at the best I have an alternate path [in case connectivity is lost]."

On top of the subsea cable landing, both projects require significant infrastructure further inland. "This is a pan-India project," Mr. Smith said.

"We're needing to install and then light and operate thousands of kilometres of new fiber ... I think what's kind of underappreciated is that this will really create a robust new layer of digital connectivity... that will go between some of the mainline metros." Taking a cue from

landside fiber built on top of electrical transmission lines, Mr. Gupta said that Lightstorm is "likely to build a terrestrial corridor ... which will connect Machilipatnam to Mumbai, Hyderabad and similarly Chennai to Hyderabad and Mumbai with the same bandwidth".

"Fiber itself is out of stock across the globe," Mr. Gupta said, adding "including from Indian manufacturers. And then the fiber sub-components, the fiber raw material, the inputs are all in short supply. So that has never been the case for the last 10 to 15 years."

Google facility

Mr. Smith said that Google's Visakhapatnam facility will focus on inference, with no immediate plans for performing power-hungry training runs. He added that the firm was trying to acquire as much renewable power for the project as possible – pointing out that Google is among the biggest buyers of renewable energy in the world – and that water use minimisation was also on the agenda with air cooling technologies.

He added that the Google facility will focus on inference for domestic enterprises and government agencies, as there has been "pretty deep AI adoption across the delivery of government services at the State levels as well as Union level."

6. Andhra Pradesh: Emerging Subsea Cable & Data-Centre Hub

Source: The Hindu

GS: GS-III — Infrastructure | Digital Economy | Information Technology

Context: Andhra Pradesh is emerging as India's third major international subsea-cable gateway, alongside the existing hubs of Mumbai (Maharashtra) and Chennai (Tamil Nadu), supported by new submarine cable and data-centre investments at Visakhapatnam.

1. Subsea Cable Infrastructure

- **I2SEA Submarine Cable:** Microsoft, Lightstorm and Singtel are developing the **3,600-km India–Southeast Asia cable system**, with a landing station in Andhra Pradesh.
- **Google's America–India Connect:** The cable system will land at **Visakhapatnam**, alongside Google's planned data-centre complex.
- **Strategic shift:** This expands India's international digital connectivity beyond the traditional concentration of **Mumbai and Chennai**.

2. Visakhapatnam as a Digital Gateway

- **Geographical advantage:** Andhra Pradesh's eastern coastline provides a direct digital route towards **Southeast Asia**.
- **Connectivity diversification:** A new eastern gateway reduces dependence on existing landing points and creates **network redundancy**.
- **Digital resilience:** Multiple international cable routes can provide alternative connectivity during **technical failures or geopolitical disruptions**.

3. Data Centres & Artificial Intelligence

- Google's **Visakhapatnam data-centre complex** is part of the emerging digital and Artificial Intelligence (AI) ecosystem.
- It is expected to support **AI inference** and digital services for **enterprises and government agencies**.
- Subsea cables provide the **high-capacity, low-latency international connectivity** required by data centres, cloud computing and AI applications.

4. Strategic & Economic Significance

- **Digital infrastructure:** Expands India's international bandwidth to meet rising data demand.
- **AI ecosystem:** Supports India's transition towards **AI-driven and data-intensive services**.
- **Regional integration:** Strengthens digital connectivity with **Southeast Asia**.
- **Investment:** Data-centre and cable infrastructure can attract **technology investment and associated employment**.
- **Strategic resilience:** Geographical diversification reduces concentration risk in India's critical digital infrastructure.

India's lithium battery costs 23% above China

SAURAV ANAND
New Delhi, August 26

INDIA'S LANDED COSTS for lithium iron phosphate (LFP) battery cells and containers were 13-23% higher than China's after-tax prices in July, as freight, duties and other import-related expenses added to costs amid a rapid expansion in grid-scale energy storage.

Landed LFP cell prices in India stood at \$62-67 per kWh (about ₹5,944-6,423 per kWh) in July, compared with about \$54.5 per kWh (around ₹5,209 per kWh) in China. This meant an additional cost of \$7-12 per kWh (approximately ₹671-1,150 per kWh) for Indian buyers.

According to a report by JMK Research & Analytics and IEEFA, a similar price differential was seen for assembled AC containers. The report attributed the gap to freight, duties and other import-related costs, and said local cell and pack manufacturing would help developers "avoid this import surcharge and reduce their reliance on Chinese supply."

IMPORT PREMIUM

■ India's landed LFP cell prices were 13%-23% above China's after-tax prices in July, adding \$7-\$12 per kWh in import costs

■ 314Ah LFP cell prices in China fell 1.4% in July to \$54.5 per kWh, helped by lower lithium carbonate prices and ample supply

■ India commissioned about 8,236 MWh of BESS capacity in April-July FY27, alongside 250 MW of pumped hydro storage



■ Domestic downstream capacity reached 6.35 GWh in July, led by Waaree ESS and Midwest Energy, but commercial cell manufacturing remains limited

■ The government has tendered the remaining 10 GWh of ACC capacity for grid storage, requiring 25% local value-add in two years and 40% in five

The price differential emerged even as battery-cell prices softened in China. Average prices of 314Ah LFP cells, widely used in utility-scale battery energy storage systems (BESS), fell 1.4% month-on-month in July to CNY0.370 per Wh, or about \$54.5 per kWh.

The decline was aided by a 10.7% month-on-month fall in lithium carbonate prices,

expectations of additional supply following the restart of Chinese battery maker CATL's Jianxiawo mine, ample availability of 314Ah cells and stronger bargaining power among buyers.

Prices of integrated two-hour liquid-cooled AC containers, however, remained unchanged at \$85.7 per kWh (about ₹8,216 per kWh). The roughly \$30-per-kWh differ-

ence between an LFP cell and an assembled container reflects the additional equipment and services required for grid-scale deployment, including power conversion systems, thermal management, fire safety, energy-management systems, commissioning and warranties.

The import premium assumes significance as India's storage deployment

accelerates. The country commissioned around 8,236 MWh of BESS capacity during April-July FY27, alongside 250 MW of pumped hydro storage. July alone saw about 710 MWh of ESS capacity commissioned.

Domestic manufacturing also expanded, with about 6.35 GWh of downstream capacity becoming operational in July.

Waaree ESS accounted for 5.15 GWh through its container plant, while Midwest Energy added a 1.2-GWh integration facility.

However, the report said commercial cell manufacturing in India "remains limited", leaving the country's BESS industry substantially dependent on imported cells.

The Ministry of Heavy Industries has meanwhile tendered the remaining 10 GWh under the 50-GWh advanced chemistry cell (ACC) battery production-linked incentive scheme exclusively for grid-scale storage. The tender requires domestic value addition of 25% within two years and 40% within five years.

epaper.financialexpress.com

CHENNAI/KOCHI

7. Lithium-Iron-Phosphate Batteries: India's Cost & Import Dependence Challenge

Source: Financial Express | **GS:** GS-III — Science & Technology | Energy | Infrastructure | Manufacturing

Context: India's rapid expansion of **Battery Energy Storage Systems (BESS)** is constrained by higher domestic landed costs and continued dependence on imported **Lithium Iron Phosphate (LFP) cells**, particularly from China.

1. **Cost Disadvantage — 13–23% Import Premium**

- **LFP cell cost:** India's landed LFP cell prices stood at **\$62–67/kWh (₹5,944–6,423/kWh)** in July, compared with **\$54.5/kWh (₹5,209/kWh)** in China.
- **Import premium:** Indian prices were therefore **13–23% higher**, adding roughly **\$7–12/kWh (₹671–1,150/kWh)**.
- **Reason:** Higher **freight, duties and other import-related costs** increase the overall cost of storage deployment.

2. **China's Cost Advantage — Scale & Supply**

- **314Ah LFP cells:** Prices in China fell **1.4% month-on-month in July** to **\$54.5/kWh**, supported by lower lithium carbonate prices and ample supply.
- **Economies of scale:** China's mature **battery manufacturing ecosystem, large production capacity and supply-chain integration** provide a significant cost advantage.

3. **India's BESS Expansion — Rising Demand**

- India commissioned around **8,236 MWh of BESS capacity during April–July FY27**, alongside **250 MW of pumped-hydro storage**.
- **July 2026:** Around **710 MWh of BESS capacity** was commissioned in a single month.
- **Downstream capacity:** Domestic downstream battery capacity reached approximately **6.35 GWh in July**.
- **Core issue:** Storage deployment is expanding rapidly, but **commercial-scale cell manufacturing remains limited**, creating continued import dependence.

4. **Domestic Manufacturing — ACC & Value Addition**

- **Advanced Chemistry Cell (ACC) scheme:** The government has tendered the remaining **10 GWh** of ACC manufacturing capacity under the Production Linked Incentive framework.
- **Domestic value addition:** The tender requires **25% local value addition within two years and 40% within five years**.

- **Objective:** Build an integrated domestic battery ecosystem, reduce import dependence and improve India's **cost competitiveness and energy-storage security**.

5. Why LFP Batteries Matter

- **Grid-scale storage:** LFP cells are increasingly important for **Battery Energy Storage Systems**, which help integrate variable renewable energy.
- **Renewable-energy integration:** Storage enables **time-shifting of electricity**, balancing supply and demand and improving grid stability.
- **Energy transition:** Affordable batteries are essential for scaling **solar and wind power** and reducing dependence on fossil-fuel-based balancing capacity.

6. Key Challenge for India

- **Import dependence:** Domestic BESS deployment remains substantially dependent on imported cells.
- **Cost competitiveness:** Higher cell costs can increase the overall cost of grid-scale storage and affect the economics of renewable-energy integration.
- **Manufacturing gap:** India has expanded **downstream battery capacity**, but commercial cell manufacturing has not expanded at the same pace.

7. Way Forward

- **Scale domestic cell manufacturing:** Accelerate ACC manufacturing and strengthen the entire **battery value chain**.
- **Reduce input dependence:** Develop domestic capabilities in **critical minerals, cell materials and battery components**.
- **Promote R&D:** Invest in next-generation battery chemistries, recycling and manufacturing technologies to improve **cost, efficiency and energy security**.
- **Strengthen recycling:** Build a **circular battery economy** to recover valuable materials and reduce import dependence.