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Paradox of India's infra-led growth

PATRANGA BASU

Economic growth fundamentally corresponds with a rise in national income and raises the average standard of living of citizens. But history shows that macro-economic prosperity does not always automatically convert into equal prospects for every citizen.

India's economy experienced a massive expansion between 2004 and 2014, with its GDP nearly trebling from US$0.71 trillion to an impressive US$2.039 trillion. This strong upward trajectory continued over the next decade, with the economy scaling up to US$3.96 trillion by 2025, i.e. by nearly doubling the figure.

Some scholars of economics suggest that true economic growth must be perceptible in the country's physical infrastructure. According to them, progress is reflected in the unprecedented expansion of ports, airports, highways, railway networks, and dedicated freight corridors, alongside soaring digital connectivity and inclusive banking systems.

But infrastructure growth is not economic growth by itself. Infrastructure is the primary driver and an essential prerequisite for economic growth. It boosts productivity, creates a platform to help expand capacity, attract investment, and encourage capital formation. Ultimately, it helps in increasing economic activities; thus income. However, its effectiveness as a stimulus isn't always upfront or guaranteed.

The advocates of supply-side economics argue that building world-class transport, logistics and digital frameworks is the only way to make India globally competitive. Between FY19 and FY22, the Government of India's capital expenditure increased by 92 per cent, from Rs 3.07 lakh crore to Rs 5.92 lakh crore. A 2024 report suggests that for each rupee spent for creation of infrastructure, the growth in GDP would be Rs 2.50 to Rs 3.50. It is evident from growth figures since 2021-22 that to maintain a steady GDP growth rate over 6 per cent India required annual expenditure on infrastructure between 3 to 4 per cent of GDP. So clearly India's is a public capital expenditure driven growth.

However, the 'multiplier' or 'crowding in' effect of public spending on infrastructure is not prevalent in India. The effectiveness of infrastructure spending depends on its 'multiplier effect' which suggests that every rupee of government spending on capex creates some additional amount of private sector spending. Public capital expenditure of Rs 10.51 lakh crore in FY25 could bring in private capital investment to the tune of Rs 6.56 lakh crore in that year envisaging not even a 1:1 multiplier effect. The government spent a staggering Rs 11.21 lakh crore during FY26 on public infrastructure. The headline figure of private capex of Rs 11.42 lakh crore in FY26 may sound massive, but a deep dive into break-ups reveals a worrying imbalance. The major capital investments are dominated by just two massive conglomerates aggregating Rs 2.97 lakh crore, accounting for more than a quarter of the country's private corporate capex.

Meanwhile, mid-sized industrial enterprises are struggling on the brink of survival, leading to a severe contraction in job creation. Budget FY27 expanded public expenditure outlay to a historic Rs 12.2 lakh crore with corresponding projected private capital investment of only Rs 9.55 lakh crore. Another estimate shows the share of private participation in total capex in infrastructure drastically diminished from 60 per cent in 2010 to less than 5 per cent in 2023. Contrarily, the central government's share increased from 11 per cent in 2010 to 51 per cent in 2023.

Thus, the massive public capital expenditure is not matched by a proportionate surge in large-scale private sector investment. This signifies a distinct lack of momentum, driven by a prolonged slump in heavy manufacturing investment, global trade fragmentation, and sluggish consumer demand. Recognising the



private sector's hesitation, the government started making huge capital expenditures on infrastructure since FY18 as its central and deliberate strategy to anchor growth. Government-led capital expenditure was heavily weaponized to stimulate the economy.

In India, big infrastructure projects have now been equated with economic growth. A massive six-lane expressway, a gleaming railway station, or a sprawling airport stand as tangible showcases of national growth. Investing billions in roads and airports by government push up GDP numbers but that does not automatically translate into economic well-being of the people.

The core structural imbalance in India's infrastructure push lies in its disproportionate focus on high-end, premium capital assets, starving the foundational sectors that support the vast majority of the labour force. It results in an economic landscape marked by premium, underutilized capital assets surrounded by an informal economy struggling with stagnant wages, compressed margins, and persistent structural bottlenecks.

In the road transport sector, the distinction between infrastructure volume and true economic efficiency is stark. Over the past ten years, India's National Highway network expanded by roughly 61 per cent to a total of 1.46 lakh km. But there remain real physical bottlenecks. When commercial trucks exit a premium expressway, they immediately encounter congested, poorly maintained state roads and highly inefficient last-mile networks. This demonstrates that an integrated, multi-modal transport network is more important than mere building of faster expressways. Despite efforts toward multimodality, as of 2025 India's transport mix – freight as well as passenger - currently remains significantly skewed in favour of road transport. Domestic freight traffic heavily relies – 66 per cent – on road transport while domestic passenger share is at least 78 per cent.

Further, the core economic problem remains: road transport is nearly twice as expensive as rail per kilometre. Road transport costs have been driven sharply upward mostly by rise in fuel prices and expressway toll structures.

Over the last decade, immense national capital has been introduced into modernizing major urban railway stations and deploying premium, air-conditioned passenger fleets like the Vande Bharat Express. These premium trains operate at near full capacity, serving the urban rich who can afford premium fares. However, during the same period, expansion of standard passenger trains was heavily marginalized. The result is a severe capacity crisis for ordinary citizens, observed in dangerously overcrowded general class compartments. Lower-income workers face increasingly degraded transit conditions. The infrastructure strategy risks functioning as an exclusionary mechanism rather than an engine of broad-based economic growth.

The belief that building infrastructure will automatically generate economic demand is a classic supply-side delusion, illustrated perfectly by the performance of the flagship UDAN regional aviation scheme. Independent performance evaluations revealed that the scheme failed to sustain operations on up to 93 per cent of its originally awarded routes once initial government subsidies expired. Regional airports suffer from financial viability and technical requirements. Airlines frequently abandoned these routes, leaving multi-crore regional terminals to sit idle as 'ghost airports.'

The economic lesson is clear: an airport does not create a business environment. Contrarily a thriving business ecosystem generates the structural demand for an airport. The costly national resources are effectively locked in, prevented from flowing into more productive, high-return areas like primary education, healthcare, or rural agricultural cold chains.

The experience of the Indian economic landscape between 2016 and 2026 offers a vital lesson: building expansive physical assets delivers diminishing returns if those assets are financially out of reach for the masses, remain underutilized due to missing last-mile connections, or plagued by severe structural imbalances. The desired multiplier effect of massive infrastructure spending is also elusive.

True economic growth is not measured by the sheer volume of concrete poured or the total kilometres of roads constructed or fibre-optic cable laid. It is measured by how effectively those assets are utilized to lower the cost of doing business, create meaningful employment opportunities, and steadily lift the real standard of living for all segments of society. To bridge this gap, India's future economic strategy must shift its focus from purely supply-driven asset creation to demand-driven, multi-modal integration. Capital must be distributed more equitably between headline-grabbing elite projects and the critical, every day, need-based infrastructure that supports the mass population.

The writer, a Cost Accountant, worked with a public sector power utility.

1. Paradox of India’s Infrastructure-led Growth

GS Paper III: Indian Economy – Infrastructure, Investment and Inclusive Growth

1. Infrastructure-led Growth: India’s Experience

1. India’s GDP increased from US$0.71 trillion (2004) to US$3.96 trillion (2025).
2. Government capital expenditure increased by 92% between FY19 and FY22, from ₹3.07 lakh crore to ₹5.92 lakh crore.
3. Every ₹1 invested in infrastructure is estimated to generate ₹2.50–₹3.50 in GDP growth over time.
4. Sustaining 6% GDP growth requires annual infrastructure investment of approximately 3–4% of GDP.

2. The Paradox: Rising Public Investment, Weak Private Participation

1. Government capital expenditure reached ₹10.51 lakh crore in FY25.
2. Private investment remains disproportionately low despite rising public expenditure.
3. Private sector share in infrastructure capex declined from 60% (2010) to below 5% (2023), recovering to 11% in 2023.
4. Concentration of investment among large conglomerates limits broader participation by mid-sized enterprises.

3. Structural Bottlenecks

A. Imbalanced Infrastructure Development

1. Excessive focus on premium infrastructure such as expressways, airports and high-speed rail.
2. Insufficient investment in foundational infrastructure supporting the informal economy.

B. Poor Multimodal Connectivity

1. Freight transport: 66% dependent on roads.
2. Passenger transport: At least 78% dependent on roads.
3. Rail transport is nearly twice as expensive per kilometre as road transport.
4. Poor last-mile connectivity reduces the economic efficiency of major infrastructure projects.

C. Unequal Access

1. Premium transport services disproportionately benefit affluent urban sections.

2. Ordinary passengers face overcrowding and inadequate public transport.
3. Regional airports struggle with low passenger demand and financial viability.

4. Why Infrastructure Spending Does Not Guarantee Growth

1. **Weak multiplier effect:** Public investment fails to generate proportionate private investment.
2. **Demand constraints:** Infrastructure without adequate economic demand leads to underutilisation.
3. **Regional imbalance:** Infrastructure remains inaccessible to disadvantaged regions.
4. **Employment concerns:** Capital-intensive projects generate fewer direct jobs than labour-intensive sectors.
5. **Last-mile gaps:** Poor connectivity undermines productivity and economic returns.

5. Way Forward

1. **Multimodal integration:** Strengthen railways, roads, waterways and logistics networks.
2. **Balanced investment:** Prioritise education, healthcare, rural infrastructure and public transport.
3. **Private participation:** Improve policy certainty and facilitate investment beyond large conglomerates.
4. **Last-mile connectivity:** Connect smaller towns, rural areas and industrial clusters.
5. **Outcome-based expenditure:** Evaluate projects through employment, productivity, accessibility and logistics efficiency.

Relevant UPSC Mains PYQ

UPSC CSE Mains 2021 | GS Paper III | 15 Marks

“Investment in infrastructure is essential for more rapid and inclusive economic growth.” Discuss in the light of India’s experience.

Rediscovering our villages

The future should not be a choice between villages and cities. Both are essential to India's economic and social progress. Cities will continue to be important centres of industry, commerce, innovation and specialised services. But they cannot indefinitely absorb populations at the cost of rural vitality and environmental sustainability



For generations, India's villages have been repositories of its civilisation, culture, traditions, community life and collective wisdom. They have sustained the country's agrarian economy, nurtured social institutions and preserved a way of life rooted in nature, family and community. Yet, over the decades, the dominant narrative of development has increasingly become synonymous with urbanisation. Cities have come to represent opportunity, aspiration, progress and modernity, while villages are often perceived as places that people must eventually leave behind in search of a better life.

This perception needs to be revisited. The steady migration of people from rural areas to cities, particularly of the young, educated and professionally skilled, is creating a development model that is neither ecologically sustainable nor socially desirable in the long run. It is placing enormous pressure on urban infrastructure while simultaneously weakening the economic, intellectual and social foundations of rural India. Perhaps it is time to ask a fundamental question: should development necessarily mean leaving our villages, or should it mean making our villages places where people can aspire to live, work, prosper and fulfil their potential?

Rural-to-urban migration is often explained as a natural consequence of economic opportunity. People move to cities in search of employment, education, healthcare, better incomes and improved living standards. These aspirations are legitimate, and migration has undoubtedly contributed to economic mobility for millions. However, when migration becomes the principal or inevitable pathway to progress, it exposes serious structural weaknesses in our model of development.

Cities are struggling to absorb increasing populations. Roads, public transport systems, water supply networks, drainage systems, housing, sanitation facilities, healthcare institutions and educational infrastructure are under mounting pressure. Urban expansion often outpaces the capacity of civic institutions to provide adequate services. The result is congestion, air pollution, deteriorating water bodies, shrinking green spaces, rising housing costs and an increasingly stressful quality of life. At the same time, villages are losing precisely those people who could contribute most significantly to their transformation. Young professionals, entrepreneurs, teachers, doctors, engineers, skilled workers and educated individuals relocate to urban centres. The resulting depletion of human capital weakens local institutions, diminishes entrepreneurial initiative and reduces the capacity of rural communities to innovate. Villages are left with ageing populations, fewer employment opportunities and growing dependence on remittances. This creates a paradox: cities become burdened by population concentration, while villages become increasingly deprived of the human resources necessary for their development. Such a pattern cannot be considered a balanced or sustainable model of national growth.

One of the most compelling reasons to rediscover rural living is ecological. Villages, despite their own environmental challenges, generally offer greater access to open spaces, vegetation, agricultural landscapes, ponds, rivers, wetlands and a closer relationship with nature. The countryside provides environmental and psychological benefits that are becoming increasingly scarce in congested urban environments. The modern city often demands that people sacrifice clean air, open spaces, quiet surroundings and proximity to nature in exchange for economic opportunity. Long commuting hours, traffic congestion, noise, air pollution, crowded residential neighbourhoods and the constant pressure of urban life have become familiar features. The countryside offers the possibility of a different equilibrium. A home surrounded by trees, access to open spaces, a community pond, a nearby field and the ability to experience changing seasons are not merely aesthetic advantages. They contribute to physical and mental well-being, environmental resilience and a more balanced relationship with one's surroundings.

This is not to suggest that every village is automatically clean, healthy or environmentally secure. Rural areas too face challenges relating to waste disposal, water contamination, agricultural practices, declining groundwater levels and inadequate sanitation. However, these problems can be addressed through planned investment and responsible environmental management.

Perhaps an even more serious consequence of excessive migration is its impact on traditional family and community support systems. Indian society has historically drawn strength from extended families, neighbourhood relationships and closely knit communities. The village was not simply a geographical settlement; it was a social ecosystem. Families lived in proximity, generations interacted regularly, children grew up surrounded by grandparents and relatives, and individuals could depend upon neighbours and community networks during times of illness, distress and celebration. Urban migration often disrupts these relationships. Nuclear families become geographically separated from their elders. Elderly parents remain in villages while their children settle in distant cities. Grandparents see their grandchildren only occasionally. Traditional systems of mutual care and informal support become weaker.

Urban life can also be socially fragmented. People may live in the same apartment complex for years without developing meaningful relationships with their neighbours. The pressures of professional competition, long working hours, commuting and the pursuit of economic security leave little time for community engagement. This is, of course, not universally true. Cities also nurture friendships, neighbourhood associations, cultural networks and vibrant communities. Yet, the anonymity and fragmentation of urban life can make social isolation a significant concern. The erosion of family support systems has implications beyond emotional well-being. It affects childcare, eldercare, upbringing of children, intergenerational learning and the transmission of cultural values. A society cannot measure prosperity solely through income, consumption and physical infrastructure; the quality of its human relationships matters equally. The solution is not to romanticise the village or advocate a reversal of urbanisation. It is to transform rural areas into viable centres of opportunity. For too long, talent has been concentrated in cities because employment, education, healthcare, financial services and professional networks are disproportionately available there. This concentration must be addressed through policy interventions. Digital connectivity provides an unprecedented opportunity. Remote working, online education, telemedicine, digital financial services and technology-enabled entrepreneurship can reduce the dependence on proximity to major cities. With reliable broadband, electricity, transport and suitable workspaces, many professionals can work from smaller towns and rural locations without compromising careers. The countryside can also become a centre for new economic activities. Agro-processing, food technology, rural tourism, eco-tourism, handicrafts, traditional industries, renewable energy, fisheries, dairy, horticulture and knowledge- based services offer considerable potential. Local enterprises can create employment while retaining value within rural economies. Universities, research institutions, skill development centres and innovation hubs should establish meaningful rural linkages. Rural schools and colleges must be strengthened so that talented young people do not feel compelled to leave their communities merely to access quality education.



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Healthcare infrastructure deserves equal attention. Well-equipped primary healthcare centres, specialist outreach services, telemedicine networks and reliable emergency transport can improve the quality of rural life. The objective should be to create villages and rural clusters where people can access essential facilities of modern life without abandoning advantages of the countryside. India needs to move beyond the conventional understanding of rural development as merely providing basic amenities. The aspiration should be to create modern, economically vibrant and environmentally sustainable rural communities.

First, rural infrastructure must be upgraded through all-weather roads, reliable public transport, uninterrupted electricity, safe drinking water, sanitation, broadband connectivity and modern waste management. Second, economic activity must be decentralised. Industries, service-sector enterprises, logistics facilities and processing units should be encouraged to locate in smaller towns and rural growth centres rather than concentrating exclusively in metropolises. Third, agriculture must become more remunerative and technologically advanced. Farmers need better market access, storage, processing facilities, institutional credit, extension services and opportunities for diversification. Fourth, rural education must be transformed. Quality schools, vocational institutions, digital learning facilities and access to higher education can ensure that rural children are not disadvantaged. Fifth, local governance institutions must be empowered. Panchayats and community organisations should have the resources, professional support and decision-making authority to plan development according to local needs. Finally, rural development must be ecologically sensitive. Wetlands, ponds, forests, agricultural land, traditional water bodies and biodiversity must be protected. Development should not reproduce in villages the environmental mistakes that have made cities increasingly difficult to inhabit. The future should not be a choice between villages and cities. Both are essential to India's economic and social progress. Cities will continue to be important centres of industry, commerce, innovation and specialised services. But they cannot indefinitely absorb populations at the cost of rural vitality and environmental sustainability.

A more balanced model would encourage the development of smaller towns, rural growth centres and well-connected village clusters. It would allow people to pursue professional ambitions while retaining their connections with their native places. It would make it possible for a young entrepreneur, a teacher, a doctor, an IT professional or a researcher to contribute meaningfully to rural society without feeling that doing so requires sacrificing opportunity. There is also a need to rediscover the cultural and emotional significance of one's native place. The village is where family histories begin, where traditions are preserved, where festivals acquire their deeper meaning and where generations share a collective memory. These connections are valuable social assets and should not be allowed to disappear under the pressure of an urban conception of success.

Mahatma Gandhi's vision of village self-reliance, or Gram Swaraj, remains relevant in this context. Its contemporary interpretation need not mean isolation or rejection of modernity. Rather, it should mean empowered local communities, productive local economies, sustainable use of resources and greater decentralisation of opportunity.

Ultimately, the measure of development should not be how many people leave villages for cities, but how many people have the freedom to choose where they wish to live and work without compromise. A truly developed India would be one in which a person does not have to migrate to secure good education, healthcare, employment or a dignified standard of living.

We must therefore reverse the direction of our imagination, if not necessarily the direction of every migration. Instead of asking why people are leaving villages, we must ask what it would take to make them stay, return or invest their talent in their native communities. The countryside should not be condemned to become a reservoir of labour for cities, nor should cities be expected to accommodate ever-growing populations at the cost of their ecological and social health. Perhaps the time has come to recognise that progress is not merely about building taller buildings, wider roads and larger urban centres. It is also about preserving open spaces, nurturing communities, strengthening families, protecting nature and ensuring that opportunity reaches every corner of the country. The true test of India's development will be when our villages become places from which people may choose to leave, but never feel compelled to leave; places to which they can return with confidence, and places where the next generation can dream, innovate and prosper.

2. Rediscovering Our Villages: Towards Balanced Rural–Urban Development

GS Paper III: Indian Economy – Rural Development, Inclusive Growth, Employment and Sustainable Development

Context: India's development cannot depend exclusively on urbanisation. Villages must become economically productive, socially empowered and sustainable so that migration becomes a choice rather than a necessity.

1. Rethinking the Rural–Urban Development Model

1. **Beyond urban-centric growth:** Cities cannot indefinitely absorb rural populations without creating pressure on housing, transport, healthcare and the environment.
2. **Villages as economic assets:** Natural resources, agricultural potential, traditional knowledge and community institutions offer opportunities for rural prosperity.
3. **Balanced development:** Villages and cities should function as complementary economic centres rather than competing spaces.
4. **Migration by choice:** People should be able to access quality education, healthcare and employment without being compelled to leave their native places.

2. The Consequences of Unbalanced Urbanisation

A. Rural Consequences

1. **Demographic depletion:** Outmigration of educated youth, skilled workers and entrepreneurs weakens rural economies.
2. **Agricultural disruption:** Declining workforce availability and weakening traditional occupations affect rural livelihoods.
3. **Social fragmentation:** Family support systems, neighbourhood relationships and intergenerational knowledge gradually weaken.

B. Urban Consequences

1. **Infrastructure pressure:** Housing shortages, traffic congestion, inadequate sanitation and overburdened public services.
2. **Environmental degradation:** Pollution, shrinking green spaces and pressure on natural resources.
3. **Social inequalities:** Expansion of informal settlements and unequal access to basic services.

3. Rediscovering Villages: Untapped Economic Potential

1. **Agricultural diversification:** Food processing, horticulture, dairy, fisheries and allied activities can increase rural incomes.
2. **Rural entrepreneurship:** Handicrafts, traditional industries, rural tourism and local enterprises can generate employment.
3. **Digital economy:** Broadband connectivity can facilitate remote employment, telemedicine, online education and digital financial services.
4. **Agro-based industrialisation:** Rural processing units and small-scale industries can strengthen local value chains.
5. **Human capital:** Quality education, vocational training and healthcare can improve productivity and retain skilled talent.

4. Roadmap for Rural Transformation

1. **Physical infrastructure:** Develop all-weather roads, reliable electricity, drinking water, sanitation and storage facilities.
2. **Digital connectivity:** Expand broadband, digital public services and technology-enabled entrepreneurship.
3. **Agricultural modernisation:** Strengthen cold chains, market linkages, institutional credit, food processing and agricultural extension.
4. **Decentralised governance:** Empower Panchayati Raj Institutions with financial resources, technical expertise and administrative autonomy.
5. **Human development:** Ensure quality schools, vocational institutions, healthcare facilities and higher education opportunities.
6. **Ecological sustainability:** Protect wetlands, ponds, forests, biodiversity and traditional water bodies.

5. Constitutional and Governance Linkages

1. **Article 40:** Directs the State to organise village Panchayats as units of self-government.
2. **73rd Constitutional Amendment Act, 1992:** Provided constitutional status to Panchayati Raj Institutions.
3. **Article 243G:** Empowers Panchayats to function as institutions of self-government.
4. **Gandhian philosophy – Gram Swaraj:** Emphasises self-reliant villages, local participation, decentralisation and community empowerment.

Relevant UPSC Mains PYQ

UPSC CSE Mains 2015 | GS Paper I | 12.5 Marks

“Smart cities in India cannot sustain without smart villages. Discuss this statement in the backdrop of rural-urban integration.”

Sodium-ion batteries gain traction on lower costs

● Cell emerging as most cost-effective alternative to lithium-ion: Report

SAURAV ANAND
New Delhi, November 12

SODIUM-ION BATTERIES ARE emerging as the most cost-effective alternative among developing battery technologies to lithium-ion storage, offering 21% lower lifetime ownership costs despite higher upfront prices, according to Wood Mackenzie. With global supply agreements exceeding 70 gigawatt-hours (GWh), the technology is entering commercial production even as India's battery storage requirement is projected to rise nearly sevenfold by 2031-32.

The development comes as India's battery energy storage system (BESS) requirement is projected to rise from 34.72 GWh in 2026-27 to 236.22 GWh by 2031-32, according to the Central Electricity Authority's national electricity plan. These projections cover the broader battery storage market, not sodium-ion alone.

Wood Mackenzie's report, 'Sodium-ion Batteries: Commercialisation Begins, Economics to Follow', covering China, the US, Germany and India, finds that leading manufacturers could achieve cell-level cost parity with lithium iron phosphate (LFP) batteries by the end of 2026. However, parity at the module and system levels is expected only after 2030.

Currently, sodium-ion batteries have a global average upfront cost of $229 per kilowatt-hour (kWh), compared with $200/kWh for LFP. However, their total cost of ownership over a 20-year project life is estimated to be 21% lower, primarily due to reduced operating expenditure and the elimination of battery capacity augmentation requirements.

"SIB wins on supply chain security, cycle life and wide thermal threshold," said Ankita Chauhan, director, global supply chain and integrated power & renewables research at Wood Mackenzie. "Geopolitical supply advantages and superior performance of SIB across temperature ranges drive near-term commercialisation," she added.

China leads sodium-ion commercialisation, with BYD planning 30 GWh of manufacturing capacity and CATL targeting shipments of at least 1 GWh by the end of 2026. Wood Mackenzie estimates China's manufacturing learning rate at 18-20% during 2026-2035.

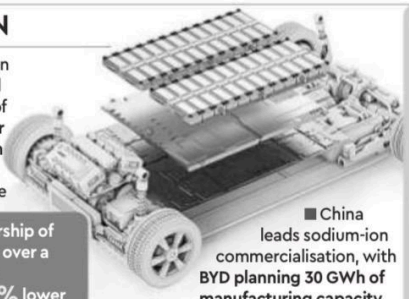
India, however, remains in the early commercial validation stage, compared with China, the US and Europe, where significant supply agreements have been secured. The report identified India's underdeveloped supply chain as a constraint on near-term deployment.

The International Energy Agency noted that global sodium-ion battery production in 2025 was less than 1% of lithium-ion output, underlining the technology' limited commercial scale despite growing investment commitments.

POWER PLAN

■ Currently, sodium-ion batteries have a global average upfront cost of **$229 per kilowatt-hour (kWh), compared with $200/kWh** for lithium iron phosphate storage

■ Total cost of ownership of sodium-ion batteries over a 20-year project life is estimated to be **21%** lower



■ China leads sodium-ion commercialisation, with **BYD planning 30 GWh of manufacturing capacity**

■ India's BESS requirement is projected to rise from **34.72 GWh** in 2026-27 to **236.22 GWh** by 2031-32

■ Sodium-ion batteries have lower operating expenditure

3. Sodium-Ion Batteries: An Emerging Alternative to Lithium-Ion Technology

GS Paper III: Science & Technology – Energy Storage, Renewable Energy and Battery Technology

Context: Sodium-ion batteries are emerging as a cost-effective alternative to lithium-ion batteries, offering lower lifetime ownership costs, supply-chain security and opportunities for India's energy storage sector.

1. Understanding Sodium-Ion Battery Technology

1. **Working principle:** Sodium ions move between the cathode and anode during charging and discharging, generating electrical energy.
2. **Resource advantage:** Sodium is more abundant and widely available than lithium, reducing dependence on geographically concentrated mineral supplies.
3. **Cost advantage:** Lower operating expenditure and reduced battery capacity augmentation requirements.
4. **Strategic significance:** Potential to diversify battery technologies and reduce dependence on lithium-based supply chains.

2. Sodium-Ion vs Lithium-Ion: Economic Advantage

1. **Upfront cost:** Sodium-ion batteries currently cost approximately $229/kWh compared with $200/kWh for lithium iron phosphate (LFP) batteries.
2. **Lifetime ownership cost:** Sodium-ion batteries are estimated to have 21% lower total ownership costs over a 20-year project life.
3. **Operating expenditure:** Lower operating costs and reduced capacity augmentation requirements improve long-term economics.
4. **Cost parity:** Cell-level cost parity with LFP batteries is expected by the end of 2026, while module and system-level parity may take until 2030.

3. Advantages and Applications

1. **Supply-chain security:** Greater availability of sodium can reduce dependence on critical mineral imports.
2. **Thermal performance:** Wider thermal operating range and improved performance across temperature variations.
3. **Battery Energy Storage Systems (BESS):** Suitable for stationary electricity storage and renewable energy integration.
4. **Grid stability:** Can help balance intermittent solar and wind power generation.
5. **Long-term storage:** Potential applications in grid-scale storage and renewable energy infrastructure.

4. Global Developments and India's Position

1. **China's leadership:** China is leading commercialisation, with BYD planning 30 GWh of manufacturing capacity and CATL targeting shipments of at least 1 GWh by the end of 2026.
2. **Global supply agreements:** More than 70 GWh of supply agreements indicate growing commercial interest.
3. **India's BESS demand:** Projected to rise from 34.72 GWh (2026–27) to 236.22 GWh (2031–32).
4. **India's challenge:** India remains at an early commercial validation stage, with an underdeveloped domestic supply chain.
5. **Manufacturing gap:** Global sodium-ion battery production in 2025 was less than 1% of lithium-ion output.

5. Challenges and Way Forward

1. **Commercialisation:** Scale up domestic research, pilot projects and manufacturing capabilities.
2. **Supply-chain development:** Build domestic capabilities in battery materials, components and cell manufacturing.
3. **Research and innovation:** Improve energy density, charging performance, durability and battery efficiency.

4. **Industrial partnerships:** Encourage collaboration between research institutions, domestic manufacturers and global technology companies.
5. **Energy ecosystem:** Integrate sodium-ion batteries into renewable energy projects and grid-scale storage infrastructure.

Relevant UPSC Mains PYQ

UPSC CSE Mains 2015 | GS Paper III | 12.5 Marks

"To what factors can the recent dramatic fall in equipment costs and tariff of solar energy be attributed? What implications does the trend hold for the thermal power producers and the related industry?"

To strengthen the Supreme Court, divide it



Pradeep S. Mehta

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is the Vice President of the Pune International Centre

In 2016, three judges of the Supreme Court of India paused to ask a question about their own institution: had the apex court, established by the Constitution's framers to safeguard the Republic's foundational document, lost its way, drowning in ordinary appeals while its constitutional work withered? They framed 11 questions and referred it to a larger Bench. A decade later, the reference remains unheard. No emblem of the problem is sharper, nor any case for reform stronger: split the Supreme Court in two.

As 2025 drew to a close, the court carried 92,318 pending cases, its heaviest backlog ever and nearly 10,000 more than a year earlier. The caseload is growing at a pace that no reasonable enlargement of the Bench can outrun. The remedy is simple and not new: a lean Constitutional Court of about 11 judges in Delhi, hearing only constitutional cases and substantial questions of law, with four or five regional Courts of Appeal to handle the appeals that now flood the apex court. The idea is not to shrink the judiciary's reach but to sort its work, so that questions shaping the Republic are not decided in the same queue as those shaping a single case.

Consider how far the court has drifted. In the first half of the 1960s, its Constitution Benches decided an average of 134 cases a year; over the last decade, that has collapsed to fewer than 10. The docket, instead, has been swallowed by Special Leave Petitions, discretionary appeals under Article 136 that were intended to serve as a rare safety valve. By one count, they accounted for 84.6% of the court's admission docket in 2011. A tribunal designed to be the final word on the Constitution has turned itself into a general court of fourth appeal. It has admitted as much: in *Bihar Legal Support Society* (1986), a Constitution Bench under Chief Justice P.N. Bhagwati said it was never meant to be an ordinary court of appeal.

Beyond the backlog

The case for splitting the court is not merely that it is overcrowded. A two-tier structure would allow specialisation to achieve what an increase in judicial capacity alone cannot. A dedicated Constitutional Court, hearing a curated stream of cases, could sit in full Benches and deliver consistent, predictable rulings that settle questions once. Regional courts of appeal could specialise in the ordinary caseload and clear it far faster than an apex court. They would also bring the final tier of ordinary justice closer to the citizens who need it. Every large legal system has converged on this pyramid-shaped structure: a final court works best when it decides a few cases carefully, while the tiers below it handle many more quickly.

> Adding judges without sorting the work risks enlarging the same overburdened court. The task is not to move the same work faster, but to sort it

The 229th Law Commission Report (2009) laid out a full blueprint for a Constitution Bench in Delhi with four regional Cassation Benches. In 2023, a Parliamentary Standing Committee recommended regional Benches, which the Union Law Ministry has since accepted. The model is well tested in the very democracies India is compared to.

The U.S. Supreme Court sits atop 13 federal Courts of Appeals, deciding only a sliver of cases. South Africa runs a two-court system: a Constitutional Court in Johannesburg, and a separate Supreme Court of Appeal in Bloemfontein for everything else. Germany's Federal Constitutional Court in Karlsruhe hears constitutional matters alone, while specialised federal courts handle other areas of law.

And this is not only a matter of systems built that way from the start: countries have made the very change India now contemplates. Brazil is the closest recent parallel. Its Supreme Federal Tribunal once carried the same double burden as ours, guarding the Constitution while drowning in ordinary federal appeals. The 1988 Constitution created a separate Superior Tribunal of Justice to take over that appellate load.

Brazil, however, also offers a warning: the split alone did not ease the backlog, which declined only after the apex court was given the power to filter out cases it did not need to hear. The tool is familiar from the very courts India admires. The U.S. Supreme Court grants review to roughly one per cent of the 7,000 petitions it receives each year, a discretion held since 1925; Brazil's apex court, after a 2004 reform, hears a constitutional appeal only where the question carries a "general repercussion" beyond the parties. Without such a filter, a Constitutional Court would inherit, in miniature, the very congestion it was built to escape. And the route need not be treacherous: the 229th Report argued Article 130 may permit regional Benches without a constitutional amendment, meaning the first steps could be taken by the court itself, without waiting for Parliamentary approval.

The strongest objection must be stated at full strength, because it is why this reform has stalled for so long, and because it is held by those who know the institution best. The concern, voiced by successive Chief Justices, is that a divided Supreme Court may no longer be a single supreme one: separate the constitutional work from the appellate work, and the regional courts could come to be seen as lesser venues, with litigants pressing to reach the apex court in Delhi, until the authority that flows from having one final court is diffused. There is real force in this. An apex court's power lies partly in its indivisibility: it is the last word, with no higher forum to appeal to and no rival court to be played against it.

Restoring the court

But the concern mistakes the disease for the cure. A single court is only a single voice when it can speak with one, and ours cannot: it already sits in a dozen small Benches that often contradict each other, its constitutional work reduced to a handful of Constitution Benches a year.

The indivisibility being defended is a fiction; the court is already divided, not by design but by sheer volume, into scattered panels whose rulings no one can fully reconcile. Separation would rescue the constitutional core of one that has fractured on its own. When the Bench was expanded to 34 in 2019, pendency stood near 60,000; today it is close to 93,000. In 2025, the court disposed of 65,615 cases and still fell behind, as 75,410 fresh matters arrived. In 2026, Parliament raised the sanctioned strength again, to 38. Adding judges without sorting the work risks enlarging the same overburdened court. The task is not to move the same work faster, but to sort it.

The Supreme Court that gave us the basic structure doctrine, and once stood as the boldest constitutional court in the democratic world, now rarely sits in constitutional judgment at all. No outside hand has diminished it; it has been buried under its own docket. To leave it as it is, out of reverence for a unity that no longer exists, is to mistake sentiment for strength. Splitting the court would let it return to its pristine structure, while a new tier of regional appeals courts would finally give ordinary litigants the swift justice they are owed. That would not be its diminishment, but its restoration.

(With contributions from Anushka Kewlani of CUTS)

4. To Strengthen the Supreme Court, Divide It

GS Paper II: Indian Polity – Judiciary, Judicial Reforms, Access to Justice and Constitutional Governance

Context: Rising pendency and an expanding appellate workload have revived the proposal to divide the Supreme Court into a Constitutional Court and regional Courts of Appeal to improve judicial efficiency and access to justice.

1. The Problem: Supreme Court Facing a Structural Crisis

1. **Rising pendency:** The Supreme Court had 92,318 pending cases at the end of 2025, nearly 10,000 more than a year earlier.
2. **Constitutional workload:** Constitution Benches decided an average of 134 cases annually during the 1960s; the number has fallen to fewer than 10 in recent years.
3. **Misuse of appellate jurisdiction:** Special Leave Petitions under Article 136, intended as an exceptional remedy, accounted for 84.6% of the Court's admission docket in 2011.
4. **Institutional overload:** Constitutional interpretation, fundamental rights and routine civil and criminal appeals compete for the same judicial time.

2. Proposed Reform: Divide the Supreme Court into Two

A. Constitutional Court (New Delhi)

1. A dedicated bench of approximately 11 judges.
2. Focus exclusively on constitutional interpretation, federal disputes and substantial questions of law.
3. Ensure authoritative and consistent constitutional rulings.

B. Regional Courts of Appeal

1. Establish four or five regional Courts of Appeal.
2. Handle ordinary civil and criminal appeals.
3. Bring the final appellate stage closer to citizens.
4. Reduce the Supreme Court's routine caseload and improve disposal efficiency.

3. International Models: Lessons for India

1. **United States:** Supreme Court supported by 13 federal Courts of Appeals.
2. **South Africa:** Separate Constitutional Court and Supreme Court of Appeal.
3. **Germany:** Federal Constitutional Court handles constitutional matters, while specialised federal courts deal with other legal disputes.

4. **Brazil:** Created a separate Superior Tribunal of Justice in 1988 to reduce the Supreme Federal Tribunal's appellate burden.

Key lesson: Institutional separation must be accompanied by effective filtering of cases; merely creating additional courts cannot eliminate pendency.

4. Constitutional and Institutional Framework

1. **Article 130:** Allows the Supreme Court to sit in Delhi or other places appointed by the Chief Justice of India with the President's approval.
2. **229th Law Commission Report (2009):** Proposed a Constitution Bench in Delhi and four regional Cassation Benches.
3. **2023 Parliamentary Standing Committee:** Recommended regional benches of the Supreme Court.
4. **Judicial specialisation:** Separate constitutional and appellate jurisdictions can improve consistency, efficiency and quality of adjudication.

5. Concerns and Counterarguments

1. **Institutional fragmentation:** Dividing the Supreme Court may weaken its identity as a single national institution.
2. **Conflicting judgments:** Multiple appellate courts may create inconsistent interpretations of law.
3. **Access to the apex court:** Litigants may face additional procedural barriers in reaching the Constitutional Court.
4. **Incomplete reform:** Increasing the number of judges without restructuring judicial workload may reproduce the same problem.

6. Way Forward

1. Establish a dedicated Constitutional Court for substantial constitutional questions.
2. Create regional appellate institutions to improve geographical access to justice.
3. Introduce effective case-filtering mechanisms to prevent unnecessary appeals.
4. Strengthen judicial infrastructure, court management and technology-enabled case disposal.
5. Preserve constitutional consistency through clearly defined jurisdiction and authoritative precedents.

Relevant UPSC Mains PYQ

UPSC CSE Mains 2023 | GS Paper II | 10 Marks

"Constitutionally guaranteed judicial independence is a prerequisite of democracy." Comment.

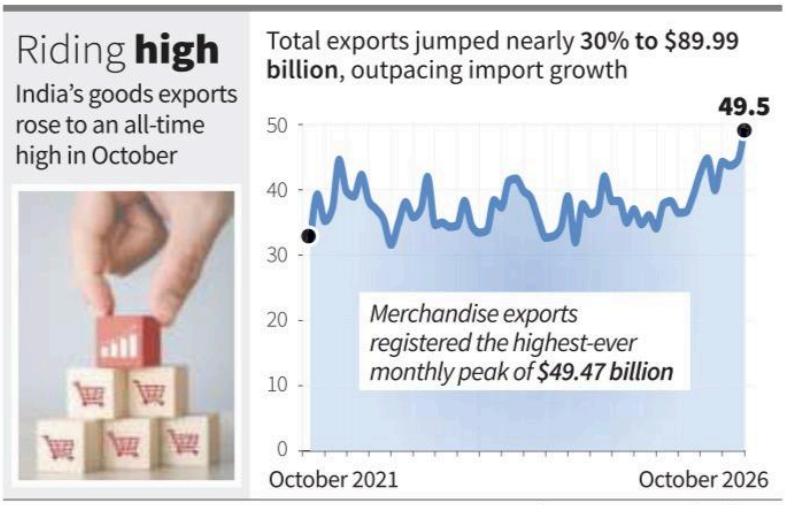
Exports touch record high as diversification pays off

T.C.A. Sharad Raghavan
NEW DELHI

India's merchandise exports rose to an all-time high of $49.5 billion in October, bringing down the country's overall trade deficit, official data released on Friday showed.

While a large part of this growth was due to petroleum products, Commerce Secretary Rajesh Agrawal said diversification of exports to various locations helped improve the numbers. India's total exports, including goods and services, stood at $89.99 billion in October 2026, up nearly 30% from last October. The overall trade deficit shrank from $25.1 billion last October to $20.1 billion year-on-year (YoY).

"In the month of October, merchandise exports have registered a new peak of $49.47 billion," Mr. Agrawal said at a press briefing. "This is the highest-ever monthly merchandise export value, along with the highest monthly growth of 45.03% in the last five years."



Source: Ministry of Commerce and Industry

Merchandise imports rose to a record high of $89.35 billion in October 2026, up 16.5% YoY. Total imports stood at $110.1 billion, a 16.6% increase.

According to trade experts, goods exports growing faster than merchandise imports shows that while the rise in global prices contributed to the increase in the value of India's exports, there was also an increase in the underlying export volumes.

"The particularly encouraging part of this growth is that this is not in any particular sector, this is not in any particular geography, it is broad-based across countries and regions," Mr. Agrawal said. "Forty-three of our 50 top export destinations posted positive growth in October this year as compared to 2025."

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5. India’s Exports Touch Record High as Diversification Pays Off

GS Paper III: Indian Economy – Foreign Trade, Export Diversification and Balance of Payments

Context: India’s merchandise exports reached a record high in October 2026, supported by geographical diversification and stronger performance across international markets.

1. India’s Export Performance – October 2026

1. **Merchandise exports:** $49.5 billion – highest-ever monthly level.
2. **Total exports (goods and services):** $89.99 billion, nearly 30% higher year-on-year.
3. **Merchandise imports:** $89.35 billion, up 16.5%.
4. **Total imports:** $110.1 billion, up 16.6%.
5. **Trade deficit:** Narrowed from $25.1 billion to $20.1 billion.
6. **Export destinations:** 43 of India’s top 50 export markets recorded positive growth.

2. India’s Position in Global Merchandise Trade

1. **Global ranking:** 18th-largest merchandise exporter in 2024 (World Trade Organization).
2. **Share in global merchandise exports:** Approximately 1.8% in 2024.
3. India’s ranking improved from 19th in 2014 to 17th in 2023, before standing at 18th in 2024.

3. India’s Total Exports – FY 2025–26

US$ 863.1 billion – Record high

1. **Merchandise exports:** US$ 441.8 billion.
2. **Services exports:** US$ 421.3 billion.
3. **Merchandise exports in FY 2024–25:** US$ 437.7 billion.
4. **Significance:** Services exports now contribute nearly half of India’s total export earnings.

4. Major Drivers and Economic Significance

1. **Export diversification:** Expansion into multiple geographical markets reduces dependence on a limited number of destinations.
2. **Petroleum products:** Significant contribution to October’s merchandise export growth.
3. **External sector resilience:** Higher exports strengthen foreign exchange earnings.
4. **Global competitiveness:** Broad-based growth creates opportunities for Indian manufacturing and services.
5. **Trade balance:** Faster export growth relative to imports helps reduce the trade deficit.

5. Challenges and Way Forward

1. **Import dependence:** Merchandise imports remain significantly higher than merchandise exports.
2. **Export concentration:** Reduce excessive dependence on petroleum and other commodity exports.
3. **Manufacturing competitiveness:** Improve productivity, quality standards and domestic value addition.
4. **MSME integration:** Connect Micro, Small and Medium Enterprises with global value chains.
5. **Trade facilitation:** Reduce logistics costs, improve port infrastructure and diversify export destinations.

Relevant UPSC Mains PYQ

UPSC CSE Mains 2025 | GS Paper III | 10 Marks

"What are the challenges before the Indian economy when the world is moving away from free trade and multilateralism to protectionism and bilateralism? How can these challenges be met?"

Canada trade talks to finish by Dec

● Modi set to visit Canada next month

FE BUREAU
New Delhi, November 12

INDIA AND CANADA are aiming to conclude negotiations for a comprehensive economic partnership agreement (CEPA) during Prime Minister Narendra Modi's proposed visit to the north American country next month, Canadian International Trade Minister Maninder Sidhu said on Thursday. He pitched Canada as a long-term supplier of liquefied natural gas (LNG), uranium and critical minerals to meet India's growing energy and manufacturing requirements.

Speaking at the CII Partnership Summit in Visakhapatnam, Sidhu said the sixth round of negotiations between the chief negotiators of the two countries was underway and expressed hope that the agreement would be finalised before Modi's visit. "We're negotiating right now with India. I'm here for round six between our chief negotiators, and we're going to hopefully get there by the time Prime Minister Modi visits Canada next month," he said.



Canadian International Trade Minister Maninder Sidhu meets Civil Aviation Minister K Rammohan Naidu on the sidelines of the CII Partnership Summit in Visakhapatnam on Thursday

Sidhu said the two economies were complementary, with Canada's natural resources and technological capabilities offering opportunities to support India's expanding energy requirements, electric vehicle manufacturing and industrial growth.

The minister said Canadian pension funds and institutional investors were also keen to expand their investments in India, particularly in data centres and artificial intelligence infrastructure. Canadian investors, including Fairfax, had already invested more than $100 billion in India, he said. "If you look at it collectively, Canada is the largest investor in India," Sidhu said.

India already sources a range of commodities from Canada, including pulses, potash fertilisers, coal, crude oil, wood pulp and non-ferrous metals. Canada has emerged as an important supplier of heavy crude oil to India over the past five years.

The two countries are now looking to expand this relationship to LNG, nuclear fuel and critical minerals. A memorandum of understanding on critical minerals value chains was signed during Canadian Prime Minister Mark Carney's visit to India in March this year, covering cooperation in exploration, mining, beneficiation, processing and investment. During the visit a $2.5-billion deal was signed for the supply of uranium to India, Sidhu said. The agreement was signed between Canada's Cameco and India's Department of Atomic Energy in March. Cameco will supply nearly 22 million pounds of uranium over nine years, with deliveries beginning in 2027.

6. India–Canada CEPA: Reviving Trade and Strategic Economic Partnership

GS Paper II: International Relations – India–Canada Relations and Bilateral Cooperation
GS Paper III: Indian Economy – Foreign Trade, Energy Security and Critical Minerals

Context: India and Canada are accelerating negotiations for a Comprehensive Economic Partnership Agreement (CEPA), targeting its conclusion by December 2026 to strengthen trade, investment, energy security and critical-mineral cooperation.

1. Latest Developments

1. **CEPA negotiations:** Sixth round underway in November 2026; three services-related chapters have reportedly been concluded.
2. **Completion target:** Both countries aim to finalise negotiations by December 2026.
3. **Trade ambition:** India aims to achieve US$50 billion bilateral trade by 2030; Canada has set a C$70 billion annual trade ambition.
4. **Diplomatic reset:** Canadian Prime Minister Mark Carney's March 2026 visit helped revive economic engagement.
5. **Investment interest:** Canadian pension funds and institutional investors are expanding their interest in India's infrastructure, technology and energy sectors.

2. India–Canada Trade: Latest Figures

A. Merchandise Trade – FY 2025–26 (Indian data)

1. India's exports to Canada: **US$4.67 billion**.
2. India's imports from Canada: **US$3.28 billion**.
3. Total bilateral merchandise trade: **US$7.95 billion**.
4. India recorded a merchandise trade surplus of approximately **US$1.39 billion**.

B. Major Indian Exports to Canada

1. Engineering goods – US$1.39 billion.
2. Pharmaceuticals – US$629.4 million.
3. Gems and jewellery – US$376.47 million.
4. Chemicals, textiles and marine products.

C. Major Indian Imports from Canada

1. Pulses – US$617.8 million.
2. Transport equipment – US$350.05 million.
3. Coal, coke and briquettes.
4. Fertilisers, non-ferrous metals and mineral ores.

3. Where India Leads and Where Canada Has an Advantage

India's Strengths

1. Pharmaceuticals, engineering goods, textiles and gems and jewellery.
2. Information technology, skilled workforce and digital services.
3. Large consumer market and manufacturing capabilities.

Canada's Strengths

1. Natural resources, crude oil, uranium and agricultural commodities.
2. Critical minerals such as lithium, nickel and cobalt.
3. Institutional investment, advanced technology and higher education.

Important Trade Imbalance: Canada's 2025 trade data shows that it exported approximately C$15.1 billion in services to India, while importing C$4.3 billion in services from India. Education-related travel is a major contributor to Canadian services exports. Thus, India has an advantage in merchandise trade, whereas Canada has a substantial advantage in services trade.

4. Strategic Significance for India

1. **Energy security:** Diversification of LNG, crude oil and nuclear fuel supplies.
2. **Critical mineral security:** Access to lithium, nickel and cobalt for electric vehicles, batteries and renewable energy.
3. **Nuclear cooperation:** A US$2.5 billion uranium supply agreement was signed between India's Department of Atomic Energy and Canada's Cameco in March 2026.
4. **Technology partnerships:** Cooperation in Artificial Intelligence, semiconductor ecosystems and advanced manufacturing.
5. **Investment:** Mobilisation of Canadian pension funds and institutional capital for Indian infrastructure and technology.
6. **Trade diversification:** Reduced dependence on limited geographical markets and suppliers.

5. Challenges and Way Forward

1. **Trade barriers:** Improve market access for Indian pharmaceuticals, textiles, agricultural products and engineering goods.
2. **Services imbalance:** Expand opportunities for Indian IT professionals and skilled service providers.
3. **Critical minerals:** Develop long-term supply agreements and joint exploration and processing projects.
4. **Energy cooperation:** Strengthen LNG, uranium and clean-energy partnerships.
5. **Diplomatic stability:** Maintain predictable bilateral relations and institutional dialogue.
6. **CEPA implementation:** Ensure balanced concessions, investment protection and effective dispute-resolution mechanisms.

Relevant UPSC Mains PYQ

UPSC CSE Mains 2025 | GS Paper III | 10 Marks

“What are the challenges before the Indian economy when the world is moving away from free trade and multilateralism to protectionism and bilateralism? How can these challenges be met?”