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GS 2: INTERNATIONAL RELATIONS

INDIAN EXPRESS PAGE : 1 &2

THE PORTS & PIPELINES PUSH

In bid to bypass Hormuz chokepoint, Gulf countries scramble to ramp up infra

West Asian states with strained ties find common cause to de-risk economies, global supply chains

Sukalp Sharma
New Delhi, April 20

WITH TEHRAN weaponising the Strait of Hormuz and jeopardising global oil and gas flows, countries in the Gulf region led by the United Arab Emirates and Saudi Arabia are scrambling to reduce their dependence and vulnerability on this chokepoint. From ports to pipelines, countries are hoping to ramp up infrastructure in the coming years.

The Iran-Israel/ US conflict has seen an unprecedented halt in maritime traffic through the Strait—a narrow waterway between Iran and Oman—through which about one-fifth of global oil and liquefied natural gas (LNG) flows.

The West Asia war gives reason enough for the Gulf states to collaborate and coordinate for revitalising old pipelines and building new ones. According to reports from the region, early efforts may already be underway to do just that.

"I have spent the past month in discussions with hundreds of business leaders and senior Gulf government officials on the crisis and what comes after it. The conversation has already shifted—from managing the

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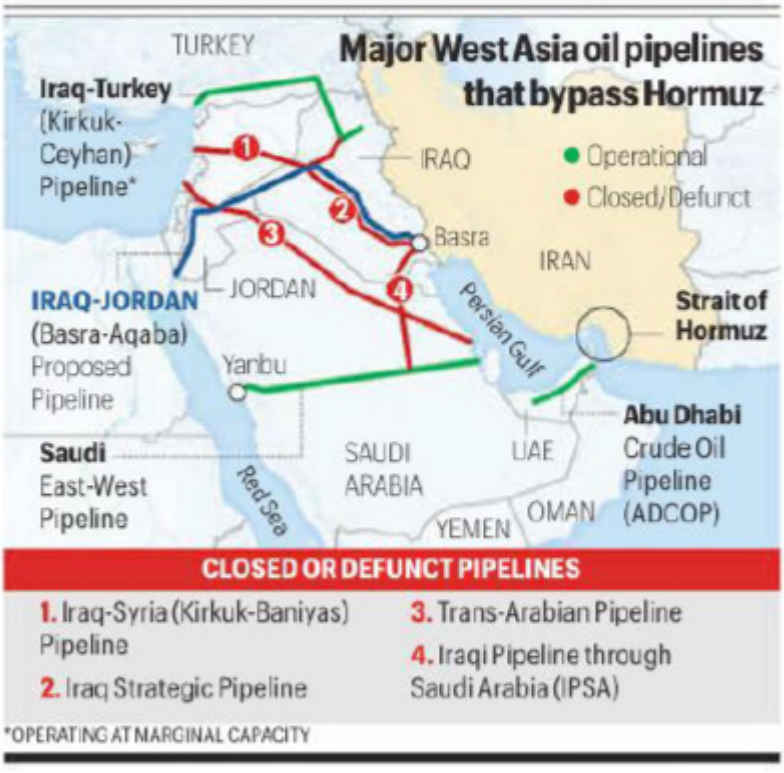

THE WORLD PAGE 16

UNCERTAINTY LOOMS OVER FATE OF U.S.-IRAN TALKS

[FROM PAGE 1 | FULL REPORTS ON WWW.INDIANEXPRESS.COM

Hormuz

immediate crisis to redesigning the systems that created this vulnerability in the first place," UAE based businessman and the country's Special Envoy for Business & Philanthropy Badr Jafar wrote recently in *Financial Times*.

"The crisis is doing what years of summitry could not—creating the conditions for genuine intraregional economic integration. States whose ties were strained only weeks ago are now finding common cause. Rerouting essential commerce away from a single chokepoint de-risks not only the economies of the region but global supply chains," Jafar wrote.

For decades, Iran threatened to close the Strait, but didn't actually do it. The US-Israel war against Iran that started on February 28 changed that. Tehran—and the world—now know that it can effectively halt vessel movements through the maritime chokepoint almost at will, and impose a massive cost on the global economy.

"Looking ahead, several pipeline options could be expanded, reactivated, or newly constructed to further reduce reliance on the Strait of Hormuz. However, all of these would require a significant financial investment and several years to be realised," Victoria Grabenwöger, senior oil analyst at commodity market analytics firm Kpler, told *The Indian Express*.

Even as numerous oil tankers, among scores of merchant vessels, have been stranded in the Persian Gulf, Saudi Arabia and the UAE managed to export some of their oil using pipelines that bypass the Strait of Hormuz. These are Saudi Arabia's 1,200-km long East-West pipeline from oil fields near the Persian Gulf to the Red Sea port of Yanbu, and UAE's Abu Dhabi Crude Oil Pipeline (ADCOP) that connects the Habshan oil field to the port of Fujairah in the Gulf of Oman.

While the volumes that can be moved through these pipelines are much lower than what Saudi Arabia and UAE usually export through the Hormuz, they have exhibited the potential of pipelines as a tool to reduce dependence on the Strait.

This realisation could lead to a tectonic shift in how energy flows from West Asia. According to experts and analysts, the war has jolted other West Asian powers into recognising the importance of building massive infrastructure like pipelines to bypass the Strait of Hormuz. Such infrastructure build-up—which could include building new pipelines, expanding capacities of existing pipeline systems, and reviving discarded or mothballed pipelines — would take years, huge investments, and a great degree of cooperation between the Gulf states. But with Iran having tasted blood by disrupting the Strait of Hormuz, it is likely that more pipeline and port infrastructure will be come up in West Asia to divert exports through alternative routes like Gulf of Oman, Red Sea, and Mediterranean Sea.

It's not like West Asia didn't have oil export pipelines in the past. Yet, hardly any has stood the test of time and regional tensions. "When looking at the historical performance of the oil export pipelines in the Gulf, one could easily note that every line in the region has been shut down at least once, and that most of them remain closed until the present time. The main reasons remain the political conflicts within producing countries or transit states, and interstate disputes. In fact, most of the pipelines crossing state boundaries have fallen victim to the region's political rivalries and conflicts at one point or another," Naji Abi-Aad, senior advisor on energy studies at Gulf Research Center wrote in an analysis.

The pipeline options

"The most feasible measures would likely include capacity expansions of Saudi Arabia's East–West pipeline/Yanbu, as well as enhancements or parallel lines to the UAE's ADCOP pipeline to Fujairah," said Kpler oil analyst Grabenwöger. "Increasing throughput on the Iraq–Turkey pipeline (Kirkuk to Ceyhan) could also enable greater volumes of Iraqi crude to bypass the Gulf. In addition, several projects currently on hold could be revived in the coming years, including the Basra–Aqaba (Iraq-Jordan) pipeline and the IPSA (Iraqi Pipeline through Saudi Arabia) pipeline. The latter—linking Iraq to Saudi Arabia and onward to Yanbu on the Red Sea—has been out of service since the early 1990s and would require significant technical refurbishment and political coordination to restart. If reactivated, however, it could provide a substantial alternative export route that avoids the Strait entirely."

Abu Dhabi-based energy analyst Natalia Katona said connecting the oil production in Iraq's Basra to Kirkuk and then onward to Ceyhan in Turkey makes a "lot of sense on paper".

"The infrastructure partly exists, but expanding and stabilising it would take time, money, and a much more predictable security environment. That said, Iraq probably has the most pressure to act—limited storage, limited refining, and a heavy reliance on continuous exports...," Katona said.

Apart from the Trans-Arabian Pipeline and IPSA, other major defunct or inactive West Asian oil pipeline systems include a pipeline that connected Kirkuk in Iraq with the Syrian port of Baniyas and the Iraq-Syria-Lebanon pipeline. Most of such pipelines have effectively been shut due to wars and political tensions, although talks of reviving them do surface from time to time. "For countries like Kuwait, Qatar, and Bahrain, geography really works against them. They don't have many viable pipeline alternatives, so in the short to medium term it's more about building up storage and managing risk rather than rerouting flows entirely. In terms of timing, UAE probably has the most flexibility to move relatively quickly on incremental projects. But the real structural pressure is on Iraq and the smaller Gulf countries—they are the most exposed and have the fewest fallback options," Katona said.

But the current limitations faced by the likes of Kuwait, Qatar, and Bahrain doesn't stop them from collaborating with their Gulf neighbours to build pipeline infrastructure for the future. "Saudi Arabia and the UAE managed to circumvent the chokepoint to a limited degree via their bypass pipelines. Riyadh and Abu Dhabi are almost certain to double down, expanding those emergency conduits further. Kuwait would doubtless join forces with the Saudis to build its own bypass pipeline. Iraq would struggle with the expense, but it has every incentive to rebuild its old strategic pipeline that let it move oil from the south to the Mediterranean via Turkey," Javier Blas, energy and commodity columnist at Bloomberg wrote in a recent column.

"Five years from now, the Persian Gulf will have far better bypass options than it does today. No matter what the US and Iran agree over the future of Hormuz, the strait's status will change. But the waterway will never be as critical to the global economy as it was when the fighting started six weeks ago," Blas wrote.

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'TOBACCO NOT JUST A HEALTH BURDEN, IT IS A POVERTY TRAP'

10% of Indian households can rise to a higher economic class just by quitting tobacco: Study

Authors suggest integrating tobacco control with flagship poverty programmes, other nutrition and livelihood schemes

Anuradha Mascarenhas
Pune, April 20

OVER 20.49 million households — 10.6% of all households in the country — could rise to a higher economic class just by stopping spending on tobacco and redirecting that money to other needs, as per a new study published in BMJ Global Health. The study led by researchers at ICMR National Institute of Cancer Prevention and Research (ICMR-NICPR), Noida, and Tata Institute of Social Sciences (TISS), Mumbai, is the first to quantify at national scale the households using tobacco in different forms.

The poorest households, the study finds, spend 6.4% of their entire monthly income on tobacco, the study found. "Tobacco is not just a health burden — it is a poverty trap. We have now shown, with the most rigorous national data available, that 20 million households could move up an economic class simply by quitting. For a rural family already spending nearly 7% of all its income on tobacco, this is not an abstraction — this is the difference between poverty and dignity. Tobacco cessation must be treated as a poverty alleviation strategy, not merely a health message," Dr Prashant Kumar Singh, Senior Scientist, ICMR-NICPR, Noida, and corresponding author told The Indian Express.

India carries one of the world's largest tobacco burdens. With over 267 million tobacco users, which is nearly a quarter of the adult population, tobacco is the single largest preventable cause of death and disease in the country, responsible for over a million deaths every year. Its established links to cancers of the mouth, throat, lung, and oesophagus as well as to heart disease and stroke, have long made it a central concern of public health policy.

Drawing on 2,61,746 nationally representative households from the 2022-23 survey on Household Consumption Expenditure, the study found that the poorest families are paying the highest price. According to the study (The economics of quitting: estimating the uplift potential of Indian households through tobacco cessation), a family in the lowest income group spends 6.4% of its entire monthly income on tobacco. A family at the top spends just 2%. Among the poorest households, 5.62 million (12.4%) could escape their income class entirely through cessation, the study suggests.

According to the researchers, 17 million rural households could move up an economic class through tobacco cessation, compared to 3.5 million urban households. Rural families spend a larger share of income on tobacco (6.6% vs 5.6% in cities) and have far fewer financial safety nets. The rural uplift rate is 60% higher than in urban areas. Also 7.12 million lower-middle-income households (16.8%) could advance to a higher income bracket through cessation.

"This study reframes the conversation on tobacco. It is no longer sufficient to speak of lives saved, we must speak of livelihoods transformed. When a family quits tobacco, they do not just reduce their cancer risk, they reclaim the income to feed their children, pay school fees, and seek timely medical care. Our findings demand that tobacco control be placed at the centre of poverty and development agenda," said Dr Shalini Singh, Director, ICMR–National Institute of Cancer Prevention and Research (ICMR-NICPR), Noida.

According to Dr Montu Bose, School of Health Systems Studies, TISS Mumbai, the household expenditure data tells a story that tobacco is actively blocking economic mobility for millions of Indian families. "This study contributes evidence that bridges public health and social equity in such a direct, policy-relevant way," Dr Bose said.

Study authors have pointed out that no new government schemes or additional cash transfer are required. "The resources are already there ... What is vital is to integrate tobacco control into flagship poverty programmes and other nutrition and livelihood schemes. International development organisations should likewise incorporate cessation into their poverty reduction frameworks for low- and middle-income countries," they said.

E. EXPLAINED

Tobacco Tally & Toll

India is the second largest consumer and producer of tobacco globally. Tobacco products account for nearly 1.35 million deaths every year (3,700 deaths every single day). India also accounts for 70% of the global burden of smokeless tobacco, and 27% of all cancers in India are attributable to tobacco use. Nearly 9 out of 10 adults who use tobacco started before age 18 when the brain is still developing, making young people far more susceptible to nicotine dependence. Among adolescents specifically, tobacco prevalence among those aged 13-15 was 8.5% in 2019 according to the Global Youth Tobacco Survey. In India, 9.6% of boys and 7.4% of girls use tobacco, it said.

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INDIAN EXPRESS PAGE : 12

Uncertainties of Iran war, compounded by US politics

SUMIT GANGULY

NOTWITHSTANDING THE escalations across the Strait of Hormuz in the past 48 hours, there are a series of imponderables at various levels that could undermine the fragile ceasefire between the United States and Iran. US President Donald Trump, with his propensity for hyperbole, had announced that Iran had agreed to hand over its entire stockpile of enriched uranium. He also asserted that this process would not involve the use of American troops. Within a couple of hours of this claim, Iranian authorities categorically denied that they had agreed to any such arrangement. To muddle matters further, at least one reliable American news site, Axios, reported that Iran had agreed to hand over the enriched uranium in exchange for $20 billion in frozen assets. Trump, in turn, stated that no such agreement has been reached.

Meanwhile, in the US House of Representatives, an effort to rein in the administration's war-making abilities, invoking the post-Vietnam era War Powers Act, failed by a single vote. This, however, may change, as according to reports in *The New York Times*, a small number of Republicans in the House have some qualms about granting the President *carte blanche* to continue this war that began nearly two months ago.

Their concerns, with marked exceptions, do not stem from questions involving constitutional proprieties. Instead, many who are coming up for re-election in the November mid-terms have their sights firmly set on spiralling prices and the President's declining poll numbers. With large numbers of Americans reeling from the price of gasoline, which has reached a national average of $4 per gallon, inflation spikes are already underway. Consequently, if this war resumes, President Trump may not be able to prevent them from invoking the War Powers Act. However, given their abject fealty to Trump, this cannot be a foregone conclusion.

It is also worth bearing in mind that Secretary of War Pete Hegseth is scheduled to testify before the House Armed Services Committee on April 29. It is already known that he is expected to seek a dramatic increase in the defence budget, asking for the unprecedented amount of $1.5 trillion.

Democrats, without a doubt, will subject him to much scrutiny. They may also not be swayed from sharply questioning him despite the predictable attempts from Republicans to portray them as weak on defence issues. Most Republicans, however — because of their ideological beliefs as well as their loyalty to President Trump — are likely to sound sympathetic to the request to increase the budget.

Hegseth, for his part, is likely to make two arguments. First, he will emphasise war wastage and the consequent need to rebuild the arsenal. Simultaneously, he is likely to invoke the unwillingness of American allies to bolster the common defence against a range of enemies. If Hegseth and Trump have their way and receive the supplementary funding that they have been seeking (in addition to the dramatic increase in the defence budget), it would be unwise to rule out a reprise of the attack on Iran based on some flimsy and dubious pretext. The war, which has now been paused, could well return with full force.

Other issues also add uncertainty to the situation. Iranian authorities initially stated that they had opened the Strait of Hormuz after a ceasefire was announced in Lebanon on April 16. However, for some utterly inexplicable reason, Trump has sustained the naval blockade. With that flotilla in place, should some Iranian statement or demand pique him, Trump could well resume the conflict.

In the meantime, with the April 22 ceasefire deadline approaching, Pakistan's Field Marshal Asim Munir has been trying to facilitate an end to the conflict. According to reports, a US delegation is making a return to Islamabad despite the deadlock that emerged in the initial round of talks earlier this month, but Iran has refused talks in the face of Trump's blockade and threats.

Obviously, given the widespread adverse economic repercussions of this ill-conceived war, it is in the global interest that it ends as soon as possible. That fervent hope aside, it would be downright foolish to predict its imminent end given the many imponderables involved.

The writer is a senior fellow and directs the Huntington Programme on US-India Relations at the Hoover Institution, Stanford University

Iranian authorities initially stated that they had opened the Strait of Hormuz after a ceasefire was announced in Lebanon. However, for some utterly inexplicable reason, Trump has sustained the naval blockade

GS 3: ENVIRONMENT

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• POLICY

Marine Spatial Plan: Odisha's bid to strengthen climate resilience

Sujit Bisoyi
Bhubaneswar, April 20

THE ODISHA government last week signed a memorandum of understanding with the National Centre for Coastal Research (NCCR) under the Union Ministry of Earth Sciences to launch a Marine Spatial Plan (MSP) for integrated coastal and marine planning in the state.

Sustainable ocean planning has been underway in India since 2019, through a collaboration between India and Norway. In the first phase, it was undertaken in two Union Territories, Puducherry and Lakshadweep. Odisha has become the first state in the country to implement the MSP in the second phase.

Marine Spatial Planning

According to the Intergovernmental Oceanographic Commission (IOC) of UNESCO, MSP is a public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives specified through a political process.

Flamingoes at Chilika Lake. WIKIMEDIA COMMONS

It is a tool for sustainable and integrated ocean management aimed at boosting the blue economy and strengthening climate resilience. MSP helps with the sustainable utilisation of marine resources in energy, and economic activities like developing ports, setting up industries, and to formulate policies accordingly.

Experts analyse the coastal region and specify areas for human activities in marine areas to achieve ecological, economic and social objectives. The goal is to ensure the utilisation of marine resources so that marine ecosystems remain healthy.

Need for conservation

- Odisha has a huge coastline of more than 550 km, featuring lagoons, mangroves and estuaries
- Increasing developmental activities in this region call for the scientific management of the marine ecosystem

Odisha's context

Odisha has a huge coastline of more than 550 km, featuring lagoons, mangroves and estuaries. According to Chithra Arumugam, additional chief secretary, science and technology department, Odisha, the NCCR will study the components of the water in the entire ocean adjoining Odisha's coast as part of the MoU.

"They will map the vegetation below the water, which is called benthic mapping. The NCCR will study the kind of water—its salinity, temperature and other aspects and prepare parameters like areas suitable for tourism activities, fisheries, growing seagrass and seaweeds, and to take up economic activities," she said.

The state government can thus formulate appropriate policies. The initiative will aid the development of multiple economic sectors and stakeholders in many coastal areas of the state.

Odisha Chief Minister Mohan Charan Majhi said the state's coastal and marine regions are rich in biodiversity and play a vital role in livelihoods, economic growth and environmental balance.

"Due to increasing developmental activities, environmental impacts, and rising sectoral demands, there is a need for scientific management of the marine ecosystem. MSP is a timely step in this direction. It will help meet the needs of fisheries, tourism, ports, ocean energy, and other sectors while ensuring the protection of marine ecosystems," said the chief minister.

Other initiatives

In August 2025, the Odisha government launched the Odisha Marine Biotechnology Research and Innovation Corridor (OMBRIC) to promote the use of biotechnology for marine environmental protection and economic development.

The OMBRIC also aims to support the growth of marine biotech startups and enterprises and help in the field of research, ecology protection, scientific tourism and livelihood support to the coastal population."

GS 2: SOCIAL JUSTICE

THE HINDU PAGE : 9

Puzzle of missing urgency around learning

India, like many other developing countries, has been in the midst of a learning crisis, as evidenced by Annual Status of Education Reports (ASER), notwithstanding the marginal improvements seen in the last few years. Yet, the absence of learning outcomes, especially Foundational Literacy and Numeracy (FLN), has failed to generate urgency on the ground, despite policy backing and unprecedented funding.

Why does a crisis of such magnitude not result in immediate action? The answer may lie in a concept often overlooked in public policy: salience. Systems change not merely when policies are well-designed or resources are abundant, but when enough people recognise a problem, believe it matters, and act on it.

The necessity of salience

Vietnam provides a useful example. Researchers from the RISE Programme at the Blavatnik School of Government, Oxford, found that Vietnam outperformed far richer nations in learning outcomes despite having no significant advantage with respect to spending or infrastructure. The explanation was disarmingly simple yet profound: Vietnam improved learning outcomes because it wanted to. The 'wanting to' reflects salience – a shared recognition that learning matters. In India, this salience remains weak at the field level.

However, there is no dearth of policy intent. The National Education Policy, 2020 clearly identifies FLN as an urgent national priority, with the NIPUN Bharat Mission mobilising administrative machinery and financial resources. The Prime Minister himself has emphasised the importance of fluency in oral reading to enable children to transition from 'learning to read' to 'reading to learn'. Yet, this policy intent has not fully translated into field-level urgency. Across schools and communities, learning outcomes often remain secondary. Conversations in school management committees or parent-teacher meetings tend to focus on buildings, toilets, and teacher vacancies, rather than the fundamental question: can children read and understand a basic text?

Jatin Goyal

Civil Servant of the DANICS cadre, presently posted in the UT of Dadra & Nagar Haveli and Daman & Diu

Accepting that millions of children are in school but not learning is deeply unsettling for educators who have spent their careers expanding access and enrolment

Myriad factors

The gap can be explained by the following reasons. First, learning is inherently difficult to observe. Unlike a pothole or missing rations, poor learning is intangible. A child copying from the blackboard can create the illusion of learning. Further, the concept of oral reading fluency – where reading becomes effortless enough for cognitive effort to shift from decoding words to understanding meaning – is not widely understood. As a result, findings from surveys such as ASER, which show that many Grade 5 children cannot fluently read a Grade 2 text, often seem exaggerated and are dismissed.

Second, power asymmetries weaken accountability, particularly in the education sector. Children have no voice, and their parents may lack the tools to assess learning. Teachers and administrators, by contrast, occupy positions of greater authority and social capital. Decision-making and teacher accountability remain centralised, while local institutions have limited influence. The exit of the middle class from public schooling further reduces bottom-up pressure, a key determinant of salience in a system.

Third, the scale of the crisis is under-recognised. When a senior official was briefed by the author that fluent reading in Grade 5 had improved from 20% to 65% in the Union Territory of Dadra & Nagar Haveli and Daman & Diu, his first reaction was one of alarm: "What do you mean 35% of children still cannot read?" His reaction was valid but revealing. It shows how even well-intentioned actors may not grasp the scale of the crisis.

Fourth, there is a fundamental disconnect in how responsibility is perceived: schooling is seen as the state's responsibility, while learning is often implicitly seen as dependent on the child's ability or family support. This undermines the role of systemic factors such as pedagogy, teacher support, curriculum design, and accountability mechanisms that are critical to shaping outcomes.

Fifth, acknowledging the problem is difficult. Accepting that millions of children are in school but not learning is deeply unsettling for educators who have spent their careers expanding access and enrolment. For political actors, openly acknowledging the scale of the crisis carries political risks. Yet, this failure is not the result of any single political dispensation or bureaucratic actor, but of a long-standing systemic neglect of learning outcomes.

Finally, a sense of fatalism often prevails. When systems appear entrenched, it is easy to assume that change is unlikely. However, change is important and possible.

The way forward

Over the last two decades, large-scale assessments have moved learning outcomes to the centre of policy discourse. There is now growing evidence that improving foundational learning at scale is both possible and cost-effective, with approaches such as 'Teaching at the Right Level' and structured pedagogy demonstrating disproportionate gains across contexts. Importantly, salience can be built through personal experience by conducting village-level assessments. When parents or officials see first-hand that a child cannot read, the issue ceases to be abstract; it becomes immediate and impossible to ignore. The path forward lies in making learning visible, communicating the scale of the problem, and demonstrating that solutions exist. It also requires creating conditions where those responsible for delivery are compelled to act.

GS 3: ENERGY

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The strategic vulnerability in India's LPG supply model

India's Liquefied Petroleum Gas (LPG) problem is not a passing shortage. It comes from a gap that has grown too wide to ignore. India consumed about 33.15 million tonnes of LPG last year, but domestic production met only about 40% of that need. The remaining 60% had to be imported. Put plainly, India's total LPG demand is now about 250% of indigenous production, while annual LPG imports are equal to about 150% of domestic LPG output. That is not a minor balancing gap. It is a significant mismatch between what India produces and what its kitchens consume.

This matters because LPG in India is overwhelmingly a household fuel; commercial LPG accounts for less than 10% of national consumption. So, the imported molecule is not mainly feeding a flexible industrial user that can cut runs or switch feedstock. It is going into domestic kitchens. This is what makes India's LPG dependence more serious than a normal product-import issue. A petrochemical plant can slow down. A household kitchen cannot.

Shrikant Madhav Vaidya

Former Chairman of Indian Oil Corporation Ltd. and an energy strategist

India's LPG use is mainly household-based, heightening import vulnerability

No longer a dependable corridor

The crisis now has exposed this sharply. About 90% of India's LPG imports normally transit the Strait of Hormuz. India must now accept that the Strait of Hormuz cannot be treated as a routinely dependable corridor for household fuel security. Even if the present tensions ease, the old assumption of uninterrupted normality will not return easily. The risk attached to this route has now entered the strategic calculation in a lasting way.

Import dependence alone, however, does not tell the full story. Japan imports a larger share of LPG than India does. China and South Korea also import large volumes of LPG. But what matters is not only how much a country imports. It is where the molecule goes, what alternatives households already have, and how much storage supports the system.

Lessons from Japan

The *table* shows why raw percentages can mislead. Japan appears more import-dependent than India on LPG. Yet, Japanese household vulnerability is far lower – LPG serves only about 40% of households. Electricity accounts for about 55% of residential final energy use, and city gas also has a large residential base. More importantly, Japan has about 108.3 days of LPG stock through national and private reserves. Japan imports more, but it cushions that dependence with alternatives and storage.

China and South Korea are different again. In China, a large share of its LPG demand is driven by the petrochemical sector. In South Korea, household energy is supported much more by natural gas and electricity.

India's position is more exposed because the imported molecule goes overwhelmingly into domestic kitchens. India's problem is not that it imports LPG – many countries do. India's problem is that it imports LPG for the one use that is hardest to defer and also the hardest to replace quickly.

India's storage position also needs to be seen clearly. The Petroleum Planning and Analysis Cell reports about 15 days of LPG tankage cover in the broad operational sense across import locations, bottling plants, refineries and fractionators. But visible underground cavern-based deep storage is only about 140,000 tonnes – 60 TMT at Visakhapatnam (Andhra Pradesh) and 80 TMT at Mangaluru (Karnataka) which is equal to only about 1.5 days of national demand. The first number shows that the system is not empty. The second shows that reserve-style protection is still very thin for a country of India's size and import dependence.

There is another point that deserves attention. India is not buying LPG in a loose, neutral global market. The exportable pool is not large, and it is already heavily claimed by a few Asian buyers. Just four Asian countries absorb a little over half of the world's exportable LPG pool. And the rest is not sitting idle waiting to be redirected. Much of it is already tied up in petrochemicals, household cooking and heating, and autogas. This is why any sustained loss of dependable Gulf supply can quickly tighten the market.

What India should do

How can India reduce its vulnerability?

First, it should stop treating all LPG molecules as one pool. During the present disruption, India has already directed refiners to prioritise propane and butane for cooking LPG rather than for petrochemical or gasoline-blending use. That logic should continue. Domestically produced LPG and refinery-origin C3/C4 (propane/butane) streams should be reserved first for household fuel security. Petrochemical users should increasingly arrange their own feedstock imports. The government should not have to defend domestic kitchens and industrial feedstock demand from the same protected pool.

Second, India should build a deeper LPG buffer. An initial goal of two to three weeks of protected cover for the household pool would be a sensible start. At current demand levels, that means about 1.3 million tonnes for 14 days and 1.9 million tonnes for 21 days. This is a large jump from the current cavern capacity, but it is the minimum scale at which India can begin to claim meaningful resilience.

Third, India needs a sustained campaign for electric cooking in urban and semi-urban India. This cannot be a one-season appeal. It has to continue over the years. Households with reliable power, adequate wiring and access to induction cooking should be encouraged to shift their primary cooking load away from LPG. A 'Give it up 2.0' plan should be launched.

The aim is simple: reduce the number of homes for which the LPG cylinder remains the first and only kitchen fuel. Piped Natural Gas (PNG) should expand where density supports it, but electricity is the broader lever.

India's LPG vulnerability will continue to persist unless policy addresses a basic mismatch: demand that is too high relative to domestic production; imports that are too concentrated in a single corridor, and excessive dependence concentrated in household kitchens. The answer is not simply to buy more LPG cargoes. It is to reserve domestic molecules for kitchens, separate petrochemical demand, build more storage, and steadily reduce the number of homes that rely on LPG alone.

India's LPG problem is not a passing shortage. It is an enduring mismatch between what the country produces and what its kitchens consume. This is why India's asymmetric LPG demand will remain a lasting vulnerability – unless the design of the system itself changes.

Why India is more exposed

High household dependence and tight global supply make the LPG risk sharper

A household LPG vulnerability matrix

Country	LPG import share of total demand	Total LPG demand as % of domestic production	LPG imports as % of domestic production	Household kitchen criticality of LPG	LPG cover / storage position
India	60%	250%	150%	Very high	15 days operational tankage cover (PPAC); ~1.5 days in cavern-based deep storage
Japan	70%	333.3%	233.3%	Low	108.3 days
China	40.4%	167.7%	67.7%	Low to moderate	No clear public LPG-days figure verified here
South Korea*	~74.5%	~391.7%	~291.7%	Low	15-30 day stockholding obligation framework

** Indicative, based on publicly available market data*

Who absorbs the global exportable LPG pool?

Country	LPG imports used for comparison	Share of global LPG exports*	Main use of LPG
China	36.7 MMT	26.3%	Mainly petrochemical-driven at the margin
India	19.89 MMT	14.2%	Mainly household cooking fuel
Japan	9.8 MMT	7%	Mixed: household/commercial + chemicals
South Korea*	~7 MMT	~5%	Mixed, with strong industrial/petrochemical role
Total	73.39 MMT	52.5%	-

** Using global LPG exports of 139.8 MMT. South Korea is indicative*

GS 3: ENVIRONMENT

THE HINDU PAGE : 6

India's forests could nearly double carbon storage by 2100, study finds

The findings, published in *Environmental Research: Climate*, involved researchers from Indian institutes; biggest increases in vegetation carbon are projected in desert and semi-arid zones across Rajasthan, Gujarat and Madhya Pradesh, study says

Jacob Koshy
NEW DELHI

India's forests could store nearly twice as much carbon by the end of this century as they do now if current greenhouse gas emission trends continue, according to a new modelling study published this week in the journal *Environmental Research: Climate*.

The findings, involving researchers from multiple Indian institutes, present a granular forecast of how climate change will reshape the country's forest carbon stocks. Significantly, they diverge in important ways from official estimates compiled by the Forest Survey of India (FSI) - the official source of tree and forest cover data in India.

For this study, the authors used modelling to peer into the future and found that vegetation carbon biomass rises by 35% under a low-emissions future, 62% under a medium-emissions pathway, and as much as 97% under a high-emissions, fossil-fuel-intensive scenario by 2100. Till about 2030, all of the scenarios project roughly the same quantities of vegetation after which they diverge sharply – the steepest acceleration occurring after 2050.

Wake-up call: Climate change is silently rewriting every sector, including our forests, say scientists. SPECIAL ARRANGEMENT

The projected increases are driven primarily by two interacting forces: rising precipitation and elevated atmospheric CO_2. Higher rainfall, projected across much of India under all emissions scenarios, translates to more moisture available for trees to grow. Simultaneously, more available carbon dioxide means enhancing photosynthesis and water-use efficiency. Rainfall effects appear with a lag of roughly two years under low and medium emissions, extending to about four years under the high-emissions scenario to account for the fact that forests do not respond instantly to a single wet year, and that woody biomass accumulates slowly over time.

"Climate change is not just about rising temperatures – it is silently rewriting every sector, including our forests," said lead author Fathima Fitha. "Even where gains appear, they may mask deeper stresses, raising concerns about the stability of today's dense forests and the risk of releasing large stores of carbon. Human pressures, land-use change, and extreme events such as wildfires, droughts, and heatwaves are intensifying these risks. If we undermine our forests today, we risk amplifying emissions tomorrow."

The largest relative increases are projected not in India's established forest heartlands but in its driest margins. Desert and semi-arid zones across Rajasthan, Gujarat, western Madhya Pradesh, and adjoining dry interiors are expected to see vegetation carbon rise by more than 60% compared to historical levels under high emissions. The Trans-Himalayas, the Gangetic forest belt, and the Deccan Peninsula follow. The Western Ghats and the Himalayas – India's most biodiverse and ecologically significant forest zones – are projected to see comparatively smaller relative increases, constrained by ecological saturation and specific climatic pressures those regions face, the study shows.

The increase in vegetation doesn't mean that climate change is acting as a net good, the researchers warned, as the models do not capture disruptive forces such as deforestation, land conversion, fire, and pest outbreaks intensified by warming.