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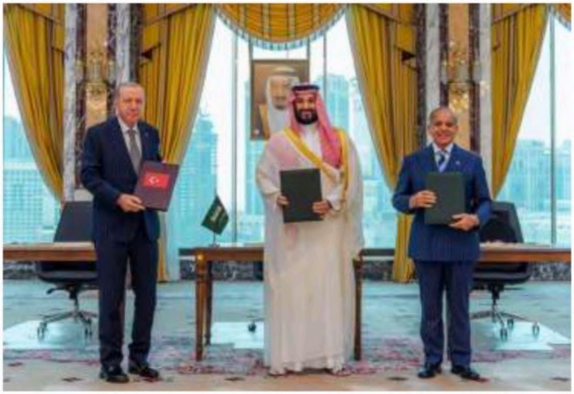
Pakistan, Saudi Arabia, Turkiye ink defence deal

The countries sign the pact pledging a joint response to aggression against any member; it aims at strengthening security and promoting 'peace and stability in the region', says a joint statement

Stanly Johny



Turkish President Recep Tayyip Erdogan, Saudi Crown Prince Mohammed bin Salman, and Pakistan PM Shehbaz Sharif pose after signing a trilateral defence agreement in Mecca, on Friday. AP

Pakistan, Saudi Arabia, and Turkiye on Friday signed a joint defence agreement in Mecca committing "collective defence" and "collective deterrence", at a time when Saudi Arabia is under attack from Yemen's Houthis and West Asia remains engulfed in the ongoing war against Iran.

The three countries, an oil-rich Persian Gulf kingdom, a South Asian nuclear power and a NATO member, said the pact was aimed at strengthening "collective deterrence" and declared that an armed attack against any one of them would be treated as an attack against them all.

The agreement was signed at the Mecca Al-Mukarramah Summit for Joint Defence, attended by Saudi Crown Prince and Prime Minister Mohammed bin Salman, Turkish President Recep Tayyip Erdogan, and Pakistani Prime Minister Shehbaz Sharif.

According to a joint announcement issued by the Pakistani Foreign Ministry, the leaders, who met at Al-Safa Palace in Mecca after an invitation from Saudi Arabia's King Salman bin Abdulaziz, reviewed bilateral ties among the three countries as well as a range of regional issues before signing what was described as the Mecca Joint Defence Agreement.

It added that the pact reflected their commitment to strengthening collective security while promoting "peace, security, and stability in the region and beyond, in pursuit of a secure and prosperous future."

A Turkish government source said the agreement is "a defence-oriented partnership" that does not target any country. "It seeks to strengthen commitments to preserving regional and global peace, stability and prosperity through burden-sharing and collective security," the official added.

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1. Context (West Asia — International Relations — GS2)

West Asian instability, attacks on Gulf states and uncertainty over existing security arrangements have encouraged regional powers to pursue collective security, greater deterrence and strategic autonomy.

2. Makkah Joint Defence Agreement

- Collective deterrence: An armed attack on any one signatory will be treated as an attack on all three.
- Defensive character: Not aimed at any specific country and not intended to create a sectarian or military bloc.
- Strategic convergence: Combines Saudi Arabia's economic and energy power, Turkey's military and defence-industrial strength, and Pakistan's military and nuclear capability.
- Broader objective: Strengthen defence coordination, regional deterrence and protection of maritime and energy routes.

3. Core Strategic Interests

I. Saudi Arabia
- Security: Diversify security partnerships and reduce dependence on U.S. guarantees.
- Deterrence: Strengthen protection against regional threats.

II. Pakistan
- Strategic relevance: Expand its role in the West Asian security architecture.
- Economic interests: Secure energy, investment and employment linkages with Saudi Arabia.

III. Turkey
- Power projection: Expand its influence in West Asia.
- Strategic autonomy: Build an independent regional security role alongside NATO membership.

4. Core Takeaway — "Muslim NATO"?

- Not a Muslim NATO: It resembles NATO's collective-defence principle but lacks NATO-like institutional structures, automatic military intervention and unified command.
- Real significance: A regional strategic partnership for deterrence and security coordination, reflecting the three countries' pursuit of greater strategic autonomy.
- Emerging trend: Signals a shift towards a more multipolar, regionally driven West Asian security architecture, rather than a formal Islamic military alliance.

Service charge on UPI transactions makes sense

The current zero-MDR regime puts pressure on govt finances and limits the ecosystem's ability to invest in long-term infrastructure

GANGA NARAYAN RATH

The Finance Ministry recently tabled a bill proposing to amend the Payment and Settlement Systems Act, 2007 empowering the government to levy MDR (Merchant Discount Rate) on "one or more electronic modes" of payment, including UPI."

The debate over subjecting UPI transactions to a service charge — MDR — was initiated in August 2022 by the RBI itself through a "Discussion Paper on Changes in Payment System." To promote UPI at that time, the Finance Ministry rightfully set aside the RBI paper, while continued advocacy kept the MDR debate alive. Since then, the stakeholders have kept the opinion poll in a permanent campaign mode, with news of sporadic wins and losses popping up now and then depending upon whether there is red or black ink on their balance sheets.

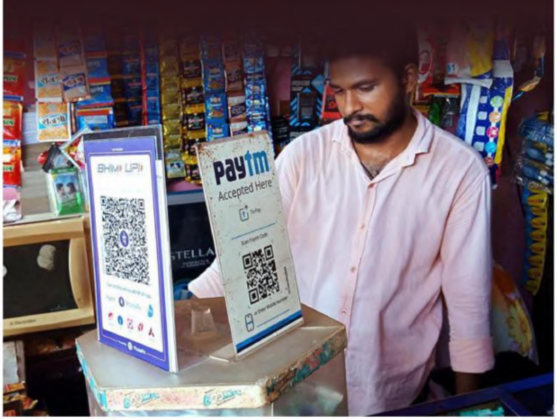
The debate took a favourable turn with the payment industry successfully convincing the Parliamentary Standing Committee early this year that the current zero-MDR regime puts pressure on government finances and limits the ecosystem's ability to invest in long-term infrastructure. On the back of the Standing Committee's report comes the proposed bill to give flexibility to the government to decide which digital payment modes should remain exempt from charges and which could attract MDR.

This has rekindled the interest of third-party application providers and payment processors who have long sought a sustainable revenue model.

UPI SCALING WITH SUPPORT

As of early 2026, UPI's scale has reached considerable heights, with monthly volumes exceeding 21.7 billion transactions and value crossing ₹28.33 lakh crore. While the volumes endorse ease of making small payments, they also place a substantial financial burden on banks and payment service providers managing the servers, security systems, and fraud prevention infrastructure that keep the network running.

The government has been making budgetary allocations to incentivise digital payments since FY2021-22. Those allocations have followed an uneven path: ₹2,485 crore in FY24, falling to ₹1,146 crore in FY25, with ₹2,200 crore budgeted for FY26 and estimated ₹2,000 crore for FY27. The Department of Financial Services confirmed to the Parliamentary Committee that these incentives cover only around 11 per cent of actual industry costs and represent approximately 14 per cent of the MDR revenue the industry forgoes under the current policy. Industry estimates place actual operational costs closer to ₹20,000 crore annually, leaving a funding gap that the incentive scheme, in its present trajectory, cannot close.



NECESSARY TO KEEP IN STEP

On the technical side, the MDR landscape is already moving towards a tiered model. While basic UPI remains free, RuPay Credit Card on UPI and PPI wallet transactions now carry an MDR of up to 2 per cent for transactions exceeding ₹2,000. This targeted approach protects small *kirana* stores and low-ticket daily purchases, which account for over 80 per cent of total transaction volume, while asking larger merchants to contribute to the system's upkeep.

> **The case for exempting small-value transactions** from MDR is well-founded. The question is, whether the same logic extends to large value transactions processed by organised commercial users

Proponents of the status quo argue that any friction, even a 0.1 per cent fee, could drive small vendors back to cash, reversing years of progress in formalising the economy. Proponents of a fee structure counter that a digital public infrastructure of UPI's scale requires a durable revenue model to fund future development — including 5G integration and cross border expansion — rather than indefinite reliance on taxpayer-funded subsidies.

DIRECTION IS CLEAR

The RBI Discussion Paper engaged directly with this tension: whether a payment service should recover costs from its users, or whether the presence of a public good element justifies absorbing those costs as a state obligation. The paper acknowledged that "the government and regulators have an important role in ensuring wider acceptance of payment systems." It also recognised that full cost absorption by the state is not the only available model. In practice, governments routinely build infrastructure in partnership with the private sector and permit partial cost recovery from users. Roads built under the highway authority model are one example.

The toll structure is the mechanism through which commercial users contribute to the cost of infrastructure they could not have efficiently built alone. The more relevant domestic parallel, however, sits within the payments system itself.

NEFT and RTGS transactions recover charges from users, structured in bands of transaction value. Those charges have not suppressed adoption. Electronic fund transfer volumes have grown consistently because the opportunity cost of moving money efficiently is higher than the cost of the transfer. The same logic applies to high-value UPI transactions processed by large commercial entities. For a retail chain settling thousands of transactions daily, a nominal MDR is not friction. It is a cost of operating on infrastructure that makes that settlement possible.

A large share of UPI's user base remains in segments where any marginal cost could affect adoption. With India's financial inclusion index at 67 per cent, the case for exempting small-value transactions from MDR is well-founded. That exemption is not disputed. The question is, whether the same zero-cost logic extend even to large value transactions processed by organised commercial users who derive direct revenue from the network's reliability and reach. It should not.

The appropriate design mirrors what the payments system already does for NEFT and RTGS: band the MDR by transaction value, exempt low-value transactions entirely, and apply a nominal charge to high-value commercial processing. The Parliamentary Committee has pointed in this direction. The RBI's own 2022 Discussion Paper pointed in this direction. The data on the funding gap confirms the direction.

"...establishing a viable revenue mechanism is critical to ensuring the UPI ecosystem achieves financial sustainability without perpetually straining the government exchequer," stated the Parliamentary Standing Committee on Finance, Report on Demands for Grants, Department of Financial Services. With the proposed Bill, the government intent is clear. Hopefully, the amendment gets enacted quickly translating it into implementation.

The writer is former chief general manager, Reserve Bank of India. Views are personal

Pay wall

Removing UPI's free nature will not only be unpopular but also unfair

The government's decision to allow banks and payment processors to levy a charge on UPI transactions, while still pending, has already led to several policy questions. No official decision has yet been announced, but the preparations are apparent. The only official change that has been made is the amendment to the Payment and Settlements Systems Act that will now allow the government to notify which types of transactions can attract a charge. This was done through the Taxation and Other Laws (Amendment) Bill, 2026, which was passed in the Lok Sabha recently without a debate. Before this law, UPI and RuPay debit card transactions were expressly exempt from any charges. Government sources say that the charge could be allowed only for transactions conducted by large merchants with turnovers of more than ₹1 crore-₹1.5 crore and for transactions above ₹2,000 in value. This would limit the charge to only about 5% of all UPI transactions. However, the amended law gives the government the ability to widen this scope. The fear also is that merchants will pass this cost on to consumers, who will move back to cash, which remains free to use. That said, the issue must also be looked at from the point of view of the payment ecosystem. UPI was made free in 2020. The payments players have argued that they have been bearing the cost of maintaining and running UPI since then. As Reserve Bank of India (RBI) Governor Sanjay Malhotra recently said, "somebody has to pay" for UPI. Presumably, he meant that "somebody" should no longer be the payment processors or banks.

However, the burden of the cost has not solely been borne by these players. Taxpayers are already bearing some of it. In 2021, the government introduced a scheme where it paid these payment processors and banks a subsidy to partially cover the cost of processing transactions up to ₹2,000 done by small merchants. The government has already paid about ₹11,349 crore on this, with another ₹2,000 crore budgeted for 2026-27. The question is whether consumers and merchants should be asked to pay an additional charge when some of their taxes are already being used for this purpose. There is also some anger over the perception that the government pushed people towards UPI through demonetisation, only to now allow it to become chargeable. Finance Minister Nirmala Sitharaman has argued that such a charge will help payment players invest more on infrastructure, innovation, and security. The RBI has the resources to pay for UPI's development. Using this would entail a small reduction in the vast surplus that it transfers to the Centre each year, but it would save the government from an increasingly unpopular decision.

Which one of the following best describes the term "Merchant Discount Rate" sometimes seen in news ?

(a) The incentive given by a bank to a merchant for accepting payments through debit cards pertaining to that bank.

(b) The amount paid back by banks to their customers when they use debit cards for financial transactions for purchasing goods or services.

(c) The charge to a merchant by a bank for accepting payments from his customers through the bank's debit cards.

(d) The incentive given by the Government to merchants for promoting digital payments by their customers through Point of Sale (PoS) machines and debit cards.

1. Context (Economy — GS3)

The proposed amendment to the Payment and Settlement Systems Act, 2007 seeks to empower the government to notify electronic payment transactions that may attract charges. This comes amid concerns that the zero-Merchant Discount Rate (MDR) regime is putting financial pressure on the UPI ecosystem and limiting investment in infrastructure, cybersecurity and innovation.

2. Basics

- Merchant Discount Rate (MDR): Fee paid by the merchant to banks/payment processors for processing digital payments.
- Unified Payments Interface (UPI): Real-time bank-to-bank digital payment system.
- Current regime: UPI transactions carry zero MDR, with ecosystem costs partly supported through government incentives.
- Under consideration: MDR on UPI transactions above ₹2,000 made by large merchants, potentially below 0.5%; small merchants and consumers are expected to remain exempt. This is under consideration, not yet a final notified policy.

3. Positive Aspects

- Sustainability: Creates revenue for maintaining UPI infrastructure.
- Investment: Supports cybersecurity, innovation and technological upgrades.
- Lower fiscal burden: Reduces dependence on government incentives.
- Fair cost-sharing: Large commercial users contribute to the infrastructure they heavily utilise.

4. Negative Aspects

- Cost pass-through: Large merchants may indirectly transfer MDR to consumers.
- Cash revival: Higher payment costs could encourage cash transactions.
- Digital inclusion: Wider MDR could discourage small merchants and low-value users.
- Public-good concern: UPI's success rests partly on being simple, affordable and frictionless.

5. Core Argument

The issue is not simply MDR vs zero MDR, but how to make UPI financially sustainable without undermining its affordability and mass adoption.
Best approach: Keep small-value transactions and small merchants free, while imposing a limited MDR on high-value transactions of large merchants.

The changing logic of the India-U.S. partnership

The Trump administration's latest tariffs on several trading partners, including India, are widely seen as another trade dispute. That interpretation misses the larger picture. Alongside growing demands for greater burden-sharing, tighter technology restrictions and a more reciprocal approach to international partnerships, the tariffs reflect a broader shift in American statecraft. Washington is increasingly judging partners and competitors through the lens of national interest rather than strategic convergence. The immediate impact will be felt in trade negotiations; the more enduring implications are strategic. They signal a changing American approach to alliances and partnerships with important implications for India.

This approach reflects what the Trump administration describes as 'flexible realism'. Unlike the post-Cold War liberal international order, this approach places national interest at the centre of American foreign policy. It treats trade, technology, industrial policy, and security as integrated instruments of statecraft. Partnerships are judged less by shared values or historical goodwill than by the tangible strategic and economic value they deliver. Rather than signalling a retreat from global engagement, it recalibrates how the United States pursues its interests in an increasingly competitive international environment.

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The China factor

It is useful to recall the strategic logic that has underpinned the India-United States partnership over the past decade. With China's emergence as Washington's principal strategic competitor, India assumed growing strategic importance in the U.S.'s calculations. Defence cooperation expanded, the Quad gained momentum, technology partnerships deepened, and supply-chain resilience became a shared priority. While democratic values provided a favourable political backdrop, it was the convergence of strategic interests driven by China's rise that gave the partnership its real momentum. For both New Delhi and Washington, managing the geopolitical consequences of a more powerful China became the principal driver of bilateral cooperation. This shift in American statecraft does not diminish India's strategic importance, but it does redefine the basis on which that importance will be judged. Strategic convergence with the U.S. remains important, but it can no longer be assumed to be the principal driver of the relationship. Washington is increasingly likely to assess even close partners through the lens of reciprocal economic benefit, technological capability, and strategic contribution. Consequently, India can no longer assume that intensifying U.S.-China competition will, by itself, continue to enhance its strategic relevance. The partnership must increasingly rest on what India brings to the table than on China's rise alone.

India's challenge is to build capabilities that make it an indispensable U.S. partner

The next phase

The more significant implication of this evolving approach is that it redefines the nature of strategic partnerships. The first phase of the India-U.S. relationship was shaped by strategic convergence driven by China's rise. The next phase will increasingly depend on strategic complementarity, with each country expected to contribute capabilities that reinforce the other. Defence cooperation, critical technologies, resilient supply chains, and advanced manufacturing will matter not merely because they help manage China's rise, but because they strengthen the resilience and competitiveness of both economies. The India-U.S. partnership is therefore evolving from one defined primarily by a shared strategic challenge to one sustained by mutual strategic value. Far from weakening the relationship, this evolution could make it more balanced and resilient.

If flexible realism encourages Washington to rely on stronger and more capable partners, it also creates greater space for India's strategic agency. A more economically competitive, technologically advanced, and militarily capable India is not only a more valuable partner for the U.S. but also better positioned to pursue its own strategic interests. The relationship can therefore evolve from one shaped primarily by China's rise to one anchored in India's capabilities and strategic contribution.

For India, this evolution reinforces rather than weakens the relevance of strategic autonomy. In the emerging international environment, strategic autonomy is not about maintaining equal distance from competing powers; it is about preserving the ability to make independent choices based on India's own interests. That also means that India's approach to China should increasingly be guided by its own long-term strategic calculations rather than by the trajectory of U.S.-China relations. In practice, this requires a strategy of multi-alignment: strengthening the strategic partnership with the U.S., managing competition and cooperation with China on India's own terms, and deepening strategic, economic, and technological partnerships with the European Union, Japan, and Global South.

Looking ahead

The India-U.S. partnership is entering a new phase. During the past decade, its momentum was driven by a shared response to China's rise. That strategic convergence will remain important, but it will no longer be sufficient on its own. In this emerging strategic environment, enduring partnerships will increasingly be built on capability, reciprocity, and strategic value. For India, this carries a broader strategic lesson. India's strategic relevance must increasingly flow from its own economic dynamism, technological capabilities, defence preparedness, and diplomatic influence. The challenge, therefore, is not merely to remain relevant in Washington's strategic calculus, but to build the capabilities that make it an indispensable partner. That would not only strengthen the India-U.S. partnership but also reinforce India's strategic autonomy in an increasingly contested world.

The views expressed are personal

‘पश्चिम भारत को, चीन की आपूर्ति शृंखला पर निर्भरता कम करने के लिये एक विकल्प के रूप में और चीन के राजनीतिक और आर्थिक प्रभुत्व का मुकाबला करने के लिये एक रणनीतिक सहयोगी के रूप में बढ़ावा दे रहा है।’ उदाहरणों के साथ इस कथन की व्याख्या कीजिये। (उत्तर 150 शब्दों में दीजिये)

‘The West is fostering India as an alternative to reduce dependence on China's supply chain and as a strategically to counter China's political and econimic dominance.’ Explain this statement with examples. (Answer in 150 words) 10

1. Context (GS2 — International Relations)

China's rise initially drove India–U.S. convergence; however, the partnership is now shifting towards mutual strategic value—India's economic scale, technology, defence capability and strategic geography are becoming valuable in their own right.

2. India as an Alternative to China's Supply Chain

I. Manufacturing:

- China+1: Diversification of production; Apple's expanding India manufacturing is a key example.
- Critical minerals: Minerals Security Partnership (MSP) diversifies mineral supply chains.
- Pax Silica: Builds resilient supply chains across critical minerals → semiconductors → AI → advanced manufacturing.
- iCET: Cooperation in semiconductors, AI, quantum, telecom and space.

3. India as a Strategic Ally

I. Indo-Pacific:

- India's Indian Ocean location + military capability make it vital for balancing China.
- Quad: India–U.S.–Japan–Australia cooperation in maritime security, technology and resilient supply chains.

II. Defence & technology:

- GE–HAL, defence co-production, technology cooperation strengthen India's strategic capability.

4. Way Forward

- Convert Western interest into domestic manufacturing and technological capability.
- Move from buyer → co-developer/co-producer through technology transfer.
- Use MSP/Pax Silica to integrate India into high-value supply chains.
- Preserve strategic autonomy and multi-alignment.

Stop assuming GDP is an indicator of prosperity

Ehsan Masood

Not yet 30 and already a veteran chief economist to Pakistan's Planning Commission, Mahbub ul Haq wrote in 1963: "It is well to recognize that economic growth is a brutal, sordid process. There are no short-cuts to it . . . The road to eventual equalities may inevitably lie in initial inequalities."

At the time, he was an evangelist for a kind of "growth at all costs" philosophy, then at the leading edge of economics. Guided by economists sent to Karachi from Harvard University, Haq and his colleagues helped the fledgling nation grow at around 6 per cent during the 1960s. Pakistan came to be known as the "development miracle".

Yet five years later, Haq had changed his mind. You did not need to be an economist to see that sustained growth had failed to eliminate the country's structural poverty. The architects of Pakistan's first five-year plan wanted to prioritise affordable housing, spending on public health and education. But their US-trained advisers put more emphasis on industrial policy, specifically on those that would boost a relatively small number of conglomerates. The economist Khadija Haq, who happened to be Haq's wife, found that just 20 family groups controlled most of the industrial corporations, insurance companies and banks then listed on the Karachi Stock Exchange.

Writing later in *The Poverty Curtain*, Haq argued: "It is time to stand economic theory on its head, since a rising growth rate is no guarantee against worsening poverty."

Haq, who died in 1998, could have been writing today. From Tunisia in 2011 to Bangladesh in 2024, country after country has gone through a similar kind of cycle: billboard-worthy rates of economic growth masking unemployment — especially among the young — as well as high levels of wealth inequality and social unrest, which, in a few cases, led to revolutions. More than ever, we need to rethink GDP as an indicator of economic growth.

Nearly six decades after Haq's epiphany, the rest of the world now seems to be catching up. UN secretary-general António Guterres has made reform of global rules for economic measurement a priority for his second term. And it may well be his most important legacy.

> Billboard-worthy rates of growth often mask high levels of wealth inequality and social unrest

In 2021, Guterres got the chief executives of the major multilateral agencies including the IMF and the World Bank to write a paper summarising what was right and wrong with GDP. Their paper, "Valuing What Counts", called for a political moonshot to decouple GDP from progress. Guterres then assembled a second group of independent academic economists who came to a similar conclusion. UN member states, led by Spain and Guyana, have begun an intergovernmental process to adopt new metrics — including possibly a new composite index — that goes beyond GDP.

Countries have essentially two choices. They can change what GDP measures, so it doesn't just count the monetary value of all finished goods and services. Instead, it would also capture things such as unpaid housework, or misleadingly named "externalities" such as the natural capital and ecosystem services on which human life and future wellbeing depend and which are either threatened or have already transgressed safe limits. This, however, is proving fiendishly hard to achieve.

An alternative choice is that we all just stop using the GDP index as the main yardstick for prosperity — which just about any economic statistician will tell you is no bad thing — and start to run economies according to a dashboard of indicators instead. Many of these, including getting every child into school or universal healthcare, are already being measured in the UN Sustainable Development Goals. They just need elevating to the status of GDP.

In his later years, Haq went to work for the UN where he led the design of the Human Development Index, a calculated attempt at dethroning GDP. It would be just as vulgar but stand for better things, he told Amartya Sen, his friend and collaborator on the project. But the HDI team made the error of setting up their new index as a parallel indicator to GDP — but one that existed outside the UN system of national accounts. This enabled GDP to continue its reign for another three decades, untroubled by its new competitor.

As Guterres prepares to leave office, his successor must continue to champion the UN's Beyond GDP work. They cannot undo history, but they can study what went before. To paraphrase Haq, the world can ill-afford being endlessly preoccupied with the refinement of the national accounts when not enough is being done on the real problems of mass poverty.

The writer is an editor at Nature and author of 'GDP: The World's Most Powerful Formula and Why it Must Now Change'

1. Context (Economy — GS3)
High economic growth does not automatically translate into prosperity or better quality of life. GDP captures economic output but overlooks several dimensions that determine people's actual wellbeing.

2. Basics: Gross Domestic Product (GDP)
- GDP: Monetary value of all final goods and services produced within a country's territory during a given period.
- Purpose: Measures the size and growth of an economy.
- Limitation: Does not adequately reflect income distribution, poverty, health, education, unpaid work, environmental sustainability or overall wellbeing.

3. Why GDP Alone Is Inadequate
I. Growth ≠ Prosperity
- High GDP growth can coexist with poverty, unemployment and social unrest.
- Pakistan: Growth has not automatically eliminated structural poverty.

II. GDP Does Not Show Distribution
- GDP is an aggregate measure; it does not show who benefits from economic growth.
- A rising GDP can coexist with high wealth and income inequality.

III. GDP Misses Social Wellbeing
- It inadequately captures healthcare, education, quality of life and unpaid household/care work.
- Therefore, economic expansion may not translate proportionately into human development.

IV. GDP Ignores Environmental Costs
- GDP can rise even when growth involves depletion of natural resources, ecosystem degradation and environmental damage.
- Sustainable prosperity requires accounting for natural capital and ecological wellbeing.

4. Way Forward
- Retain GDP as a measure of economic activity, but do not treat it as the sole measure of prosperity.
- Use a dashboard of indicators covering income distribution, health, education, employment, environment and wellbeing.
- HDI and SDGs provide useful complementary frameworks.

WASHINGTON

NASA astronauts Anil Menon, Meir undertake spacewalk outside ISS

REUTERS

NASA astronauts Anil Menon and Jessica Meir on Friday concluded their spacewalk outside International Space Station to assemble a modification kit for its power channel, to allow the addition of solar arrays. The spacewalk, sixth for Ms. Meir and first for Mr. Menon, concluded at 12.30 a.m. IST on Friday. PTI

1. Context (Science & Technology — GS3)

NASA astronaut Anil Menon, an Indian-origin American, completed his first spacewalk outside the International Space Station (ISS) with Jessica Meir. The spacewalk involved modifying the ISS power system to enable the installation of additional solar arrays, strengthening its future power-generation capacity.

2. Anil Menon — Mission & Background

- Indian-origin American astronaut, physician and former flight surgeon.
- Selected: NASA Astronaut Candidate Class, 2021.
- First spaceflight: Soyuz MS-29 mission to the ISS.

3. Indian-Origin Astronauts & ISS

- Kalpana Chawla: First Indian-American in space; her missions were aboard the Space Shuttle and not to the ISS.
- Sunita Williams: Indian-American astronaut who undertook multiple ISS missions and long-duration stays.
- Raja Chari: Indian-American NASA astronaut who served aboard the ISS during Expedition 66.
- Anil Menon: Latest Indian-American astronaut to undertake an ISS mission and has now conducted his first spacewalk.
- Shubhanshu Shukla: First Indian national to visit the ISS, through the Axiom-4 mission in 2025—distinct from being an Indian-origin American.

Astrobase unveils India's first private 800kN rocket engine

The Hindu Bureau
BENGALURU

Astrobase, a Bengaluru-based space company unveiled India's first privately built 800 kN Full-Flow Staged Combustion (FFSC) LOX-Methane rocket engine on Friday.

"The engine, named EVEREST, has been developed by Astrobase making it the fourth commercial company to successfully develop a high thrust flow FFSC engine globally," said Neeraj Khandelwal, co-founder and CEO, Astrobase Space Technologies.

Astrobase Space Technologies said that the unveiling of EVEREST marks a significant milestone in the company's efforts to strengthen India's indigenous launch infrastructure and advance reusable launch capabilities.

The company added that it is also building the complete industrial chain required for launch – from engine manufacturing and high-flow testing to stage integration, vehicle qualification and launch operations.

"All critical propulsion design authority, system engineering, manufacturing knowledge, software and mission configuration will remain under Indian control. The next major milestone for the programme will be the full-engine hot-fire test...," it said.

1. Context (Science & Technology — GS3)

India's growing private space sector is moving beyond satellite manufacturing and launch services towards indigenous rocket propulsion. Bengaluru-based Astrobase Space Technologies has unveiled EVEREST, an 800 kilonewton (kN) rocket engine, marking an important step in developing advanced private-sector launch capabilities.

2. EVEREST — Key Features

- **Engine**: EVEREST — 800 kN thrust.
- **Propellant**: Liquid Oxygen (LOX) + Methane.
- **Combustion cycle**: Full-Flow Staged Combustion (FFSC), an advanced cycle offering high efficiency and high performance.
- **Reusability**: Designed for multiple operating cycles and intended to support reusable launch vehicles; reusability is not yet flight-demonstrated.
- **Application**: Intended for high-thrust, medium-lift launch vehicles and future reusable launch systems.