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PCS Special:	18 August
18A8	Gen. Dhiraj Seth conferred honorary rank in Nepal जनरल धीरज सेठ को नेपाल में मानद रैंक प्रदान की गई



PCS

Gen. Dhiraj Seth conferred honorary rank in Nepal

Indian Army chief General Dhiraj Seth was on Monday conferred the honorary rank of General of the Nepalese Army by Nepal President Ramchandra Paudel at a special investiture ceremony at the Rashtrapati Bhavan in Kathmandu. The Indian Army said General Seth was on an official visit to Nepal from August 17 to 19. The conferment of the honorary rank is part of a long-standing military tradition under which India and Nepal reciprocally confer the honorary rank of General on the Chiefs of each other's Armies. The tradition is regarded as a symbol of the close and enduring ties between the Indian Army and the Nepalese Army.

each other's Armies.

- मानद रैंक प्रदान करना एक दीर्घकालीन सैन्य परंपरा का हिस्सा है, जिसके अंतर्गत भारत और नेपाल पारस्परिक रूप से एक-दूसरे की सेनाओं के प्रमुखों को जनरल की मानद रैंक प्रदान करते हैं।
- The tradition is regarded as a symbol of the **close and enduring ties** between the **Indian Army and the Nepalese Army**.
- इस परंपरा को भारतीय सेना और नेपाली सेना के बीच घनिष्ठ एवं स्थायी संबंधों का प्रतीक माना जाता है।

18A8. Gen. Dhiraj Seth conferred honorary rank in Nepal

जनरल धीरज सेठ को नेपाल में मानद रैंक प्रदान की गई

- Indian Army chief **General Dhiraj Seth** was on Monday conferred the **honorary rank of General of the Nepalese Army** by **Nepal President Ramchandra Paudel** at a special investiture ceremony at the **Rashtrapati Bhavan in Kathmandu**.

- भारतीय सेना प्रमुख **जनरल धीरज सेठ** को सोमवार को नेपाल के राष्ट्रपति **रामचंद्र पौडेल** द्वारा काठमांडू स्थित राष्ट्रपति भवन में आयोजित एक विशेष अलंकरण समारोह में **नेपाली सेना के जनरल की मानद रैंक** प्रदान की गई।

- The Indian Army said **General Seth was on an official visit to Nepal from August 17 to 19**.

- भारतीय सेना ने बताया कि जनरल सेठ **17 से 19 अगस्त तक नेपाल की आधिकारिक यात्रा** पर थे।

- The conferment of the honorary rank is part of a **long-standing military tradition** under which **India and Nepal** reciprocally confer the honorary rank of General on the Chiefs of

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Why Adivasis are resisting the Ken-Betwa river-linking project

Currently, affected villagers who were 18 years or older in February 2024 are eligible to receive ₹12.5 lakh in compensation and ₹5 lakh per acre of acquired land. However, the villagers say, 'We want a forest for our forest, land for our land, water for our water, and a village for our village'

Rizwan Rahman
CHHATARPUR

Evening had fallen over Daudhan village in Madhya Pradesh's Bundelkhand region. A soft beat of a dhol came from the distance as dump trucks and heavy machines fell silent. Inside his baidri (mud house), Munni Lal sat chatting with his neighbours. About 500 m away, construction work on the Daudhan dam, across the Ken river, continued. The dam is the main part of the Ken-Betwa river-linking project. "If we leave here, we will not find this kind of life anywhere. *Lekin hamara ujaad ho raha hai* (But we are being uprooted)," Munni Lal said. "Ab kisko kaku kahiba?" (Who will we call kaka in the new place?). How will we speak our language in a new village? How will we make ourselves at home there? Our hearts belong here."

Ken and Betwa
His village, Daudhan, where around 700 people live, is among those affected by the Indian government's Ken-Betwa river-linking project. Once completed, the dam will submerge 10 villages, including Daudhan. Since the project falls within the Panna Tiger Reserve, the people of another 12 villages will be displaced, to offset the loss of forest area. In all, 22 villages across Panna and Chhatarpur districts will be affected.

The Union Cabinet approved the interlink in 2021 to transfer 'surplus' water from the Ken river to the Betwa river through a 231-km-long canal, ostensibly for irrigation and drinking in the water-stressed districts of Bundelkhand.

Bundelkhand spans 13 districts in Madhya Pradesh and Uttar Pradesh. Known for its heroic folklore, the region has also been in the news for being one of India's driest and most impoverished areas.

Both the Ken and the Betwa flow through the region. The Ken originates in the Vindhyan plateau, flows mainly through Madhya Pradesh, and joins the Yamuna in Banda in Uttar Pradesh. The Betwa also originates in the Vindhyan, and flows primarily through Uttar Pradesh before meeting the Yamuna in Hamirpur.

But in the villages affected by river linking, conversations from morning until late into the night revolve around displacement, compensation, rehabilitation, and the loss of their forests and farmlands.

"We will go together"
(The villagers said monetary compensation cannot replace what they are losing. "We want a forest for our forest, land for our land, water for our water, and a village for our village," Jayanti Bai, of Mainari village, said.)

Currently, affected villagers who were 18 years or older in February 2024 are eligible to receive ₹12.5 lakh in compensation and ₹5 lakh per acre of acquired land. However, Mr. Lal said most Adivasi families do not have patta land. Fifty-year-old Siya Rani sits inside her house in Daudhan talking about the future and what the project will take away.

"We have been living along the Ken. This is our *janam bhoomi* (birthplace). Why should we leave?" she said. "Our faith is being lost. *Dharti Mata* (Mother Earth) is being taken away. We do not want to leave our Ken and our forest, but the government is forcing us and not meeting our demands."

"If the government is displacing us, we want a village like ours," Kosam, an Adivasi of Mainari, one of the villages threatened by displacement, said. "Just as we are living together, we will go together. We will not go separately. Otherwise, we will not let the dam be built."

Narauli village, home to around 300 people, is located on a hill and is inhabited mostly by the Gonds. Unlike others, it said not fall within the submergence zone, yet its people face the same consequences. At the edge of the settlement, a forest begins, with *mahua*, *charwa*, and other forest produce sustaining the people.

"We want these same trees, this same *mahua*," Kesar Bai, 53, of Narauli village, said as she worked with other women collecting forest produce. "Here, we collect *charwa*, *mahua*, *tendu* leaves, and *guli-golanda*, and manage our expenses. What will we do after going outside?" The women around her agree: "Give us our *charwa* and *mahua*. Otherwise, we will not leave."

One of them, Rati Bai, says, "Have we become so bad in the eyes of the



(From Top) Women prepare food on the banks of the Barana river for people protesting against the Ken-Betwa Link Project on July 18. Adivasis affected by the project hold a Chita Andolan (pyre protest) in Chhatarpur on April 10. Tribal families affected by the Ken-Betwa river-linking project stage protest on the Barana river in April. PTI & ANI

government? When our household runs because of this forest, why are we being forced to leave? If we don't get our rights, we will die in our birthplace. We will not go anywhere."

'Just cancel the dam'
A protest in response to the project, known as Chita Andolan, or 'symbolic pyre protest', has been led by Adivasi women. While they have been protesting since 2022, the movement gained national attention in April and July this year.

Phoola Rani from Palkuan village says the thought of leaving makes her sleepless.

"We are losing our gods and goddesses. We are losing everything. Everything we have will be destroyed. *Hamse hamari jani chini ja rahi hai* (the land that gave birth to us is being taken away)." Then she smiles: "*Bandha ka kaam ekdam cancel karo* (Just cancel the dam completely)."

Mithi Bai, who also hails from Palkuan, asks, "Has our voice not reached Narendra Modi?"

The villagers said that when they went to Chhatarpur and Bijawar to demand their rights, the police responded with lathis.

Rajast Saklecha, Superintendent of Police, Chhatarpur, said that after one of their leaders, Amit Bhatnagar, was placed

displaced and made homeless," she continued. "People don't want to be displaced but when the project is moving ahead, an immediate, sensible dialogue on resettlement and rehabilitation between government and the people who are united and organised is a must. That is not happening."

Land and houses
According to a 2017 forest advisory committee record, the detailed project report estimated that 23 lakh trees will be felled. Some experts have, however, said this is an underestimate.

In July, villagers again lay on symbolic pyres and went on a hunger strike at the Baran river following a similar protest in April. After 15 days, the police cleared the protest site.

Mr. Bhatnagar, the leader of the movement, said the administration had promised a dialogue with representatives of the Centre but no such conversation took place. "If our demands had been accepted, why would we have continued protesting?" he asked. He also alleged that houses in some villages were demolished without adequate notice or compensation.

In April, villagers demanded a joint survey of land and houses, ₹25 lakh in compensation per individual, four-times the value in compensation for the land, and an April 2026 deadline. By the July protest, the demands had shifted to three acres of land jointly in the names of male and female family heads, a village for the displaced village, and the same deadline.

The Chhatarpur District Magistrate in April, Parth Jaiswal, said most of the demands raised during the April protest had been addressed. However, neither the current District Magistrate, Mrinal Meena, nor the CEO of Zila Panchayat, Namah Shivay Arjariya, responded to multiple requests for comment. An email sent to the Principal Secretary of the Madhya Pradesh Revenue Department, which oversees land acquisition, had not elicited a reply at the time of publishing.

No place like this
Kalla, 70, and his joint family depend on some three acres of land and forest resources in Kharhani village. His voice trembles as he speaks looking at the trees he planted, of mango, *ber*, *kaitha*, and *teak*.

"*Yahan humare dja-par-tiya rahe* (Our ancestors settled here), and we are left craving our own rights. I planted trees with my own hands. But now Patwari tells me, what will you get? Your land is going to submerge."

People are now living with the reality that the forest and river they call home may soon become just another site of development.

Nestu, a 20-year-old Adivasi originally from Mainari village and married in Palkuan, cannot imagine a life elsewhere. "We like everything here," she says. "We will never find a place like this, even in our dreams."

(Rizwan Rahman is an independent journalist. rizwan.newsplatform@gmail.com)

18A8. Why Adivasis are resisting the Ken-Betwa river-linking project

आदिवासी केन-बेतवा नदी जोड़ो

परियोजना का विरोध क्यों कर रहे हैं

- About 500 m away, construction work on the **Daudhan dam, across the Ken river**, continued.

लगभग 500 मीटर दूर, केन नदी पर दौधन बाँध का निर्माण कार्य जारी था।

- The **dam is the main part of the Ken-Betwa river-linking project.**

यह बाँध केन-बेतवा नदी जोड़ो परियोजना का मुख्य हिस्सा है।

- Once completed, the dam will submerge 10 villages, including Daudhan.**

परियोजना पूरी होने के बाद यह बाँध दौधन सहित 10 गाँवों को जलमग्न कर देगा।

- Since the project falls within the **Panna Tiger Reserve**, the people of another 12 villages will be displaced, to offset the loss of forest area.

चूँकि यह परियोजना पन्ना टाइगर रिज़र्व के अंतर्गत आती है, इसलिए वन क्षेत्र के नुकसान की भरपाई के लिए अन्य 12 गाँवों के लोगों को विस्थापित किया जाएगा।

- The **Union Cabinet approved the interlink in 2021 to transfer 'surplus' water from the Ken river to the Betwa river through a 231-km-long canal, ostensibly for irrigation and drinking in the water-stressed districts of Bundelkhand.**

केंद्रीय मंत्रिमंडल ने 2021 में इस नदी जोड़ो परियोजना को मंजूरी दी थी, जिसके तहत 231 किलोमीटर लंबी नहर के माध्यम से केन नदी के 'अतिरिक्त' जल को बेतवा नदी में स्थानांतरित किया जाना है, जिसका उद्देश्य कथित रूप से बुंदेलखंड के जल-संकटग्रस्त जिलों में सिंचाई और पेयजल उपलब्ध कराना है।

- Bundelkhand spans 13 districts in Madhya Pradesh and Uttar Pradesh.**

बुंदेलखंड मध्य प्रदेश और उत्तर प्रदेश के 13 जिलों में फैला हुआ है।

- Known for its heroic folklore, the region has also been in the news for being **one of India's driest and most impoverished areas.**



अपने वीरता-प्रधान लोककथाओं के लिए प्रसिद्ध यह क्षेत्र भारत के सबसे शुष्क और अत्यधिक गरीबी से प्रभावित क्षेत्रों में से एक होने के कारण भी चर्चा में रहा है।

- The **Ken** originates in the **Vindhayan plateau**, flows mainly through **Madhya Pradesh**, and joins the **Yamuna in Banda in Uttar Pradesh**.
केन नदी की उत्पत्ति विंध्य पठार में होती है, यह मुख्यतः मध्य प्रदेश से होकर बहती है और उत्तर प्रदेश के बाँदा में यमुना नदी से मिलती है।
- The **Betwa** also originates in the **Vindhayas**, and flows primarily through **Uttar Pradesh** before meeting the **Yamuna in Hamirpur**.
बेतवा नदी की उत्पत्ति भी विंध्य क्षेत्र में होती है और यह मुख्य रूप से उत्तर प्रदेश से होकर बहने के बाद हमीरपुर में यमुना से मिलती है।
- Narauli village**, home to around 300 people, is located on a hill and is inhabited mostly by the **Gond community**.
लगभग 300 लोगों की आबादी वाला नरौली गाँव एक पहाड़ी पर स्थित है और यहाँ मुख्य रूप से गोंड समुदाय निवास करता है।
- "Here, we collect **charwa, mahua, tendu leaves, and guli-golanda**, and manage our expenses."
"यहाँ हम चारवा, महुआ, तेंदू पत्ते और गुली-गोलंदा एकत्र करते हैं और इसी से अपने खर्च चलाते हैं।

IMPORTANT NON-TIMBER FOREST PRODUCE (NTFPs)			
CHARWA (<i>Pentapetes phoenicea</i>) • A edible fruit • Rich in nutrition • Found in tropical forests • Source of income for tribal communities		MAHUA (<i>Madhuca longifolia</i>) • Flowers used in food & beverages • Seeds yield oil • Important source of livelihood • Sacred tree for tribal communities	
TENDU LEAVES (<i>Diospyros melanoxylon</i>) • Leaves used for making bidi • Major source of income for tribals • Widely found in central & eastern India		GULI-GOLANDA (<i>Stereospermum suaveolens</i>) • Seeds used in traditional medicine • Useful in joint pain, inflammation & fever • Important medicinal plant	

Forest Wealth, Tribal Livelihood, Natural Heritage
Sustainable Use, Better Future

Land and houses भूमि और घर

- According to a **2017 Forest Advisory Committee record**, the detailed project report estimated that **23 lakh trees** will be felled.
2017 की वन सलाहकार समिति के अभिलेख के अनुसार, विस्तृत परियोजना रिपोर्ट में अनुमान लगाया गया था कि **23 लाख पेड़** काटे जाएंगे।
- In April, villagers demanded a **joint survey of land and houses**, ₹25 lakh in compensation per individual, four-times the value in compensation for the land, and an **April 2026 deadline**.
अप्रैल में ग्रामीणों ने **भूमि और घरों के संयुक्त सर्वेक्षण**, प्रत्येक व्यक्ति को ₹25 लाख का मुआवजा, भूमि के मूल्य का चार गुना मुआवजा, और **अप्रैल 2026 की समय-सीमा** की मांग की।

Questions and Answers to the previous day's daily quiz:

- Indonesia is recognised as the largest of this type of political entity because of more than 17,000 islands spread between the Indian and Pacific oceans under its control. What type of state?
Ans: Archipelagic state
- Name the legendary first president of Indonesia from 1945 to 1967 and his daughter.
Ans: Sukarno and Megawati Sukarnoputri
- Name the invisible biogeographical boundary that separates Asian and Australian wildlife zones within the archipelago.
Ans: Wallace Line
- What is the Indonesian textile art using wax that was given a UNESCO Intangible Cultural Heritage status in 2009.
Ans: Batik
- What is Indonesia's National emblem, which gets its name from a mythical

- bird from Indian mythology? **Ans: 'Garuda Pancasila'**
- Indonesia is relocating its capital away from Jakarta to a purpose-built city in Borneo. What is it called? **Ans: Nusantara**
- Indonesia is home to the world's largest Buddhist temple, built in the 9th-century in Central Java, that has nine stacked platforms and thousands of relief panels. Name this UNESCO World Heritage Site.
Ans: Borobudur
- Name the real-life couple who gave Indonesia's first-ever Olympic gold medals in 1992 and in which sport? **Ans: Susi Susanti and Alan Budikusuma in badminton**
- Visual: Name this creature, considered the largest extant lizard, which gets its name from an Indonesian island to which it is endemic.
Ans: Komodo Dragon
- Early Birds: Prem Nath Tiwari | C. Saravanan | Tamal Biswas | Siddhartha Viswanathan | Tito Shiladitya

- By the July protest, the demands had shifted to **three acres of land jointly in the names of male and female family heads, a village for the displaced village, and the same deadline**.

जुलाई के विरोध प्रदर्शन तक मांगों में परिवर्तन करते हुए परिवार के पुरुष और महिला मुखियाओं के संयुक्त नाम पर तीन एकड़ भूमि, विस्थापित गांव के लिए एक गांव, और वही समय-सीमा शामिल हो गई थी।

18A8. Quiz: Indonesia Geography 1. Indonesia as an Archipelagic State

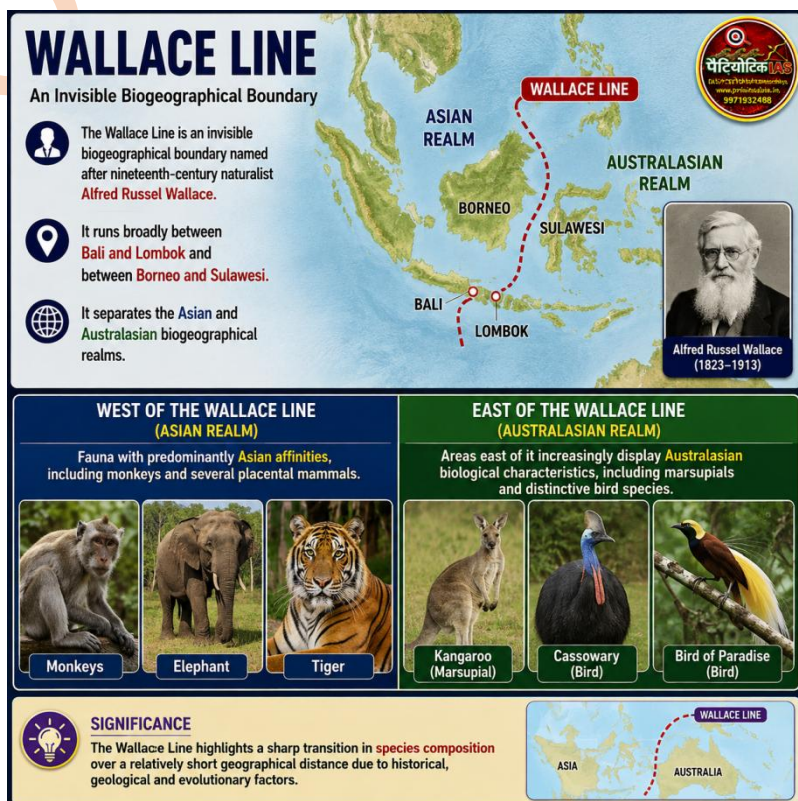
- An **archipelagic state** consists entirely of one or more archipelagos and may include other islands.
- Indonesia is widely recognised as the **world's largest archipelagic state**, comprising **more than 17,000 islands**.
- It extends for over **5,000 kilometres from east to west** between the **Indian and Pacific oceans**.
- Under the **United Nations Convention on the Law of the Sea, 1982**, an archipelagic state may draw archipelagic baselines joining the outermost islands.
- Waters enclosed by these baselines are legally treated as archipelagic waters, subject to recognised navigation rights.

2. Sukarno and Megawati Sukarnoputri

- Sukarno** was Indonesia's first President and one of the principal leaders of its anti-colonial independence movement.
- Along with Mohammad Hatta, he proclaimed Indonesia's independence from the **Netherlands on 17 August 1945**.
- He served as President from **1945 until 1967**, when political authority formally shifted to General Suharto.
- Sukarno helped formulate **Pancasila**, the philosophical foundation of the Indonesian state.
- His daughter, **Megawati Sukarnoputri**, became Indonesia's Vice-President in 1999.
- She subsequently served as the country's **fifth President from 2001 to 2004**.
- She was Indonesia's first woman to hold the presidency.

3. The Wallace Line

- The **Wallace Line** is an invisible biogeographical boundary named after nineteenth-century naturalist **Alfred Russel Wallace**.
- It runs broadly between **Bali and Lombok** and between **Borneo and Sulawesi**.
- Islands west of the line contain fauna with predominantly Asian affinities, including monkeys and several placental mammals.
- Areas east of it increasingly display Australasian biological characteristics, including marsupials and distinctive bird species.





- The deep-water channels separating these islands remained submerged even during periods of lower sea level.
- They therefore restricted the movement of terrestrial animals.

4. Indonesian Batik

- **Batik** is a traditional Indonesian textile-making technique involving wax-resist dyeing.
- Artisans apply hot wax to selected portions of cloth before dyeing it.
- The wax prevents colour from penetrating the covered areas, allowing intricate patterns to be produced through repeated waxing and dyeing.
- UNESCO inscribed **Indonesian Batik** on the Representative List of the Intangible Cultural Heritage of Humanity on **2 October 2009**.
- Indonesia subsequently began observing **National Batik Day on 2 October**.



5. Garuda Pancasila

- **Garuda Pancasila** is the national emblem of the Republic of Indonesia.
- Garuda is a mythical bird appearing in Indian Hindu and Buddhist traditions and is prominently associated with **Vishnu's vehicle or vahana**.
- The Indonesian emblem portrays a golden Garuda carrying a shield representing the five principles of **Pancasila**.
- These principles include belief in God, humanitarianism, national unity, consultative democracy and social justice.
- Garuda holds a scroll bearing the national motto "**Bhinneka Tunggal Ika**", meaning "Unity in Diversity".



Pancasila

The Pancasila incorporated in the **Preamble to Indonesia's 1945 Constitution** consists of:

1. **Belief in the One and Only God:** Indonesia recognises the importance of belief in God while accommodating its religious diversity.
2. **Just and Civilised Humanity:** emphasises human dignity, justice and humane treatment.
3. **Unity of Indonesia:** seeks to bind Indonesia's enormous diversity of **ethnic groups, languages, religions and islands** into one nation.
4. **Democracy Guided by the Inner Wisdom of Deliberations among Representatives:** emphasises representative government and decision-making through **consultation and deliberation**.
5. **Social Justice for All the People of Indonesia:** seeks social and economic justice and welfare for Indonesian citizens.



Panchshil as India's Foreign Policy

- Respect each-others territorial integrity and sovereignty.
- No interference in domestic affairs.
- Mutual non-aggression.
- Equality and mutual benefits.
- Peaceful coexistence.

6. Indonesia's New Capital

- **Nusantara** is Indonesia's planned new national capital in **East Kalimantan** on the island of **Borneo**.
- Its establishment was authorised through Indonesia's **National Capital Law of 2022**.
- The relocation seeks to reduce pressure on Jakarta, which faces congestion, pollution, land subsidence, flooding and excessive population concentration.
- Nusantara is being designed as a green, smart, inclusive and sustainable city.
- Initial governmental relocation and construction activities began in **2024**, but development is planned to continue in phases until **2045**.

7. Borobudur Temple

- **Borobudur** is one of the world's greatest Buddhist monuments and is located in Central Java.
- It was constructed during the **eighth and ninth centuries CE under the Sailendra dynasty**.
- Its principal structure comprises five concentric square terraces, three circular platforms and a monumental central stupa.
- The circular platforms contain **72 perforated stupas**, each enclosing a Buddha statue.
- Its walls and balustrades contain extensive narrative and decorative reliefs illustrating Buddhist teachings.
- The ascending architectural arrangement symbolises progress towards enlightenment and Nirvana.
- UNESCO inscribed the **Borobudur Temple Compounds** on the World Heritage List in **1991**.

8. Indonesia's First Olympic Gold Medallists

- **Susi Susanti** won the women's singles badminton title at the **Barcelona Olympic Games in 1992**.
- Her victory gave Indonesia its first-ever Olympic gold medal.
- At the same Games, **Alan Budikusuma** won the men's singles badminton gold medal.
- Badminton made its full-medal Olympic debut at Barcelona in 1992 after previously appearing as a demonstration sport.
- **Susanti and Budikusuma** later married in **1997**, making them one of badminton's best-known sporting couples.
- Their victories established badminton as Indonesia's most successful Olympic sport.
- The surname is also written officially as **Budi Kusuma** in some Olympic records.

9. The Komodo Dragon

- The **Komodo dragon**, scientifically known as *Varanus komodoensis*, is the world's largest living lizard.
- Its name comes from **Indonesia's Komodo Island**, although it is not restricted to that island alone.
- It occurs naturally on a limited number of Indonesian islands, including **Komodo, Rinca, Flores, Gili Motang and Nusa Kode**.
- Therefore, it is more accurate to describe it as **endemic to a restricted part of Indonesia rather than solely to Komodo Island**.
- It is an apex predator that feeds on deer, wild pigs and smaller animals.



- **Komodo National Park was established in 1980** and became a UNESCO World Heritage Site in 1991.

GS Paper II: Polity	18 August 2026
TOPICS COVERED	
18A8	Murmu gives assent to Bill to rename Kerala as Keralam मुर्मू ने केरल का नाम बदलकर केरलम करने संबंधी विधेयक को मंजूरी दी

Murmu gives assent to Bill to rename Kerala as Keralam

GS II: Polity

Press Trust of India
NEW DELHI

President Droupadi Murmu has given assent to a Bill to rename Kerala as Keralam, with the legislation now becoming a law.

The Lok Sabha had passed the Kerala (Alteration of Name) Bill, 2026, on August 11, followed by the Rajya Sabha the next day.

In the Rajya Sabha, Minister of State for Home Affairs Nityanand Rai said the State Assembly passed a resolution in 2024, urging the Centre to bring a law to change the name of the State to Keralam.

"The Bill provides that the State of Kerala will be known as the State of Keralam, and hence there is a proposal to rename the State of Kerala to Keralam," he said.

The Kerala government had forwarded a resolution passed by the State Assembly regarding the name change to the Centre in June 2024. Subsequently, President Murmu referred the Bill to the State legislature for its views, following which the Assembly adopted a unanimous resolution.

The Kerala (Alteration of Name) Bill provides for the alteration of the State's name and contains necessary amendments to the Constitution and consequential provisions. Amendments will be made in the First Schedule by modifying the name of Kerala as Keralam in accordance with Article 3.

18A8. Murmu gives assent to Bill to rename Kerala as Keralam

मुर्मू ने केरल का नाम बदलकर केरलम करने संबंधी विधेयक को मंजूरी दी

- President **Droupadi Murmu** has given assent to a Bill to rename Kerala as **Keralam**, with the legislation now becoming a law.

राष्ट्रपति द्रौपदी मुर्मू ने केरल का नाम बदलकर केरलम करने संबंधी विधेयक को मंजूरी दे दी है, जिससे यह विधेयक अब कानून बन गया है।

- The **Lok Sabha** had passed the **Kerala (Alteration of Name) Bill, 2026**, on August 11, followed by the **Rajya Sabha** the next day.

लोकसभा ने केरल (नाम परिवर्तन) विधेयक, 2026 को 11 अगस्त को पारित किया था, जिसके बाद अगले दिन राज्यसभा ने भी इसे पारित कर दिया।

- Subsequently, President Murmu referred the Bill to the **State legislature** for its views, following which the Assembly adopted a unanimous resolution.

इसके बाद राष्ट्रपति मुर्मू ने विधेयक पर उसके विचार जानने के लिए इसे राज्य विधानमंडल को भेजा, जिसके बाद विधानसभा ने सर्वसम्मति से एक प्रस्ताव पारित किया।

- The **Kerala (Alteration of Name) Bill** provides for the **alteration of the State's name** and contains necessary amendments to the **Constitution** and **consequential provisions**.

केरल (नाम परिवर्तन) विधेयक में राज्य के नाम में परिवर्तन का प्रावधान किया गया है तथा इसमें संविधान में आवश्यक संशोधन और उससे संबंधित परिणामी प्रावधान शामिल हैं।

- Amendments will be made in the **First Schedule** by modifying the name of **Kerala as Keralam** in accordance with **Article 3**.

अनुच्छेद 3 के अनुसार पहली अनुसूची में संशोधन करते हुए केरल का नाम बदलकर केरलम किया जाएगा।

GS Paper III: Economy		18 August 2026
TOPICS COVERED		
18A8	Decoding India's growth in merchandise exports भारत के वस्तु निर्यात में वृद्धि को समझना	
18A8	The IT Ministry says ₹7,877-cr. worth projects under ECMS आईटी मंत्रालय ने ECMS के तहत ₹7,877 करोड़ मूल्य की परियोजनाओं को मंजूरी दी	
18A8	CAS here to stay, but open to review for improvement: SEBI CAS जारी रहेगा, लेकिन सुधार के लिए समीक्षा को तैयार: SEBI	
18A8	India set for record soyoil import on Russia-Ukraine war रूस-यूक्रेन युद्ध के कारण भारत का सोयाबीन तेल आयात रिकॉर्ड स्तर पर पहुँचने को तैयार	
18A8	From price taker to price setter: India's commodity market gains clout मूल्य-गाही से मूल्य-निर्धारक तक: भारत के कमोडिटी बाजार का प्रभाव बढ़ रहा है	

Decoding India's growth in merchandise exports

While the country has made marginal progress in diversification, the nearly 20% growth in merchandise exports was largely driven by petroleum products

GS III: Economy

DATA POINT

Aarena Arora
Gandha Sneha

Data released by the Ministry of Commerce and Industry on August 13, 2026, showed India's exports gaining momentum, despite the ongoing war in West Asia, driven in particular by the growth in export of merchandise (goods).

In July 2026, India exported \$44.2 billion worth of goods, up nearly 20% compared to July 2025. Though the growth in the goods exports was encouraging, India's merchandise trade deficit widened from nearly \$28 billion in July 2025 to \$32 billion in July 2026 due to higher growth in imports. Analysis showed that the growth in exports was largely driven by an increase in the export of petroleum products, whose prices have gone up since the U.S. launched its attack on Iran in the last week of February.

India exported \$7.26 billion more merchandise in July 2026 than it did in July 2025. Petroleum products accounted for nearly \$2.8 billion of that increase (39%). Electronics added another \$2.16 billion (30%), while engineering goods contributed \$1.84 billion (25%). The growth in petroleum products in April-July 2026 compared with the same period in 2025 was 42.6%. India exported \$30 billion worth of petroleum products in April-July this year as against \$21 billion in the same period last year.

Export of engineering goods grew by 18.2% from \$39.2 billion to \$46.4 billion, while electronic goods' exports grew by 30.7% from \$16.2 billion to \$21.2 billion. Chart 1 shows the top five commodity groups in terms of value of goods exported.

A few other sectors also reported strong growth. Marine product exports rose nearly 18%. Meat, dairy and poultry products increased

41%, while handicrafts grew 16%.

The share of the top six commodity groups in India's total merchandise export shows that the majority of fluctuations came from petroleum products, hugely influencing the value of goods exported by the country (Chart 2). The share of engineering goods and drugs and pharmaceuticals have largely remained the same while the share of electronic goods nearly doubled in April-July 2026.

Despite the impact due to tariffs imposed by U.S. President Donald Trump, the country remained India's largest market for merchandise export. The U.S. accounted for about a fifth of India's exports between April and July 2026-27, almost unchanged from its share in the previous two financial years (Chart 3). Singapore's share has risen more noticeably from 2.7% in 2024-25 to 4.7% in the first four months of 2026-27.

China's share, which saw an increase from 3.3% to 4.4% between 2024-25 and 2025-26, has remained around the same level as of the April-July period in 2026-27. The UAE's share in India's exports came down from 8.5% to 6.5% in the same period due to the West Asia crisis. The share of other countries shown in Chart 3 increased marginally.

A country-wise breakdown showed that the highest growth came from countries such as South Africa, Tanzania, Sri Lanka, Malaysia and Kenya (Chart 4). Tanzania nearly doubled its share in India's total goods exports from 1.1% to 2%. However, an analysis of commodity groups showed that the majority of the increase in export to these countries came from refined petroleum products.

India also showed promising increase in exports to countries such as Vietnam (\$2.6 billion) and Taiwan (\$0.8 billion) in April-July 2026, which were not driven primarily by petroleum goods. An easing of the West Asia crisis will reveal the true extent to which India is diversifying its exports.

A refining-led boom in exports

Data for the charts were sourced from Ministry of Commerce and Industry. Gandha Sneha is interning with The Hindu's Data team



CHART 1: The five commodity groups that accounted for the highest value of merchandise exports from April to July this year

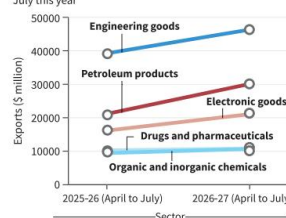


CHART 3: The share (%) of major countries in India's total merchandise exports. Countries that account for at least 2.5% of total exports are shown

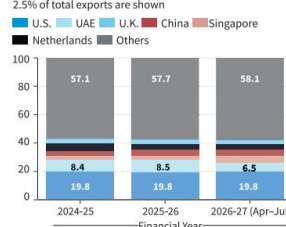


CHART 2: The share (%) of the six biggest commodity groups in India's total merchandise exports. The data for 2026-27 is only for the April-July period

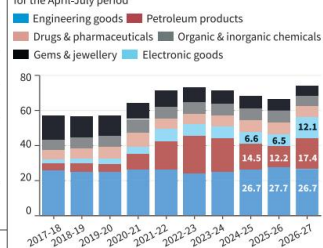
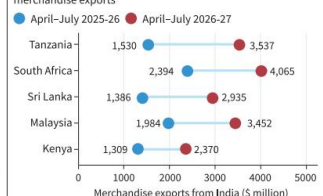


CHART 4: The top five countries in the 'Others' category in Chart 3 that saw the highest growth in value of merchandise exports



18A8. Decoding India's growth in merchandise exports

भारत के वस्तु निर्यात में वृद्धि को समझना

- In July 2026, India exported \$44.2 billion worth of goods, up nearly 20% compared to July 2025.



जुलाई 2026 में भारत ने \$44.2 बिलियन मूल्य की वस्तुओं का निर्यात किया, जो जुलाई 2025 की तुलना में लगभग 20% अधिक था।

- Though the growth in the goods exports was encouraging, India's merchandise trade deficit widened from nearly \$28 billion in July 2025 to \$32 billion in July 2026 due to higher growth in imports.

यद्यपि वस्तुओं के निर्यात में वृद्धि उत्साहजनक रही, लेकिन आयात में अधिक वृद्धि के कारण भारत का वस्तु व्यापार घाटा जुलाई 2025 के लगभग \$28 बिलियन से बढ़कर जुलाई 2026 में \$32 बिलियन हो गया।

- Analysis showed that the growth in exports was largely driven by an increase in the export of petroleum products, whose prices have gone up since the U.S. launched its attack on Iran in the last week of February.

विश्लेषण से पता चला कि निर्यात में वृद्धि मुख्यतः पेट्रोलियम उत्पादों के निर्यात में वृद्धि से प्रेरित रही, जिनकी कीमतें फरवरी के अंतिम सप्ताह में अमेरिका द्वारा ईरान पर हमला शुरू किए जाने के बाद बढ़ गई हैं।

- Petroleum products accounted for nearly \$2.8 billion of that increase (39%).
इस वृद्धि में पेट्रोलियम उत्पादों का योगदान लगभग \$2.8 बिलियन (39%) रहा।
- Electronics added another \$2.16 billion (30%), while engineering goods contributed \$1.84 billion (25%).

इलेक्ट्रॉनिक्स ने अतिरिक्त \$2.16 बिलियन (30%) का योगदान दिया, जबकि इंजीनियरिंग वस्तुओं का योगदान \$1.84 बिलियन (25%) रहा।

- The growth in petroleum products in April-July 2026 compared with the same period in 2025 was 42.6%.

अप्रैल-जुलाई 2026 में पेट्रोलियम उत्पादों की वृद्धि, 2025 की इसी अवधि की तुलना में 42.6% रही।

- Export of engineering goods grew by 18.2% from \$39.2 billion to \$46.4 billion, while electronic goods' exports grew by 30.7% from \$16.2 billion to \$21.2 billion.

इंजीनियरिंग वस्तुओं का निर्यात 18.2% बढ़कर \$39.2 बिलियन से \$46.4 बिलियन हो गया, जबकि इलेक्ट्रॉनिक वस्तुओं का निर्यात 30.7% बढ़कर \$16.2 बिलियन से \$21.2 बिलियन हो गया।

- Marine product exports rose nearly 18%.

समुद्री उत्पादों के निर्यात में लगभग 18% की वृद्धि हुई।

- Meat, dairy and poultry products increased 41%, while handicrafts grew 16%.

मांस, डेयरी और पोल्ट्री उत्पादों में 41% की वृद्धि हुई, जबकि हस्तशिल्प में 16% की वृद्धि दर्ज की गई।

- The share of engineering goods and drugs and pharmaceuticals have largely remained the same while the share of electronic goods nearly doubled in April-July 2026.

इंजीनियरिंग वस्तुओं तथा दवाओं एवं फार्मास्यूटिकल्स की हिस्सेदारी काफी हद तक समान रही, जबकि अप्रैल-जुलाई 2026 में इलेक्ट्रॉनिक वस्तुओं की हिस्सेदारी लगभग दोगुनी हो गई।

- Despite the impact due to tariffs imposed by U.S. President Donald Trump, the country remained India's largest market for merchandise export.

अमेरिकी राष्ट्रपति डोनाल्ड ट्रंप द्वारा लगाए गए टैरिफ के प्रभाव के बावजूद, अमेरिका भारत के वस्तु निर्यात का सबसे बड़ा बाजार बना रहा।

- The U.S. accounted for about a fifth of India's exports between April and July 2026-27, almost unchanged from its share in the previous two financial years (Chart 3).

अप्रैल से जुलाई 2026-27 के बीच भारत के निर्यात में अमेरिका की हिस्सेदारी लगभग पाँचवाँ हिस्सा रही, जो पिछले दो वित्तीय वर्षों में उसकी हिस्सेदारी की तुलना में लगभग अपरिवर्तित थी (चार्ट 3)।

- Singapore's share has risen more noticeably from 2.7% in 2024-25 to 4.7% in the first four months of 2026-27.

सिंगापुर की हिस्सेदारी 2024-25 में 2.7% से बढ़कर 2026-27 के पहले चार महीनों में 4.7% हो गई है।

- The UAE's share in India's exports came down from 8.5% to 6.5% in the same period due to the West Asia crisis.

भारत के निर्यात में UAE की हिस्सेदारी पश्चिम एशिया संकट के कारण इसी अवधि में 8.5% से घटकर 6.5% हो गई।



- A country-wise breakdown showed that the **highest growth came from countries such as South Africa, Tanzania, Sri Lanka, Malaysia and Kenya** (Chart 4).
देश-वार विश्लेषण से पता चला कि सबसे अधिक वृद्धि दक्षिण अफ्रीका, तंजानिया, श्रीलंका, मलेशिया और केन्या जैसे देशों से हुई (चार्ट 4)।
- Tanzania nearly doubled its share in India's total goods exports from 1.1% to 2%.**
तंजानिया की हिस्सेदारी भारत के कुल वस्तु निर्यात में लगभग दोगुनी होकर 1.1% से 2% हो गई।
- However, **an analysis of commodity groups showed that the majority of the increase in export to these countries came from refined petroleum products.**
हालाँकि, **वस्तु समूहों के विश्लेषण से पता चला कि इन देशों को निर्यात में अधिकांश वृद्धि रिफाईंड पेट्रोलियम उत्पादों से हुई।**

IT Ministry okays ₹7,877-cr. worth projects under ECMS

The projects under the Electronics Component Manufacturing Scheme include several electronic parts that have not been manufactured before in India such as metalised films for capacitors

CS III: Economy
The Hindu Bureau
NEW DELHI

The Ministry of Electronics and Information Technology (MeitY) on Monday approved projects collectively worth ₹7,877 crore for incentives under the Electronics Component Manufacturing Scheme (ECMS).

The projects include several electronic parts that have not been manufactured before in India, including electrolyte additives, hermetic terminals (used for defence-grade sealed assemblies), metalised films for capacitors, and coils.

The ECMS has so far approved projects collectively worth ₹69,548 crore, and these will receive turnover- or capex-linked incentives upon achieving key milestones.

IT firm Wipro's lami-



IT Minister Ashwini Vaishnaw and Union MoS Jitin Prasada during handing over of Approvals under ECMS on Monday. ANI

nates project had a ₹1,033 crore increase in project value, which is reflected in the project total shared by the Ministry, leaving ₹6,844 crore in approvals for fresh projects.

IT Minister Ashwini Vaishnaw said that India was "fully atmanirbhar" (autonomous) in approved projects' planned supplies of enclosures for devices, relays (which are being exported also), anode material, and optical transceiv-

ers. Laminates are being produced at 80% of domestic demand, with connectors, lithium ion cells and transducers at 75%, 60%, and 55% domestic production respectively.

"We are yet to reach the employment target [under the scheme], but we will reach that shortly," IT Secretary S. Krishnan said in his remarks. "This is one of the fastest moving programmes of the ministry currently, with a large

number of approvals coming up every week. We have a cadence where almost every week or 10 days we have an approval meeting where we sit down and clear whatever proposals we can bring out."

"We have 10 States of the country which are covered in the applications which are being currently approved," he added.

The tranche approved on Monday includes projects in Himachal Pradesh, Uttarakhand, Uttar Pradesh, Haryana, Gujarat, Maharashtra, Goa, Karnataka, Tamil Nadu and Telangana. Tamil Nadu had the highest approvals in this tranche, with seven project approvals.

"We expect that these approvals will result in a total output of production of ₹82,243 crore, with an employment of close to 10,000 persons," Mr. Krishnan added.

18A8. The IT Ministry says ₹7,877-cr. worth projects under ECMS

आईटी मंत्रालय ने ECMS के तहत ₹7,877 करोड़ मूल्य की परियोजनाओं को मंजूरी दी

- The **Ministry of Electronics and Information Technology (MeitY)** on Monday approved projects collectively worth **₹7,877 crore** for incentives under the **Electronics Component Manufacturing Scheme (ECMS)**.

इलेक्ट्रॉनिक्स और सूचना प्रौद्योगिकी मंत्रालय (MeitY) ने सोमवार को **इलेक्ट्रॉनिक्स कंपोनेंट मैन्युफैक्चरिंग स्कीम (ECMS)** के तहत प्रोत्साहन के लिए कुल **₹7,877 करोड़ मूल्य की परियोजनाओं को मंजूरी दी।**

- The projects include several electronic parts that have not been manufactured before in India, including **electrolyte additives, hermetic terminals** (used for defence-grade sealed assemblies), **metalised films for capacitors, and coils**.
इन परियोजनाओं में कई ऐसे इलेक्ट्रॉनिक पुर्जे शामिल हैं, जिनका पहले भारत में निर्माण नहीं किया जाता था, जिनमें इलेक्ट्रोलाइट एडिटिव्स, हर्मेटिक टर्मिनल (जिनका उपयोग रक्षा-ग्रेड सीलबंद असेंबली में किया जाता है), कैपेसिटर के लिए मेटलाइज्ड फिल्म और कॉइल शामिल हैं।
- The ECMS has so far approved projects collectively worth **₹69,548 crore**, and these will receive turnover- or capex-linked incentives upon achieving key milestones.
ECMS के तहत अब तक कुल **₹69,548 करोड़ मूल्य की परियोजनाओं** को मंजूरी दी जा चुकी है और प्रमुख मील के पत्थर हासिल करने के बाद इन्हें टर्नओवर या पूंजीगत व्यय (Capex) से जुड़े प्रोत्साहन प्राप्त होंगे।
- IT firm **Wipro's laminates project** had a ₹1,033 crore increase in project value, which is reflected in the project total shared by the Ministry, leaving ₹6,844 crore in approvals for fresh projects.
आईटी कंपनी **Wipro की लैमिनेट्स परियोजना** के परियोजना मूल्य में **₹1,033 करोड़ की वृद्धि** हुई, जो मंत्रालय द्वारा साझा किए गए परियोजना कुल में परिलक्षित होती है, जिससे नई परियोजनाओं के लिए **₹6,844 करोड़ की मंजूरीयाँ** शेष रहती हैं।
- IT Minister **Ashwini Vaishnaw** said that India was "fully atmanirbhar" (autonomous) in approved projects' planned supplies of **enclosures for devices, relays** (which are being exported also), **anode material, and optical transceivers**.
आईटी मंत्री **अश्विनी वैष्णव** ने कहा कि स्वीकृत परियोजनाओं में नियोजित **डिवाइसों के एनक्लोजर, रिले** (जिनका निर्यात भी किया जा रहा है), **एनोड सामग्री और ऑप्टिकल ट्रांसिवर** की आपूर्ति के मामले में भारत **"पूरी तरह आत्मनिर्भर"** है।
- Laminates are being produced at **80% of domestic demand**, with connectors, lithium ion cells and transducers at **75%, 60%, and 55% domestic production** respectively.
लैमिनेट्स का उत्पादन घरेलू माँग का 80% है, जबकि कनेक्टर, लिथियम-आयन सेल और ट्रांसड्यूसर के मामले में घरेलू उत्पादन क्रमशः **75%, 60% और 55%** है।
- "We are yet to reach the employment target [under the scheme], but we will reach that shortly," IT Secretary **S. Krishnan** said in his remarks.
आईटी सचिव **एस. कृष्णन** ने अपनी टिप्पणी में कहा, "हमने अभी तक **योजना के तहत रोजगार लक्ष्य** हासिल नहीं किया है, लेकिन हम इसे शीघ्र ही हासिल कर लेंगे।"
- "This is one of the fastest moving programmes of the ministry currently, with a large number of approvals coming up every week."
"यह वर्तमान में मंत्रालय के **सबसे तेजी से आगे बढ़ने वाले कार्यक्रमों** में से एक है, जिसके तहत हर सप्ताह बड़ी संख्या में मंजूरीयाँ सामने आ रही हैं।"
- We have a cadence where almost every week or 10 days we have an approval meeting where we sit down and clear whatever proposals we can bring out."
हमारी ऐसी प्रक्रिया है कि लगभग हर सप्ताह या **10 दिनों में एक बार मंजूरी बैठक** होती है, जिसमें हम बैठकर उन सभी प्रस्तावों को मंजूरी देते हैं जिन्हें हम आगे ला सकते हैं।"
- "We have **10 States** of the country which are covered in the applications which are being currently approved," he added.
उन्होंने आगे कहा, "वर्तमान में जिन आवेदनों को मंजूरी दी जा रही है, उनमें देश के **10 राज्य** शामिल हैं।"
- The tranche approved on Monday includes projects in **Himachal Pradesh, Uttarakhand, Uttar Pradesh, Haryana, Gujarat, Maharashtra, Goa, Karnataka, Tamil Nadu and Telangana**.
सोमवार को मंजूर की गई परियोजनाओं की किश्त में **हिमाचल प्रदेश, उत्तराखंड, उत्तर प्रदेश, हरियाणा, गुजरात, महाराष्ट्र, गोवा, कर्नाटक, तमिलनाडु और तेलंगाना** में स्थित परियोजनाएँ शामिल हैं।
- Tamil Nadu** had the highest approvals in this tranche, with **seven project approvals**.
इस किश्त में **तमिलनाडु** में सबसे अधिक मंजूरीयाँ दी गईं, जहाँ **सात परियोजनाओं** को मंजूरी मिली।

- “We expect that these approvals will result in a total output of production of **₹82,243 crore**, with an employment of close to **10,000 persons**,” Mr. Krishnan added.
श्री कृष्णन ने आगे कहा, “हमें उम्मीद है कि इन मंजूरीयों के परिणामस्वरूप कुल **₹82,243 करोड़ का उत्पादन** होगा और लगभग **10,000 लोगों को रोजगार मिलेगा।**”

CAS here to stay, but open to review for improvement: SEBI

GS III: Economy
Aspirantsadda
MUMBAI

The new Closing Auction Session (CAS) mechanism for determining closing prices is here to stay, even as the markets regulator remains open to stakeholder feedback and possible tweaks to address any issues.

“CAS is here to stay for sure. We will see if there are certain constraints or certain issues that we can improve,” SEBI Chairperson Tuhin Kanta Pandey said while speaking on the sidelines of the launch of cyber reporting platforms at the NISM campus.

He further said that several industry participants had welcomed the move as it provided a single price at which trades could be executed, countering criticism over tracking errors. Under the earlier system, the closing price was derived using the volume-weighted average price (VWAP). However, several market participants



Tuhin Kanta Pandey

are yet to upgrade their systems which were built around legacy processes and the earlier VWAP-based mechanism.

“It is a major microstructure change. When there is something going on for years, people think that it will never come – the change will never come. And then, therefore, they do not give total energy into learning a new system. There are some initial teething problems whenever you come up with something major because people tend to believe that it will be postponed,” Mr. Pandey said.

18A8. CAS here to stay, but open to review for improvement: SEBI

CAS जारी रहेगा, लेकिन सुधार के लिए समीक्षा को तैयार: SEBI

- The new **Closing Auction Session (CAS)** mechanism for determining closing prices is here to stay, even as the markets regulator remains open to stakeholder feedback and possible tweaks to address any issues.

समापन कीमत निर्धारित करने के लिए नई क्लोजिंग ऑक्शन सेशन (CAS) व्यवस्था जारी रहेगी, हालांकि बाजार नियामक किसी भी समस्या के समाधान के लिए हितधारकों की प्रतिक्रिया और संभावित सुधारों के लिए खुला है।

- “CAS is here to stay for sure.

“CAS निश्चित रूप से जारी रहेगा।

- We will see if there are certain constraints or certain issues that we can improve,” **SEBI Chairperson Tuhin Kanta Pandey** said while speaking on the sidelines of the launch of cyber reporting platforms at the NISM campus.

हम देखेंगे कि क्या कुछ बाधाएँ या समस्याएँ हैं, जिनमें हम सुधार कर सकते हैं,” **SEBI के अध्यक्ष तुहिन कान्ता पांडे** ने NISM परिसर में साइबर रिपोर्टिंग प्लेटफॉर्म के शुभारंभ के अवसर पर कहा।

- He further said that several industry participants had welcomed the move as it provided a single price at which trades could be executed, countering criticism over tracking errors.

उन्होंने आगे कहा कि कई उद्योग प्रतिभागियों ने इस कदम का स्वागत किया है, क्योंकि इससे ऐसी एकल कीमत उपलब्ध होती है जिस पर कारोबार निष्पादित किया जा सकता है, जिससे ट्रेडिंग त्रुटियों को लेकर की जा रही आलोचना का समाधान होता है।

- Under the earlier system, the closing price was derived using the **volume-weighted average price (VWAP)**.
पिछली व्यवस्था के तहत समापन कीमत **वॉल्यूम-वेटेड एवरेज प्राइस (VWAP)** का उपयोग करके निर्धारित की जाती थी।
- However, several market participants are yet to upgrade their systems which were built around legacy processes and the earlier VWAP-based mechanism.
हालाँकि, कई बाजार प्रतिभागियों ने अभी तक अपने सिस्टम को अपग्रेड नहीं किया है, जो पुरानी प्रक्रियाओं और पहले की **VWAP-आधारित व्यवस्था** के अनुरूप बनाए गए थे।
- “It is a major **microstructure change**.
“यह एक बड़ा **माइक्रोस्ट्रक्चर परिवर्तन** है।



- When there is something going on for years, people think that it will never come — the change will never come.
जब कोई व्यवस्था वर्षों से चल रही होती है, तो लोग सोचते हैं कि यह कभी नहीं आएगा—परिवर्तन कभी नहीं होगा।
- And then, therefore, they do not give total energy into learning a new system.
और इसलिए वे नई प्रणाली सीखने में पूरी ऊर्जा नहीं लगाते।
- There are some initial teething problems whenever you come up with something major because people tend to believe that it will be postponed,” Mr. Pandey said.
जब भी कोई बड़ा बदलाव किया जाता है, तो शुरुआत में कुछ प्रारंभिक कठिनाइयाँ होती हैं, क्योंकि लोग अक्सर मान लेते हैं कि इसे स्थगित कर दिया जाएगा,” श्री पांडे ने कहा।

India set for record soyoil import on Russia-Ukraine war

GS III: Economy

Reuters
MUMBAI

India's soyoil imports are set to hit a record high in August as competitive prices prompt refiners to boost purchases for festive demand, while disruptions to sunflower oil shipments due to the Russia-Ukraine war push buyers to switch oils, dealers said.

Soyoil imports in August may rise to 6,20,000 metric tonne, almost 46% above the average monthly import of 4,24,549 tonne so far in the current marketing year which began in November, said four traders involved in trade deals. The traders did not wish to be named in line with company policies.



Women remove weeds from soybean crop in Bhopal, MP.

“Soyoil prices are very competitive. At the same time, there are disruptions to sunflower oil shipments. That is making soyoil even more attractive,” said Sandeep Bajoria, CEO, Sunvin Group, a Mumbai-based vegetable oil brokerage.

In recent months, Rus-

sia and Ukraine have increasingly targeted each other's port and maritime infrastructure in and around the Black Sea, disrupting grain and vegetable oil shipments and reducing export capacity.

Sunflower oil to drop

Russia and Ukraine account for most of India's sunflower oil imports, which may fall to 1,80,000 metric tonne in August, the lowest since February and down 28% from July, dealers said. About 1,50,000 tonne of sunflower oil originating from the Black Sea and scheduled for shipment in August and September have been delayed because of the conflict, another dealer said.

18A8. India set for record soyoil import on Russia-Ukraine war

रुस-यूक्रेन युद्ध के कारण भारत का सोयाबीन तेल आयात रिकॉर्ड स्तर पर पहुँचने को तैयार

- India's soyoil imports are set to hit a record high in August as competitive prices prompt refiners to boost purchases for festive demand, while disruptions to sunflower oil shipments due to the **Russia-Ukraine war** push buyers to switch oils, dealers said.
डीलरों ने कहा कि अगस्त में भारत का **सोयाबीन तेल (soy oil)** आयात रिकॉर्ड ऊँचाई पर पहुँचने वाला है, क्योंकि प्रतिस्पर्धी कीमतें रिफाइनरों को **त्योहारी माँग** के लिए खरीद बढ़ाने के लिए प्रेरित कर रही हैं, जबकि

रूस-यूक्रेन युद्ध के कारण सूरजमुखी तेल की खेपों में व्यवधान खरीदारों को दूसरे तेलों की ओर रुख करने के लिए प्रेरित कर रहा है।

- Soyoil imports in August may rise to **6,20,000 metric tonne**, almost 46% above the average monthly import of 4,24,549 tonne so far in the current marketing year which began in November, said four traders involved in trade deals.
व्यापारिक सौदों में शामिल चार व्यापारियों ने कहा कि अगस्त में **सोयाबीन तेल का आयात 6,20,000 मीट्रिक टन तक बढ़ सकता है**, जो नवंबर में शुरू हुए वर्तमान विपणन वर्ष में अब तक के **4,24,549 टन के औसत मासिक आयात से लगभग 46% अधिक होगा**।
- The traders did not wish to be named in line with company policies.
कंपनी की नीतियों के अनुरूप व्यापारियों ने **अपना नाम उजागर नहीं करने** की इच्छा जताई।
- "Soyoil prices are very competitive.
"सोयाबीन तेल की कीमतें बहुत प्रतिस्पर्धी हैं।
- At the same time, there are disruptions to sunflower oil shipments.
साथ ही, **सूरजमुखी तेल की खेपों में व्यवधान** उत्पन्न हो रहा है।
- That is making soyoil even more attractive," said Sandeep Bajoria, CEO, Sunvin Group, a Mumbai-based vegetable oil brokerage.
यह सोयाबीन तेल को और भी **अधिक आकर्षक बना रहा है**," मुंबई स्थित वनस्पति तेल ब्रोकरेज कंपनी **Sunvin Group** के CEO **संदीप बजोरिया** ने कहा।
- In recent months, Russia and Ukraine have increasingly targeted each other's port and maritime infrastructure in and around the **Black Sea**, disrupting grain and vegetable oil shipments and reducing export capacity.
हाल के महीनों में **रूस और यूक्रेन ने काला सागर (Black Sea)** तथा उसके आसपास एक-दूसरे के बंदरगाह और समुद्री अवसंरचना को तेजी से निशाना बनाया है, जिससे **अनाज और वनस्पति तेल की खेपों में व्यवधान** उत्पन्न हुआ है और निर्यात क्षमता कम हुई है।

Sunflower oil to drop

सूरजमुखी तेल के आयात में गिरावट

- Russia and Ukraine account for most of India's sunflower oil imports, which may fall to **1,80,000 metric tonne in August**, the lowest since February and down 28% from July, dealers said.
डीलरों ने कहा कि भारत के **सूरजमुखी तेल के अधिकांश आयात रूस और यूक्रेन से होते हैं**, और अगस्त में इसका आयात **1,80,000 मीट्रिक टन तक गिर सकता है**, जो फरवरी के बाद का सबसे निचला स्तर होगा और जुलाई की तुलना में **28% कम** होगा।
- About **1,50,000 tonne** of sunflower oil originating from the Black Sea and scheduled for shipment in August and September have been delayed because of the conflict, another dealer said.
एक अन्य डीलर ने कहा कि **काला सागर से आने वाले लगभग 1,50,000 टन सूरजमुखी तेल**, जिसकी अगस्त और सितंबर में खेप भेजी जानी थी, **संघर्ष के कारण विलंबित हो गया है**।



From price taker to price setter: India's commodity market gains clout

FPIs could help in price discovery and a deeper MCX could allow hedging domestically, which otherwise is currently done majorly through London, New York, Chicago and Singapore; implying reduction in volatility of India's foreign exchange need, not a large reduction in total forex outflow

GS III: Economy

EXPLAINER

Santosh V. Perumal

India, a major importer of crude oil, gold and industrial metals, deserves a meaningful place in the global commodities market. To happen, it has to be a price setter, rather than a price taker, for which its domestic commodity market needs integration with global financial architecture.

In an attempt to this, market regulator Securities and Exchange Board of India (SEBI) is proposing to allow access to foreign portfolio investors or FPIs into non-agricultural derivatives. The objective is to bring global commodity risk management into India, the byproduct of which is increased depth and liquidity in commodity derivative markets, thus enabling the country to serve as a global benchmark.

SEBI is now soliciting views from public to allow FPIs participate in physically-settled contracts as bullion (gold, silver and their derivatives), energy (crude oil and natural gas) and base metals (aluminium, copper, lead, nickel and zinc), even as the challenge is to ensure greater liquidity does not become greater volatility.

Overseas investors are at present not allowed to



Right move: Logo of Securities and Exchange Board of India seen on Mumbai headquarters. REUTERS

participate in contracts linked to crude, natural gas, gold or silver that are settled by actual delivery of the underlying goods.

Multi Commodity Exchange (MCX) – with combined futures and options (F&O) Average Daily Turnover (ADT) of ₹10.5 lakh crore as of Q1FY27 – has strong retail and domestic participation but relatively limited institutional depth compared with global exchanges.

FPIs could help in price discovery and a deeper MCX could allow hedging domestically, which otherwise is currently done majorly through London, New York, Chicago and Singapore; implying reduction in volatility of India's forex requirement, not a large reduction in total forex



By attracting global capital, Indian exchanges can gradually become more influential in regional price discovery as deeper market can also cut dependence on overseas benchmarks

outflow.

Multiplier effect

FPIs can create a multiplier effect by providing the liquidity needed for airlines, oil marketing companies (OMCs) and industrial users to hedge efficiently on Indian exchanges.

More than 11,000 FPIs are at present registered in

India; even if a tenth (conservative estimates) of them participates in the Indian commodity derivatives market, it can ingress considerable liquidity.

Margin stays within the country, brokerage paid remains domestic and banks would need less foreign currency for collateral purposes. Although New Delhi cannot avoid paying dollars for the demand-inelastic imported commodities, it can nevertheless save on offshore collateral, transaction costs and financial outflows.

Historical origins

The seeds of the present proposal were sown in 2015 at the time of the merger of the Forward Markets Commission with SEBI, which has been tak-

ing measured steps in developing commodity derivatives market in an orderly manner.

To attract broad-based participation, enhancing liquidity, facilitating hedging and bringing in more depth to the commodity derivatives market, SEBI had introduced various products such as futures on commodity indices, options on commodity futures and options in goods.

The products have since been launched by bourses and are witnessing substantial trading volumes, thanks to mutual funds, alternate investment funds and portfolio management services. Initially, eligible foreign entities (EFEs) were allowed to participate (hedge) only if they had a direct exposure to Indian physical commodities; but their response was woefully low due to operational complexities.

Great potential

Citing a study in China, which found a jump in volume and deals amid largely unaffected trading cost, after internationalisation of futures markets; SEBI reasoned for the entry of FPIs.

By attracting global capital, Indian exchanges could gradually become more influential in regional price discovery as a deeper market can also reduce the country's dependence on the overseas benchmarks.

SEBI's focus is expected to benefit the MCX – dominated by commodities that are either imported or globally priced. It helps expand the addressable market and strengthen its position as an Asian commodity trading hub. The combined futures and options ADT of MCX had seen a whopping 238% increase in Q1FY27, reflecting growing investor adoption of commodity derivatives for hedging and trading. Active client base almost doubled year-on-year to 13.72 lakh in the review period.

Red flag

The SEBI's move to widen access for FPIs into non-farm commodity derivatives is a significant step but speculation may amplify price movements in an otherwise charged geopolitical environment, currency fluctuations and supply disruptions. Large international commodity trading houses and hedge funds could accumulate significant positions, influencing short-term prices, even as SEBI has mandated them to square off position before the delivery period.

Reflecting the contagion from global markets, Indian commodity markets may sway to Federal Reserve policy and the dollar movements. Excessive financialisation of commodities may create a discord between futures prices and physical market realities.

18A8. From price taker to price setter: India's commodity market gains clout

मूल्य-ग्राही से मूल्य-निर्धारक तक: भारत के कमोडिटी बाजार का प्रभाव बढ़ रहा है

- India, a major importer of crude oil, gold and industrial metals, deserves a meaningful place in the global commodities market.

कच्चे तेल, सोने और औद्योगिक धातुओं के प्रमुख आयातक भारत को वैश्विक कमोडिटी बाजार में एक महत्वपूर्ण स्थान मिलना चाहिए।

- To happen, it has to be a **price setter**, rather than a **price taker**, for which its domestic commodity market needs integration with global financial architecture. ऐसा होने के लिए भारत को **मूल्य-ग्राही (price taker)** के बजाय **मूल्य-निर्धारक (price setter)** बनना होगा, जिसके लिए उसके घरेलू कमोडिटी बाजार का वैश्विक वित्तीय ढाँचे के साथ एकीकरण आवश्यक है।

- In an attempt to this, market regulator **Securities and Exchange Board of India (SEBI)** is proposing to allow access to foreign portfolio investors or **FPIs** into non-agricultural derivatives.



इसी उद्देश्य से बाजार नियामक **भारतीय प्रतिभूति और विनियम बोर्ड (SEBI)** गैर-कृषि डेरिवेटिव्स में विदेशी **पोर्टफोलियो निवेशकों (FPIs)** को प्रवेश देने का प्रस्ताव कर रहा है।

- The objective is to bring global commodity risk management into India, the byproduct of which is increased depth and liquidity in commodity derivative markets, thus enabling the country to serve as a global benchmark.

इसका उद्देश्य **वैश्विक कमोडिटी जोखिम प्रबंधन** को भारत में लाना है, जिसका परिणाम कमोडिटी डेरिवेटिव बाजारों में **अधिक गहराई और तरलता** के रूप में सामने आएगा और इस प्रकार भारत को **वैश्विक बेंचमार्क** के रूप में कार्य करने में सक्षम बनाएगा।

- SEBI is now soliciting views from public to allow FPIs participate in physically-settled contracts as **bullion** (gold, silver and their derivatives), **energy** (crude oil and natural gas) and **base metals** (aluminium, copper, lead, nickel and zinc), even as the challenge is to ensure greater liquidity does not become greater volatility.

SEBI अब जनता से सुझाव आमंत्रित कर रहा है ताकि FPIs को **भौतिक निपटान वाले अनुबंधों** में भाग लेने की अनुमति दी जा सके, जिनमें **बुलियन** (सोना, चाँदी और उनके डेरिवेटिव्स), **ऊर्जा** (कच्चा तेल और प्राकृतिक गैस) तथा **आधारभूत धातुएँ** (एल्युमिनियम, तांबा, सीसा, निकेल और जस्ता) शामिल हैं; हालाँकि चुनौती यह सुनिश्चित करने की है कि **अधिक तरलता, अधिक अस्थिरता** में न बदल जाए।

- Overseas investors are at present not allowed to participate in contracts linked to crude, natural gas, gold or silver that are settled by actual delivery of the underlying goods. वर्तमान में विदेशी निवेशकों को **कच्चे तेल, प्राकृतिक गैस, सोने या चाँदी** से जुड़े ऐसे अनुबंधों में भाग लेने की अनुमति नहीं है, जिनका निपटान अंतर्निहित वस्तुओं की **वास्तविक डिलीवरी** द्वारा किया जाता है।

- Multi Commodity Exchange (MCX)** — with combined futures and options (F&O) Average Daily Turnover (ADT) of ₹10.5 lakh crore as of Q1FY27 — has strong retail and domestic participation but relatively limited institutional depth compared with global exchanges.

मल्टी कमोडिटी एक्सचेंज (MCX)—जिसका Q1FY27 में संयुक्त **फ्यूचर्स एंड ऑप्शंस (F&O)** औसत दैनिक कारोबार (ADT) ₹10.5 लाख करोड़ था—में खुदरा और घरेलू भागीदारी मजबूत है, लेकिन वैश्विक एक्सचेंजों की तुलना में इसकी **संस्थागत गहराई अपेक्षाकृत सीमित** है।

- FPIs could help in **price discovery** and a deeper MCX could allow hedging domestically, which otherwise is currently done majorly through London, New York, Chicago and Singapore; implying reduction in volatility of India's forex requirement, not a large reduction in total forex outflow.

FPIs मूल्य खोज (price discovery) में मदद कर सकते हैं और अधिक गहराई वाला MCX घरेलू स्तर पर **हेजिंग** की सुविधा दे सकता है, जो वर्तमान में मुख्यतः **लंदन, न्यूयॉर्क, शिकागो और सिंगापुर** के माध्यम से की जाती है; इससे भारत की विदेशी मुद्रा आवश्यकता में अस्थिरता कम हो सकती है, लेकिन कुल विदेशी मुद्रा बहिर्वाह में बड़ी कमी आवश्यक रूप से नहीं होगी।

Multiplier effect

गुणक प्रभाव

- FPIs can create a **multiplier effect** by providing the liquidity needed for airlines, oil marketing companies (OMCs) and industrial users to hedge efficiently on Indian exchanges.

FPIs **तरलता उपलब्ध कराकर गुणक प्रभाव** पैदा कर सकते हैं, जिसकी एयरलाइनों, **तेल विपणन कंपनियों (OMCs)** और औद्योगिक उपयोगकर्ताओं को भारतीय एक्सचेंजों पर **प्रभावी ढंग से हेजिंग** करने के लिए आवश्यकता होती है।

- More than 11,000 FPIs are at present registered in India; even if a tenth (conservative estimates) of them participates in the Indian commodity derivatives market, it can ingress considerable liquidity.

वर्तमान में भारत में **11,000 से अधिक FPIs पंजीकृत** हैं; यदि उनमें से केवल दसवाँ हिस्सा भी (रूढ़िवादी

अनुमान के अनुसार) भारतीय कमोडिटी डेरिवेटिव बाजार में भाग लेता है, तो इससे पर्याप्त तरलता आ सकती है।

- Margin stays within the country, brokerage paid remains domestic and banks would need less foreign currency for collateral purposes.

मार्जिन देश के भीतर ही रहेगा, भुगतान किया गया ब्रोकरेज घरेलू रहेगा और बैंकों को जमानत (collateral) के लिए कम विदेशी मुद्रा की आवश्यकता होगी।

- Although New Delhi cannot avoid paying dollars for the demand-inelastic imported commodities, it can nevertheless save on offshore collateral, transaction costs and financial outflows.

यद्यपि नई दिल्ली माँग की दृष्टि से अलोचदार आयातित वस्तुओं के लिए डॉलर में भुगतान करने से बच नहीं सकती, फिर भी वह ऑफशोर जमानत, लेन-देन लागत और वित्तीय बहिर्वाह में बचत कर सकती है।

Historical origins

ऐतिहासिक उत्पत्ति

- The seeds of the present proposal were sown in **2015** at the time of the merger of the **Forward Markets Commission with SEBI**, which has been taking measured steps in developing commodity derivatives market in an orderly manner.
वर्तमान प्रस्ताव के बीज **2015 में फॉरवर्ड मार्केट्स कमीशन के SEBI के साथ विलय** के समय बोए गए थे; तब से SEBI कमोडिटी डेरिवेटिव बाजार को व्यवस्थित तरीके से विकसित करने के लिए क्रमिक और मापे-तुले कदम उठा रहा है।

- To attract broad-based participation, enhancing liquidity, facilitating hedging and bringing in more depth to the commodity derivatives market, SEBI had introduced various products such as futures on commodity indices, options on commodity futures and options in goods.

व्यापक भागीदारी आकर्षित करने, तरलता बढ़ाने, हेजिंग को सुगम बनाने और कमोडिटी डेरिवेटिव बाजार में अधिक गहराई लाने के लिए SEBI ने कमोडिटी सूचकांकों पर फ्यूचर्स, कमोडिटी फ्यूचर्स पर ऑप्शंस और वस्तुओं पर ऑप्शंस जैसे विभिन्न उत्पाद पेश किए थे।

- The products have since been launched by bourses and are witnessing substantial trading volumes, thanks to mutual funds, alternative investment funds and portfolio management services.

इसके बाद इन उत्पादों को स्टॉक एक्सचेंजों द्वारा शुरू किया गया और म्यूचुअल फंड, वैकल्पिक निवेश कोष तथा पोर्टफोलियो प्रबंधन सेवाओं की भागीदारी के कारण इनमें पर्याप्त कारोबार हो रहा है।

- Initially, eligible foreign entities (EFEs) were allowed to participate (hedge) only if they had a direct exposure to Indian physical commodities; but their response was woefully low due to operational complexities.

प्रारंभ में पात्र विदेशी संस्थाओं (EFEs) को केवल तभी भाग लेने (हेजिंग करने) की अनुमति थी, जब उनका भारतीय भौतिक कमोडिटी में प्रत्यक्ष एक्सपोजर हो; लेकिन परिचालन संबंधी जटिलताओं के कारण उनकी भागीदारी बेहद कम रही।

Great potential

बड़ी संभावनाएँ

- Citing a study in China, which found a jump in volume and deals amid largely unaffected trading cost, after internationalisation of futures markets; SEBI reasoned for the entry of FPIs. चीन में किए गए एक अध्ययन का हवाला देते हुए, जिसमें फ्यूचर्स बाजारों के अंतरराष्ट्रीयकरण के बाद कारोबार की लागत पर अपेक्षाकृत कम प्रभाव के बावजूद वॉल्यूम और सौदों में वृद्धि पाई गई थी, SEBI ने FPIs के प्रवेश के पक्ष में तर्क दिया।
- By attracting global capital, Indian exchanges could gradually become more influential in regional price discovery as a deeper market can also reduce the country's dependence on

the overseas benchmarks.

वैश्विक पूँजी को आकर्षित करके भारतीय एक्सचेंज धीरे-धीरे क्षेत्रीय **मूल्य खोज** में अधिक प्रभावशाली बन सकते हैं, क्योंकि अधिक गहराई वाला बाजार देश की **विदेशी बेंचमार्क पर निर्भरता** को भी कम कर सकता है।

- SEBI's focus is expected to benefit the **MCX** — dominated by commodities that are either imported or globally priced.
SEBI का यह प्रयास **MCX** को लाभ पहुँचाने की उम्मीद है, जहाँ ऐसी वस्तुओं का प्रभुत्व है जो या तो **आयातित होती हैं या जिनकी कीमतें वैश्विक स्तर पर निर्धारित होती हैं**।
- It helps expand the addressable market and strengthen its position as an **Asian commodity trading hub**.
इससे संभावित बाजार का विस्तार करने और **एशियाई कमोडिटी ट्रेडिंग हब** के रूप में इसकी स्थिति मजबूत करने में मदद मिलेगी।
- The combined futures and options ADT of MCX had seen a whopping **238% increase in Q1FY27**, reflecting growing investor adoption of commodity derivatives for hedging and trading.
MCX के संयुक्त **फ्यूचर्स और ऑप्शंस ADT** में **Q1FY27 में 238% की भारी वृद्धि** हुई, जो हेजिंग और कारोबार के लिए निवेशकों द्वारा कमोडिटी डेरिवेटिव्स को तेजी से अपनाए जाने को दर्शाती है।
- Active client base almost doubled year-on-year to **13.72 lakh** in the review period.
समीक्षाधीन अवधि में सक्रिय ग्राहक आधार साल-दर-साल लगभग दोगुना होकर **13.72 लाख** हो गया।

Red flag

चेतावनी का संकेत

- The SEBI's move to widen access for FPIs into non-farm commodity derivatives is a significant step but speculation may amplify price movements in an otherwise charged geopolitical environment, currency fluctuations and supply disruptions.
गैर-कृषि कमोडिटी डेरिवेटिव्स में FPIs की पहुँच बढ़ाने का **SEBI का कदम महत्वपूर्ण** है, लेकिन सट्टेबाजी पहले से तनावपूर्ण **भू-राजनीतिक वातावरण, मुद्रा उतार-चढ़ाव और आपूर्ति व्यवधानों** के बीच कीमतों में होने वाले बदलाव को और बढ़ा सकती है।
- Large international commodity trading houses and hedge funds could accumulate significant positions, influencing short-term prices, even as SEBI has mandated them to square off position before the delivery period.
बड़ी **अंतरराष्ट्रीय कमोडिटी ट्रेडिंग कंपनियाँ और हेज फंड** बड़ी मात्रा में पोजीशन जमा कर सकते हैं और अल्पकालिक कीमतों को प्रभावित कर सकते हैं, भले ही SEBI ने उन्हें **डिलीवरी अवधि से पहले अपनी पोजीशन समाप्त करने** का निर्देश दिया हो।
- Reflecting the contagion from global markets, Indian commodity markets may sway to **Federal Reserve policy and the dollar movements**.
वैश्विक बाजारों से आने वाले **संक्रमण प्रभाव** के कारण भारतीय कमोडिटी बाजार **फेडरल रिजर्व की नीति और डॉलर की गतिविधियों** से प्रभावित हो सकते हैं।
- Excessive financialisation of commodities may create a discord between **futures prices and physical market realities**.
कमोडिटी का अत्यधिक **वित्तीयकरण (financialisation)** **फ्यूचर्स कीमतों और भौतिक बाजार की वास्तविकताओं** के बीच असंगति पैदा कर सकता है।



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Can SHANTI Act override court on compensation for nuclear disasters, asks SC

GS III: S&T
The Hindu Bureau
NEW DELHI

The Supreme Court on Monday asked if statutory thresholds prescribed by the Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India (SHANTI) Act of 2025 could possibly forbid constitutional courts from directing payment of suitable compensation to victims in cases of nuclear plant-related accidents.

“What is the prohibition on a constitutional court to grant suitable compensation against a lawful/legal tort? In case of a legal tort, the court can always grant,” Chief Justice Surya Kant, heading a three-judge Bench, said.

The court made the oral remark while issuing notice to the Union govern-

ment and the Atomic Energy Regulatory Board (AERB) in a petition represented by advocates Prashant Bhushan and Neha Rathi, challenging provisions of the SHANTI Act, 2025, which limit the liability of operators of nuclear installations, suppliers, manufacturers, etc.

“Unless Your Lordships say now that cap or no cap, the court will decide the liability of operators, suppliers and the government... Unless you say that now, operators and suppliers would cut corners that may endanger lives,” Mr. Bhushan pressed.

Mr. Bhushan pointed out that the Act has capped the government’s residual liability at “300 million Special Drawing Rights – a figure that is abysmally low and effectively ensures that victims of death, injury, or

property damage cannot recover even a small fraction of their actual losses”.

Mr. Bhushan said investment should not be at the cost of safety of thousands of lives. The senior lawyer pointed out that the Chernobyl nuclear disaster loss was estimated between \$235 billion and \$700 billion. The Fukushima Daiichi nuclear power plant accident, which occurred in Japan in 2011, had estimated clean-up costs reaching approximately \$400-445 billion.

“In contrast to this, SHANTI Act, 2025 caps the liability of the largest plant operator in India at a mere ₹3,000 crore. The exemption of suppliers from any liability in the Act is bound to encourage manufacturers and suppliers to maximise their profits,” Mr. Bhushan submitted.

18A8. Can SHANTI Act override court on compensation for nuclear disasters, asks SC

क्या परमाणु आपदाओं के मुआवज़े के मामले में SHANTI अधिनियम अदालत के आदेश को दरकिनार कर सकता है, SC ने पूछा

- The Supreme Court on Monday asked if statutory thresholds prescribed by the **Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India (SHANTI) Act of 2025** could possibly forbid constitutional courts from directing payment of suitable compensation to victims in cases of nuclear plant-related accidents.
सोमवार को सर्वोच्च न्यायालय ने पूछा कि क्या सस्टेनेबल हार्नेसिंग एंड एडवांसमेंट ऑफ न्यूक्लियर एनर्जी फॉर ट्रांसफॉर्मिंग इंडिया (SHANTI) अधिनियम, 2025 द्वारा निर्धारित वैधानिक सीमाएँ संवैधानिक न्यायालयों को परमाणु संयंत्र से संबंधित दुर्घटनाओं के मामलों में पीड़ितों को उचित मुआवज़ा देने का निर्देश देने से रोक सकती हैं।
- “What is the prohibition on a constitutional court to grant suitable compensation against a lawful/legal tort?”
“किसी वैधा/कानूनी अपकृत्य (tort) के विरुद्ध उचित मुआवज़ा देने से संवैधानिक न्यायालय को रोकने वाला क्या प्रावधान है?”
- The court made the oral remark while issuing notice to the **Union government and the Atomic Energy Regulatory Board (AERB)** in a petition represented by advocates Prashant Bhushan and Neha Rathi, challenging provisions of the SHANTI Act, 2025, which limit the liability of operators of nuclear installations, suppliers, manufacturers, etc.
न्यायालय ने यह मौखिक टिप्पणी अधिवक्ता प्रशांत भूषण और नेहा राठी द्वारा प्रस्तुत एक याचिका पर केंद्र सरकार और परमाणु ऊर्जा नियामक बोर्ड (AERB) को नोटिस जारी करते हुए की, जिसमें SHANTI अधिनियम, 2025 के उन प्रावधानों को चुनौती दी गई है जो परमाणु प्रतिष्ठानों के संचालकों, आपूर्तिकर्ताओं, निर्माताओं आदि की देयता को सीमित करते हैं।
- Mr. Bhushan pointed out that the **Act has capped the government's residual liability at “300 million Special Drawing Rights — a figure that is abysmally low and effectively ensures that victims of death, injury, or property damage cannot recover even a small fraction of their actual losses”.**
श्री भूषण ने बताया कि अधिनियम ने सरकार की अवशिष्ट देयता को “300 मिलियन स्पेशल ड्रॉइंग राइट्स (SDRs)” तक सीमित कर दिया है—एक ऐसी राशि जो अत्यंत कम है और प्रभावी रूप से यह सुनिश्चित करती है कि मृत्यु, चोट या संपत्ति की क्षति के पीड़ित अपनी वास्तविक हानि के एक छोटे से अंश की भी भरपाई नहीं कर पाएंगे।
- The senior lawyer pointed out that the **Chernobyl nuclear disaster loss was estimated between \$235 billion and \$700 billion.**
वरिष्ठ अधिवक्ता ने बताया कि चेरनोबिल परमाणु आपदा से होने वाली क्षति का अनुमान \$235 बिलियन से \$700 बिलियन के बीच लगाया गया था।
- The **Fukushima Daiichi nuclear power plant accident, which occurred in Japan in 2011, had estimated clean-up costs reaching approximately \$400-445 billion.**
2011 में जापान में हुई फुकुशिमा दाइइची परमाणु ऊर्जा संयंत्र दुर्घटना की सफाई की अनुमानित लागत लगभग \$400-445 बिलियन तक पहुँच गई थी।
- “In contrast to this, SHANTI Act, 2025 caps the liability of the largest plant operator in India at a mere ₹3,000 crore.”
“इसके विपरीत, SHANTI अधिनियम, 2025 भारत में सबसे बड़े संयंत्र संचालक की देयता को मात्र ₹3,000 करोड़ तक सीमित करता है।
- The exemption of suppliers from any liability in the Act is bound to encourage manufacturers and suppliers to maximise their profits,” Mr. Bhushan submitted.
अधिनियम में आपूर्तिकर्ताओं को किसी भी देयता से छूट दिया जाना निर्माताओं और आपूर्तिकर्ताओं को अपने लाभ को अधिकतम करने के लिए प्रोत्साहित करने वाला है,” श्री भूषण ने प्रस्तुत किया।



Rotating detonation engines: the science and the promises

RDEs are currently confined to research and development; there are no models known to be ready for commercial or military use; but going by their physics alone, they offer around 10% to 25% more thermodynamic efficiency than conventional combustors

GS III: S&T
Vasudevan Mukunth

Recently, India-based defence start-up D-Propulse announced that it had successfully demonstrated a rotating detonation engine at a Defence Research & Development Organisation facility in Hyderabad.

A rotating detonation engine, or RDE, is an engine design that promises to use fuel more efficiently than conventional rocket engines. Launching satellites to space on rockets and carrying explosives to distant targets on missiles are both expensive. If an engine can use fuel more efficiently, it will need correspondingly less fuel to achieve the same task. This saving can be passed to the payload, whether a satellite or a warhead, increasing the profitability of the mission. At least on paper.

In January, GE Aerospace and Lockheed Martin demonstrated an RDE for hypersonic missiles (using air from the atmosphere). In February, U.S.-based SpaceWorks reported hot-fire tests of its RDE for rockets. Its compatriots Astrobotic test-fired its Chakram RDE continuously for 300 seconds and L3Harris announced that it had tested two RDEs, in April and May respectively.

The Swiss start-up Stellar Alpinia completed a commercial RDE hot-fire test and raised CHF 3.5 million while Juno Propulsion raised \$1.4 million to develop an RDE for spacecraft thrusters. In July, Venus Aerospace (then partnered with Lockheed Martin) raised \$91 million to scale its tested RDE.

Wait for advances

RDEs are currently confined to research and development. There are no models

known to be ready for commercial or military use.

The actual data from many tests by commercial entities are also not available in the public domain. But going by their physics alone, RDEs offer around 10% to 25% more thermodynamic efficiency than conventional combustors. The exact value depends on real-world conditions and the engine's design.

This is considered to be significant for rocket launches. Thermodynamic efficiency measures how much chemical energy becomes useful work. If an RDE improves thermodynamic efficiency by 20%, for instance, it could theoretically require around 17% less fuel for the same output, assuming other losses are unchanged.

Scientists figured out how an RDE could work by the 1960s. Building one was a different matter. Sustaining a continuous detonation in a compact chamber requires engineers to precisely control the injection of the fuel and the internal pressure.

The chamber also needs to have a specific geometry to ensure the engine works as desired.

Unlike in regular engines, even small instabilities in the fuel-air mixture in an RDE can destabilise the engine.

The engine materials must also withstand more than 2,000°C, 10-100 atmospheres of pressure (and in brief moments much higher), detonation speeds of more than 1,500 m/s, pressures oscillating at several thousand cycles per second, and potentially tens to hundreds of g, depending on the design.

So to invent working RDEs, scientists and engineers had to wait for advances in high-speed computing, diagnostics, fuel injection, materials, and manufacturing.

Supersonic flame

In a regular engine, the combustion chamber holds the fuel-air mixture. When a flame is introduced in the chamber – like from a spark plug – it travels through the mixture at less than the speed of sound. This is called a deflagration.

When the flame travels through the mixture at more than the speed of sound, it imposes a shock wave on the mixture and heats it up, triggering rapid combustion behind it. This is called a detonation. It is also what happens in the combustion chamber of a detonation engine.

As the flame passes through the mixture in a regular engine, the combustion happens at constant pressure. This means the mixture is free to expand as it heats up instead of being confined under pressure.

But when the flame passes through the mixture as a detonation, the combustion happens at constant volume. This is because the detonation compresses the unburned mixture with a shock wave immediately before combustion, and the mixture doesn't have enough time to expand under these 'forces'.

This is also why a detonation engine produces combustion products at a higher pressure, and more of the fuel's chemical energy is converted into pressure rather than being shed as heat. This is essentially the physics of how a detonation engine can have more fuel efficiency than a 'regular' engine with the same fuel.

Pulsed and rotating detonation

A simple type of the detonation engine is called the pulsed detonation engine, or PDE. A PDE has a long tube as the combustion chamber, to allow the

detonation to pass through the whole mixture.

First, the detonation races down the tube, rapidly compressing and burning the fuel-air mixture. This leaves behind very hot, high-pressure combustion products. Those gases expand towards the open end of the tube, where they exit at a high speed.

By Newton's third law, their momentum in one direction produces an equal and opposite momentum on the engine, pushing it forward. Alternatively, if the engine is connected to a piston, the same expanding gases would push on it, generating mechanical energy. The tube is then purged before the next cycle begins.

An RDE makes the detonation a continuous process. Instead of the detonation passing through a long tube, it is made to flow in a circle. In the general RDE design, the combustion chamber has an annular shape, i.e. two concentric cylinders with a narrow ring-shaped gap between them. The fuel and the oxidiser are injected continuously into this gap, called the annulus, even as one or more detonation waves race through.

As the detonation goes round and round, it continuously imposes high pressures and temperatures on the mixture.

And to keep the detonation going, fuel is continuously injected into the annulus just ahead of the detonation wave. The wave consumes the fresh fuel-air mixture and expels the products through the nozzle, along its axis. So as long as the fuel keeps coming at the right time and in the right conditions, the detonation can keep going – even at thousands of times per second.

This is how an RDE can continuously generate thrust (or mechanical energy).

18A8. Rotating detonation engines: the science and the promises

घूर्णनशील विस्फोटन इंजन: विज्ञान और संभावनाएँ

- Recently, India-based defence start-up D-Propulse announced that it had successfully demonstrated a rotating detonation engine at a Defence Research & Development Organisation facility in Hyderabad.

हाल ही में, भारत स्थित रक्षा स्टार्ट-अप D-Propulse ने घोषणा की कि उसने हैदराबाद स्थित रक्षा अनुसंधान एवं विकास संगठन (DRDO) की एक सुविधा में घूर्णनशील विस्फोटन इंजन (Rotating Detonation Engine—RDE) का सफल प्रदर्शन किया है।

- A rotating detonation engine, or RDE, is an engine design that promises to use fuel more efficiently than conventional rocket engines.

घूर्णनशील विस्फोटन इंजन (RDE) एक ऐसी इंजन डिजाइन है, जिसमें पारंपरिक रॉकेट इंजनों की तुलना में ईंधन का अधिक दक्षतापूर्वक उपयोग करने की क्षमता होने का दावा किया जाता है।

- Launching satellites to space on rockets and carrying explosives to distant targets on missiles are both expensive.

रॉकेटों के माध्यम से उपग्रहों को अंतरिक्ष में प्रक्षेपित करना और मिसाइलों के माध्यम से दूरस्थ लक्ष्यों तक विस्फोटक पहुँचाना, दोनों ही महँगे कार्य हैं।

- If an engine can use fuel more efficiently, it will need correspondingly less fuel to achieve the same task.

यदि कोई इंजन ईंधन का अधिक दक्षतापूर्वक उपयोग कर सकता है, तो समान कार्य को पूरा करने के लिए उसे उसी अनुपात में कम ईंधन की आवश्यकता होगी।

- This saving can be passed to the payload, whether a satellite or a warhead, increasing the profitability of the mission.
इस बचत का उपयोग **पेलोड**, चाहे वह उपग्रह हो या **वारहेड**, के लिए किया जा सकता है, जिससे मिशन की **लागत-प्रभावशीलता** बढ़ सकती है।
- At least on paper.
कम-से-कम **सैद्धांतिक रूप** से।
- In January, GE Aerospace and Lockheed Martin demonstrated an RDE for hypersonic missiles (using air from the atmosphere).
जनवरी में, **GE Aerospace और Lockheed Martin** ने हाइपरसोनिक मिसाइलों के लिए एक **RDE** का प्रदर्शन किया, जिसमें वायुमंडल से हवा का उपयोग किया जाता है।
- In February, U.S.-based SpaceWorks reported hot-fire tests of its RDE for rockets.
फरवरी में, अमेरिका स्थित **SpaceWorks** ने रॉकेटों के लिए अपने RDE के **हॉट-फायर परीक्षणों** की जानकारी दी।
- Its compatriots Astrobotic test-fired its Chakram RDE continuously for 300 seconds and L3Harris announced that it had tested two RDEs, in April and May respectively.
इसी देश की **Astrobotic** ने अपने **Chakram RDE** का लगातार **300 सेकंड** तक परीक्षण किया और **L3Harris** ने घोषणा की कि उसने क्रमशः अप्रैल और मई में दो RDE का परीक्षण किया था।
- The Swiss start-up Stellar Alpina completed a commercial RDE hot-fire test and raised CHF 3.5 million while Juno Propulsion raised \$1.4 million to develop an RDE for spacecraft thrusters.
स्विस स्टार्ट-अप **Stellar Alpina** ने एक वाणिज्यिक RDE का **हॉट-फायर परीक्षण** पूरा किया और **CHF 3.5 मिलियन** जुटाए, जबकि **Juno Propulsion** ने अंतरिक्षयान के थ्रस्टर्स के लिए RDE विकसित करने हेतु **\$1.4 मिलियन** जुटाए।
- In July, Venus Aerospace (then partnered with Lockheed Martin) raised \$91 million to scale its tested RDE.
जुलाई में, **Venus Aerospace**, जो उस समय Lockheed Martin के साथ साझेदारी में था, ने अपने परीक्षण किए गए RDE को बड़े पैमाने पर विकसित करने के लिए **\$91 मिलियन** जुटाए।

Wait for advances प्रगति की प्रतीक्षा

- RDEs are currently confined to research and development.
RDE वर्तमान में **अनुसंधान एवं विकास** तक ही सीमित हैं।
- There are no models known to be ready for commercial or military use.
ऐसा कोई मॉडल ज्ञात नहीं है जो **वाणिज्यिक या सैन्य उपयोग** के लिए तैयार हो।
- The actual data from many tests by commercial entities are also not available in the public domain.
वाणिज्यिक संस्थाओं द्वारा किए गए अनेक परीक्षणों के **वास्तविक आँकड़े** भी सार्वजनिक रूप से उपलब्ध नहीं हैं।
- But going by their physics alone, RDEs offer around 10% to 25% more thermodynamic efficiency than conventional combustors.
लेकिन केवल उनके **भौतिकी संबंधी सिद्धांतों** के आधार पर देखा जाए, तो RDE पारंपरिक दहन कक्षों की तुलना में लगभग **10% से 25% अधिक तापगतिकीय दक्षता** प्रदान कर सकते हैं।
- The exact value depends on real-world conditions and the engine's design.
सटीक मूल्य **वास्तविक परिस्थितियों और इंजन की डिजाइन** पर निर्भर करता है।



- This is considered to be significant for rocket launches.
रॉकेट प्रक्षेपणों के लिए इसे महत्वपूर्ण माना जाता है।
- Thermodynamic efficiency measures how much chemical energy becomes useful work.
तापगतिकीय दक्षता यह मापती है कि रासायनिक ऊर्जा का कितना भाग उपयोगी कार्य में परिवर्तित होता है।
- If an RDE improves thermodynamic efficiency by 20%, for instance, it could theoretically require around 17% less fuel for the same output, assuming other losses are unchanged.
उदाहरण के लिए, यदि कोई RDE तापगतिकीय दक्षता में 20% सुधार करता है, तो अन्य हानियों को अपरिवर्तित मानते हुए, समान आउटपुट के लिए सैद्धांतिक रूप से लगभग 17% कम ईंधन की आवश्यकता हो सकती है।
- Scientists figured out how an RDE could work by the 1960s.
वैज्ञानिकों ने 1960 के दशक तक यह समझ लिया था कि RDE किस प्रकार काम कर सकता है।
- Building one was a different matter.
लेकिन इसका निर्माण करना एक अलग चुनौती थी।
- Sustaining a continuous detonation in a compact chamber requires engineers to precisely control the injection of the fuel and the internal pressure.
एक संकुचित कक्ष में निरंतर विस्फोटन बनाए रखने के लिए इंजीनियरों को ईंधन के इंजेक्शन और आंतरिक दबाव को अत्यंत सटीक रूप से नियंत्रित करना पड़ता है।
- The chamber also needs to have a specific geometry to ensure the engine works as desired.
इंजन को इच्छित रूप से संचालित करने के लिए कक्ष की विशिष्ट ज्यामिति होना भी आवश्यक है।
- Unlike in regular engines, even small instabilities in the fuel-air mixture in an RDE can destabilise the engine.
सामान्य इंजनों के विपरीत, RDE में ईंधन-वायु मिश्रण की छोटी-सी अस्थिरता भी इंजन को अस्थिर कर सकती है।
- The engine materials must also withstand more than 2,000° C, 10-100 atmospheres of pressure (and in brief moments much higher), detonation speeds of more than 1,500 m/s, pressures oscillating at several thousand cycles per second, and potentially tens to hundreds of g, depending on the design.
इंजन की सामग्रियों को 2,000°C से अधिक तापमान, 10-100 वायुमंडलीय दबाव (और कुछ क्षणों के लिए इससे भी बहुत अधिक), 1,500 m/s से अधिक विस्फोटन गति, प्रति सेकंड कई हजार चक्रों की दर से दोलन करते दबाव तथा डिजाइन के आधार पर संभावित रूप से दहाई से सैकड़ों g तक के त्वरण को भी सहन करना पड़ता है।
- So to invent working RDEs, scientists and engineers had to wait for advances in high-speed computing, diagnostics, fuel injection, materials, and manufacturing.
इसलिए कार्यशील RDE विकसित करने के लिए वैज्ञानिकों और इंजीनियरों को उच्च-गति कंप्यूटिंग, डायग्नोस्टिक्स, ईंधन इंजेक्शन, सामग्री विज्ञान और विनिर्माण में प्रगति की प्रतीक्षा करनी पड़ी।

Supersonic flame

अतिध्वनिक ज्वाला

- In a regular engine, the combustion chamber holds the fuel-air mixture.
एक सामान्य इंजन में दहन कक्ष ईंधन-वायु मिश्रण को धारण करता है।
- When a flame is introduced in the chamber — like from a spark plug — it travels through the mixture at less than the speed of sound.
जब कक्ष में ज्वाला उत्पन्न की जाती है—जैसे स्पार्क प्लग से—तो वह मिश्रण में ध्वनि की गति से कम गति से आगे बढ़ती है।
- This is called a deflagration.
इसे डिफ्लैग्रेशन (Deflagration) कहा जाता है।
- When the flame travels through the mixture at more than the speed of sound, it imposes a shock wave on the mixture and heats it up, triggering rapid combustion behind it.

जब ज्वाला मिश्रण में ध्वनि की गति से अधिक गति से आगे बढ़ती है, तो वह मिश्रण पर एक शॉक वेव उत्पन्न करती है और उसे गर्म करती है, जिससे उसके पीछे तीव्र दहन शुरू हो जाता है।

- This is called a detonation.
इसे **डिटोनेशन (Detonation)** कहा जाता है।
- It is also what happens in the combustion chamber of a detonation engine.
डिटोनेशन इंजन के दहन कक्ष में भी यही प्रक्रिया होती है।
- As the flame passes through the mixture in a regular engine, the combustion happens at constant pressure.
सामान्य इंजन में ज्वाला के मिश्रण से गुजरने के दौरान दहन स्थिर दबाव पर होता है।
- This means the mixture is free to expand as it heats up instead of being confined under pressure.
इसका अर्थ है कि गर्म होने पर मिश्रण को दबाव के अंतर्गत सीमित रहने के बजाय फैलने की स्वतंत्रता होती है।
- But when the flame passes through the mixture as a detonation, the combustion happens at constant volume.
लेकिन जब ज्वाला डिटोनेशन के रूप में मिश्रण से गुजरती है, तो दहन स्थिर आयतन पर होता है।
- This is because the detonation compresses the unburned mixture with a shock wave immediately before combustion, and the mixture doesn't have enough time to expand under these 'forces'.
ऐसा इसलिए होता है क्योंकि डिटोनेशन दहन से ठीक पहले एक शॉक वेव के माध्यम से बिना जले मिश्रण को संपीड़ित करता है और इन 'बलों' के अंतर्गत मिश्रण को फैलने के लिए पर्याप्त समय नहीं मिलता।
- This is also why a detonation engine produces combustion products at a higher pressure, and more of the fuel's chemical energy is converted into pressure rather than being shed as heat.
यही कारण है कि डिटोनेशन इंजन दहन उत्पादों को अधिक दबाव पर उत्पन्न करता है और ईंधन की अधिक रासायनिक ऊर्जा दबाव में परिवर्तित होती है, बजाय इसके कि वह ऊष्मा के रूप में नष्ट हो जाए।
- This is essentially the physics of how a detonation engine can have more fuel efficiency than a 'regular' engine with the same fuel.
यही मूल भौतिकी है कि समान ईंधन का उपयोग करने वाला डिटोनेशन इंजन एक 'सामान्य' इंजन की तुलना में अधिक ईंधन दक्षता कैसे प्राप्त कर सकता है।

Pulsed and rotating detonation

स्पंदित और घूर्णनशील विस्फोटन

- A simple type of the detonation engine is called the pulsed detonation engine, or PDE.
डिटोनेशन इंजन के एक सरल प्रकार को **पल्स्ड डिटोनेशन इंजन (PDE)** कहा जाता है।
- A PDE has a long tube as the combustion chamber, to allow the detonation to pass through the whole mixture.
PDE में दहन कक्ष के रूप में एक लंबी ट्यूब होती है, ताकि डिटोनेशन पूरे मिश्रण से होकर गुजर सके।
- First, the detonation races down the tube, rapidly compressing and burning the fuel-air mixture.
सबसे पहले, डिटोनेशन ट्यूब के भीतर तेजी से आगे बढ़ता है और ईंधन-वायु मिश्रण को तेजी से संपीड़ित एवं जला देता है।
- This leaves behind very hot, high-pressure combustion products.
इसके पीछे अत्यधिक गर्म और उच्च-दाब वाले दहन उत्पाद रह जाते हैं।
- Those gases expand towards the open end of the tube, where they exit at a high speed.
ये गैसें ट्यूब के खुले सिरे की ओर फैलती हैं, जहाँ से वे उच्च गति से बाहर निकलती हैं।
- By Newton's third law, their momentum in one direction produces an equal and opposite momentum on the engine, pushing it forward.
न्यूटन के तीसरे नियम के अनुसार, एक दिशा में उनका संवेग इंजन पर समान और विपरीत दिशा में संवेग उत्पन्न करता है, जिससे इंजन आगे की ओर धकेला जाता है।



- Alternatively, if the engine is connected to a piston, the same expanding gases would push on it, generating mechanical energy.
वैकल्पिक रूप से, यदि इंजन को पिस्टन से जोड़ा जाए, तो वही फैलती हुई गैसों पिस्टन पर दबाव डालेंगी और यांत्रिक ऊर्जा उत्पन्न करेंगी।
- The tube is then purged before the next cycle begins.
इसके बाद अगला चक्र शुरू होने से पहले ट्यूब को शुद्ध/खाली किया जाता है।
- An RDE makes the detonation a continuous process.
RDE डिटोनेशन को एक निरंतर प्रक्रिया बना देता है।
- Instead of the detonation passing through a long tube, it is made to flow in a circle.
डिटोनेशन के लंबी ट्यूब से गुजरने के बजाय, इसे वृत्ताकार रूप से प्रवाहित किया जाता है।
- In the general RDE design, the combustion chamber has an annular shape, i.e. two concentric cylinders with a narrow ring-shaped gap between them.
सामान्य RDE डिजाइन में दहन कक्ष का आकार वलयाकार (annular) होता है, अर्थात् दो समकेंद्रीय बेलनों के बीच एक संकीर्ण वलयाकार अंतराल होता है।
- The fuel and the oxidiser are injected continuously into this gap, called the annulus, even as one or more detonation waves race through.
ईंधन और ऑक्सीकारक (oxidiser) को इस अंतराल, जिसे एन्युलस (annulus) कहा जाता है, में लगातार इंजेक्ट किया जाता है, जबकि एक या अधिक डिटोनेशन तरंगें इसके भीतर तेजी से घूमती रहती हैं।
- As the detonation goes round and round, it continuously imposes high pressures and temperatures on the mixture.
जैसे-जैसे डिटोनेशन बार-बार घूमता रहता है, वह मिश्रण पर लगातार उच्च दबाव और उच्च तापमान उत्पन्न करता है।
- And to keep the detonation going, fuel is continuously injected into the annulus just ahead of the detonation wave.
डिटोनेशन को जारी रखने के लिए डिटोनेशन तरंग के ठीक आगे एन्युलस में लगातार ईंधन इंजेक्ट किया जाता है।
- The wave consumes the fresh fuel-air mixture and expels the products through the nozzle, along its axis.
तरंग ताजे ईंधन-वायु मिश्रण का उपभोग करती है और दहन उत्पादों को नोजल के माध्यम से उसकी धुरी के समानांतर बाहर निकाल देती है।
- So as long as the fuel keeps coming at the right time and in the right conditions, the detonation can keep going — even at thousands of times per second.
इस प्रकार, जब तक ईंधन सही समय पर और सही परिस्थितियों में आता रहता है, डिटोनेशन जारी रह सकता है—यहाँ तक कि प्रति सेकंड हजारों बार भी।

GS Paper III: Environment		18 August 2026
TOPICS COVERED		
18A8	'Dangerous misinformation': experts decry AI wildlife visuals 'खतरनाक भ्रामक सूचना': विशेषज्ञों ने AI-जनित वन्यजीव दृश्यों की निंदा की	
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Dangerous misinformation': experts decry AI wildlife visuals

GS III: Environment

Agence France Presse

The black-and-white image appears to show the unlikely of interactions: an orangutan cradling endangered leopard cubs deep in the jungles of Malaysia's Sabah state. But the viral image is not just unlikely, it is fake, part of a trend of wildlife images generated by artificial intelligence that experts warn endanger animals and people.

Fact-checkers have debunked scores of similar synthetic visuals, from an elephant climbing a tree to escape flooding in Myanmar to a pink dolphin leaping out of water in the Philippines.

They may seem more like feel-good fiction than dangerous misinformation, but experts warn hyper-realistic visuals of wild animals behaving like pets, or even like humans, can distort public perceptions of wildlife and harm conservation efforts.

"This misunderstanding can lead people to approach animals too closely or interact with them in unsafe ways," Jose Guerrero-Casado, a zoology professor at Spain's University of Cordoba, said. He cited a widely reported incident in China's northwest Xinjiang region in January, where a woman was attacked by a rare snow leopard after trying to get closer for a photo.

China's forestry department said it stepped up patrols after the incident and warned the public to maintain a safe distance when encountering wild animals.

Conservationists say AI visuals portraying wild animals as cute or cuddly make it harder for social media users to discern what is real and can fuel exploitation. They increase demand for certain species "to be used in the tourism industry as photo props, exploited to make social media content or to be kept as pets", said Chris Lewis, a researcher at the international wildlife charity Born Free.

And while the visuals could encourage some people to support animal protection, "the negative impacts outweigh that completely," said Jenny Roberts of conservation group WWF. "People could get hurt," she said.

WWF uses real images for its fundraising efforts, but fake content online "desensitises" people to even the most incredible original visuals, she said.

"When you do have something remarkable, people question it," Roberts said, recounting an incident where a camera trap set up by her charity captured a tiger with five cubs in China. Such footage had never been filmed before in the East Asian country, she said. "But when we put the content out there, we were questioned on social media: 'Is this AI-generated?'"

A September study in the journal *Conservation Biology*, co-authored by Guerrero-Casado, concluded that the rapid spread of AI misinformation and its potential to harm environmental efforts is a "major threat" to society. The researchers highlighted another challenge for those working in conservation: AI images "could affect the ability of people to identify species" and cause misunderstandings about the abundance and distribution of wildlife.

Scientists often mine data from citizen science platforms that accept photos and recordings of wildlife submitted by users.

But AI generation and manipulation could lead to flawed research, several experts warned in a recent commentary in the journal *Nature*.

Meta, Facebook's parent company, and TikTok require users to label realistic visuals that have been generated or significantly altered using AI. They also say their platforms have tools that automatically label content as AI-generated. However, fact-checkers spotted multiple wildlife posts without clear labels.

concluded that the rapid spread of AI misinformation and its potential to harm environmental efforts is a "major threat" to society.

Conservation Biology पत्रिका में सितंबर में प्रकाशित एक अध्ययन, जिसके सह-लेखक ग्युरेरो-कासाडो भी थे, ने निष्कर्ष निकाला कि AI-जनित भ्रामक सूचना का तेजी से प्रसार और पर्यावरणीय प्रयासों को नुकसान पहुँचाने की इसकी संभावित क्षमता समाज के लिए एक "बड़ा खतरा" है।

- But AI generation and manipulation could lead to flawed research, several experts warned in a recent commentary in the journal *Nature*.

लेकिन AI द्वारा सामग्री का निर्माण और हेरफेर त्रुटिपूर्ण शोध का कारण बन सकता है, ऐसी चेतावनी कई विशेषज्ञों ने पत्रिका *Nature* में हाल ही में प्रकाशित एक टिप्पणी में दी।

18A8. 'Dangerous misinformation': experts decry AI wildlife visuals

'खतरनाक भ्रामक सूचना':

विशेषज्ञों ने AI-जनित वन्यजीव दृश्यों की निंदा की

- "This misunderstanding can lead people to approach animals too closely or interact with them in unsafe ways," Jose Guerrero-Casado, a zoology professor at Spain's University of Cordoba, said.

"यह गलतफहमी लोगों को जानवरों के

बहुत करीब जाने या उनके साथ असुरक्षित तरीके से व्यवहार करने के लिए प्रेरित कर सकती है," स्पेन के कॉर्डोबा

विश्वविद्यालय में प्राणीशास्त्र के प्रोफेसर जोस ग्युरेरो-कासाडो ने कहा।

- He cited a widely reported incident in China's northwest Xinjiang region in January, where a woman was attacked by a rare snow leopard after trying to get closer for a photo.

उन्होंने जनवरी में चीन के उत्तर-पश्चिमी शिनजियांग क्षेत्र में हुई व्यापक रूप से रिपोर्ट की गई एक घटना का उल्लेख किया, जहाँ एक महिला को तस्वीर लेने के लिए करीब जाने का प्रयास करने के बाद एक दुर्लभ हिम तेंदुए ने हमला कर दिया था।

- A September study in the journal *Conservation Biology*, co-authored by Guerrero-Casado,

GS III: Environment

Losing forest for trees

India is counting trees when it should be restoring forests

A performance audit by the Comptroller and Auditor General (CAG) of the Green India Mission (GIM) has found that a scheme conceived to heal India's forests had, across a decade, achieved almost nothing it set out to do. Instead of improving forest quality over 1.4 million hectares, the mission only managed 0.11 million – not even a tenth of the target. On expanding forest cover, the mission barely scraped together four per cent. The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) channels money collected from industry for diverting forest land into afforestation, while the Mahatma Gandhi National Rural Employment Guarantee Scheme, now rebranded as VB-G RAM G funds rural wage labour that can be used for plantation and land-restoration works, but GIM's intended convergence with these schemes never materialised. The mission was one of the eight pillars of the National Action Plan on Climate Change, unveiled in 2008, and the instrument through which India promised the Paris Agreement an additional carbon sink of 2.5 billion to 3 billion tonnes by 2030. Its animating idea was ecological – biodiversity, water, sequestration, and the revival of habitat. GIM however seems to be on the back burner and, for all practical purposes, replaced by a tree plantation drive called 'Ek Ped Maa Ke Naam (A Tree in the Name of Mother)'. Launched in 2024, the government reports planting 140 crore saplings so far, but the latest forest data expose the gulf between a tree and a forest. The India State of Forest Report 2023 records a gain of 1,445 square kilometres in green cover but only 156 sq km of it is true forest. The rest, 1,289 sq km, is 'tree cover outside recorded forests.' Within the recorded forests, dense canopy is thinning into scrub. Ergo, India is planting more and foresting less.

Few examples encapsulate this as much as the controversy over the Aravallis. Arguably the country's most degraded range – its hillocks quarried away, its native growth overrun by the invasive 'vilayati kikar' (*Prosopis juliflora*) – it is now to be rescued by a 'Green Wall' of fresh planting. But these arboreal conscripts cannot undo the damage from years of mining, halt encroachment, or summon back an ecosystem that took millennia to form. Restoration is not landscaping. The CAG's instrument is accountancy: it can count hectares and rupees, not the worth of a living forest; and its assessment cannot always capture the practical challenges of implementing missions. However, its verdict still lands. A mission to restore India's forests has been allowed to wither while the state busies itself counting trees.

18A8. Losing forest for trees

पेड़ों के लिए वन खोना

- A performance audit by the **Comptroller and Auditor General (CAG)** of the **Green India Mission (GIM)** has found that a scheme conceived to heal India's forests had, across a decade, achieved almost nothing it set out to do.

भारत के नियंत्रक एवं महालेखा परीक्षक (CAG) द्वारा ग्रीन इंडिया मिशन

(GIM) के प्रदर्शन का लेखापरीक्षण करने पर यह पाया गया है कि भारत के वनों को पुनर्जीवित करने के उद्देश्य से बनाई गई इस योजना ने एक दशक के दौरान अपने निर्धारित लक्ष्यों को लगभग पूरा ही नहीं किया।

- Instead of improving forest quality over **1.4 million hectares**, the mission only managed **0.11 million** — not even a tenth of the target.

14 लाख हेक्टेयर क्षेत्र में वन गुणवत्ता में सुधार करने के बजाय, मिशन केवल 0.11 मिलियन हेक्टेयर क्षेत्र में ही ऐसा कर सका — जो लक्ष्य के दसवें हिस्से से भी कम है।

- On expanding forest cover, the mission barely scraped together **four per cent**.

वनावरण बढ़ाने के मामले में भी मिशन मुश्किल से चार प्रतिशत उपलब्धि हासिल कर सका।

- The **Compensatory Afforestation Fund Management and Planning Authority (CAMPA)** channels money collected from industry for diverting forest land into afforestation, while the **Mahatma Gandhi National Rural Employment Guarantee Scheme**, now rebranded as **VB-G RAM G**, funds rural wage labour that can be used for plantation and land-restoration works, but GIM's intended convergence with these schemes never materialised.

प्रतिपूरक वनीकरण निधि प्रबंधन एवं योजना प्राधिकरण (CAMPA) उद्योगों से एकत्र किए गए उस धन को वनीकरण के लिए उपलब्ध कराता है, जो वन भूमि के अन्य उपयोग में परिवर्तन के लिए लिया जाता है, जबकि महात्मा गांधी राष्ट्रीय ग्रामीण रोजगार गारंटी योजना, जिसे अब VB-G RAM G के रूप में पुनः नामित किया गया है, ग्रामीण मजदूरी वाले ऐसे कार्यों के लिए वित्त प्रदान करती है जिनका उपयोग वृक्षारोपण और भूमि-पुनर्स्थापन कार्यों में किया जा सकता है; लेकिन इन योजनाओं के साथ GIM का प्रस्तावित अभिसरण कभी साकार नहीं हो सका।

- The mission was one of the **eight pillars of the National Action Plan on Climate Change**, unveiled in 2008, and the instrument through which India promised the **Paris Agreement** an

additional carbon sink of 2.5 billion to 3 billion tonnes by 2030.

यह मिशन राष्ट्रीय जलवायु परिवर्तन कार्ययोजना के आठ स्तंभों में से एक था, जिसे 2008 में प्रस्तुत किया गया था, और यही वह माध्यम था जिसके द्वारा भारत ने पेरिस समझौते के तहत 2030 तक अतिरिक्त 2.5 अरब से 3 अरब टन कार्बन सिंक सृजित करने का वादा किया था।

- Its animating idea was ecological — **biodiversity, water, sequestration, and the revival of habitat.**

इसकी मूल प्रेरणा पारिस्थितिकीय थी — अर्थात् जैव विविधता, जल, कार्बन अवशोषण और आवास का पुनर्जीवन।

- GIM however seems to be on the back burner and, for all practical purposes, replaced by a tree plantation drive called '**Ek Ped Maa Ke Naam (A Tree in the Name of Mother)**'. हालांकि, GIM को अब पृष्ठभूमि में डाल दिया गया प्रतीत होता है और व्यावहारिक रूप से इसका स्थान '**एक पेड़ माँ के नाम (A Tree in the Name of Mother)**' नामक वृक्षारोपण अभियान ने ले लिया है।
- Launched in 2024, the government reports planting **140 crore saplings** so far, but the latest forest data expose the gulf between a tree and a forest. 2024 में शुरू किए गए इस अभियान के तहत सरकार के अनुसार अब तक **140 करोड़ पौधे** लगाए जा चुके हैं, लेकिन नवीनतम वन संबंधी आंकड़े **एक पेड़ और एक वन के बीच के अंतर** को उजागर करते हैं।
- The **India State of Forest Report 2023** records a gain of **1,445 square kilometres in green cover** but only **156 sq km** of it is true forest. **इंडिया स्टेट ऑफ फॉरेस्ट रिपोर्ट 2023** के अनुसार हरित आवरण में **1,445 वर्ग किलोमीटर** की वृद्धि दर्ज की गई है, लेकिन इसमें से केवल **156 वर्ग किलोमीटर** ही वास्तविक वन है।
- The rest, **1,289 sq km**, is '**tree cover outside recorded forests.**' शेष **1,289 वर्ग किलोमीटर** क्षेत्र '**दर्ज वनों के बाहर वृक्षावरण**' है।
- Within the recorded forests, **dense canopy is thinning into scrub.** दर्ज वनों के भीतर घना वृक्षावरण धीरे-धीरे झाड़ीदार वनस्पति में परिवर्तित हो रहा है।
- Ergo, India is **planting more and foresting less.** अर्थात्, भारत अधिक पेड़ लगा रहा है, लेकिन कम वन सृजित कर रहा है।
- Few examples encapsulate this as much as the controversy over the **Aravallis.** इस स्थिति को अरावली पर्वतमाला से जुड़े विवाद से बेहतर ढंग से कुछ ही उदाहरण स्पष्ट कर सकते हैं।
- Arguably the country's most degraded range — its hillocks quarried away, its native growth overrun by the invasive '**vilayati kikar**' (**Prosopis juliflora**) — it is now to be rescued by a '**Green Wall**' of fresh planting. संभवतः देश की सबसे अधिक क्षतिग्रस्त पर्वत श्रृंखलाओं में से एक — जहां इसकी पहाड़ियों को खनन द्वारा काट दिया गया है और इसकी मूल वनस्पति पर आक्रामक '**विलायती कीकर**' (**Prosopis juliflora**) का प्रभुत्व हो गया है — अब इसे नए वृक्षारोपण की '**ग्रीन वॉल**' के माध्यम से पुनर्जीवित करने का प्रयास किया जा रहा है।
- But these arboreal conscripts cannot undo the damage from years of mining, halt encroachment, or summon back an ecosystem that took **millennia to form.** लेकिन ये वृक्षारोपण के लिए लगाए गए पेड़ वर्षों के **खनन से हुई क्षति को समाप्त नहीं कर सकते**, अतिक्रमण को रोक नहीं सकते और उस पारिस्थितिकी तंत्र को पुनः स्थापित नहीं कर सकते, जिसे बनने में **हजारों वर्ष** लगे।
- Restoration is not landscaping.** पुनर्स्थापन, भू-दृश्य सज्जा नहीं है।
- The CAG's instrument is accountancy: it can count **hectares and rupees**, not the worth of a living forest; and its assessment cannot always capture the practical challenges of implementing missions. CAG का उपकरण **लेखांकन** है: वह **हेक्टेयर और रुपये** की गणना कर सकता है, लेकिन जीवित वन के वास्तविक मूल्य को नहीं माप सकता; और उसका आकलन हमेशा मिशनों के क्रियान्वयन में आने वाली व्यावहारिक चुनौतियों को समुचित रूप से दर्ज नहीं कर सकता।
- However, its verdict still lands. फिर भी, उसका **निष्कर्ष महत्वपूर्ण प्रभाव डालता है।**
- A mission to restore India's forests has been allowed to wither while the state busies itself counting tree भारत के वनों को पुनर्स्थापित करने वाले एक मिशन को **मुरझाने के लिए छोड़ दिया गया है**, जबकि राज्य स्वयं को पेड़ों की गिनती में व्यस्त रखे हुए है।



The road to E20 is not without bumps

India's rapid transition to E20 fuel has raised concerns over mileage loss, mechanical wear, contamination risks and the lack of an unblended petrol option for millions of legacy vehicles; the debate underlines the need for clearer fuel labelling, quality controls and independent real-world studies

GS III: Environment

FULL CONTEXT

O.R.S. Rao

India's rapid transition to a nationwide E20 fuel regime (petrol blended with 20% anhydrous ethanol) has triggered a complex multidimensional debate at the intersection of macroeconomic energy policy, automotive engineering, supply-chain quality control, and consumer protection. While championed by the Government of India to reduce crude oil import dependency, save foreign exchange, and reduce carbon emissions, the rollout has ignited widespread friction regarding real-world mileage drops, mechanical vulnerabilities in legacy vehicles, chemical contamination risks, and the elimination of unblended petrol (E0) as a user choice at retail pumps.

The regulatory baseline

The Government of India notified on February 17, 2026, that, effective April 1, 2026, all States and Union Territories must sell petrol blended with up to 20% ethanol and a minimum Research Octane Number (RON) of 95. It replaces the earlier 2021 notification that permitted blending of up to 10% ethanol.

Earlier, the government mandated that all automobile manufacturers comply with the Bharat Stage 6 Phase 2 Real Driving Emissions (BS 6 Phase 2 RDE) norms starting in April 2023.

Vehicles manufactured to comply with Real Driving Emissions (RDE) norms were factory-engineered with ethanol-resistant fluorinated rubber (FKM/Viton), upgraded fuel pump seals, and recalibrated Powertrain Control Modules (PCMs).

The legacy fleet, built before April 2023, was factory-calibrated for E5 or E10 configurations, featuring traditional Nitrile Butadiene Rubber (NBR) and metallic fuel system components lacking chemical shielding against higher alcohol concentrations.

Consumer surveys highlight widespread friction: over 66% of pre-2023 vehicle owners report mileage loss exceeding 10%, and 55% cite higher maintenance frequency and component wear-out.

In a written reply in Rajya Sabha, the Minister of State for Petroleum and Natural Gas, Suresh Gopi, informed the House that the Ministry of Heavy Industries had not conducted any formal assessment to determine the share of India's vehicle fleet that is genuinely E20-compatible. India's active petrol-powered vehicle pool is estimated at roughly 310 million units and may be classified broadly as shown in **Table 1**, based on surveys and social media.

While about 70 million post-April 2023 vehicles possess certified factory-level E20 compatibility, the remaining 240 million legacy vehicles, most of which are two-wheelers, rely on fuel delivery sub-assemblies built for E5 or E10 parameters.

Engineering realities

Ethanol functions as a powerful polar solvent and natural detergent. In older legacy vehicles, steel fuel tanks inevitably develop microscopic oxidised scale, rust layers, and varnish residues from years of standard petrol usage. When E20 is introduced, the alcohol scours and dislodges these dormant rust particles, suspending them in the fuel stream. This suspended particulate sludge quickly clogs inline fuel filters, chokes fuel pump strainers, and abrades high-pressure fuel

A fleet in transition

Around 70 million newer vehicles are E-20-compatible, while 240 million legacy vehicles were built for lower ethanol blends

Vehicle category	BS 6 Phase 2 compliant (post-April 2023)	Non-compliant / legacy (pre-April 2023)	Total estimated fleet (approx)
Two-Wheelers (Motorcycles & scooters)	55 million to 60 million	200 million to 210 million	260 million
Four-Wheelers (Passenger cars & SUVs)	12 million to 15 million	35 million to 38 million	50 million
Combined fleet (approx.)	70 million	240 million	310 million
Combined fleet % share	23%	77%	100%



GETTY IMAGES

injector nozzles, causing erratic spray patterns and engine misfires.

Being strongly hygroscopic, Ethanol draws ambient moisture directly from the air. In humid environments or during prolonged parking, the absorbed water reaches its saturation point, causing the ethanol-water mixture to separate from the gasoline (phase separation) and settle at the bottom of the fuel tank. This stagnant, acidic water-alcohol layer directly attacks the bare metal base of legacy steel tanks, accelerating severe internal pitting and bottom-tank perforation.

In pre-2023 fuel circuits, conventional NBR rubber hoses, O-rings, and pump diaphragms absorb ethanol, leading to swelling, premature hardening, embrittlement, and fuel leaks.

Because ethanol contains roughly 30-35% less energy per unit volume than petrol, unadjusted ignition timing in older engines results in reduced thermal efficiency, mileage penalties, and localised carbon/soot accumulation on spark plugs and valves.

Major vulnerabilities

The physical risks of ethanol blending are not limited to vehicle fuel tanks; they represent a major operational challenge at the retail dealer storage level.

Most retail petrol pumps in India utilise Underground Steel Tanks (UST). During heavy monsoons, waterlogging, or due to aged manhole gaskets, surface run-off can seep into UST vent pipes and inspection pits. While pure petrol floats on top of water with minimal mixing (allowing water to be pumped out from the bottom), E20 absorbs water instantaneously. When moisture ingress in a dealer's UST exceeds the critical saturation threshold (typically around 0.5% water content), catastrophic phase separation occurs within thousands of litres of fuel. The separated, low-octane, highly corrosive water-ethanol layer is drawn by the submerged suction pumps directly into the dispensing nozzles, leading to catastrophic engine stalling and immediate fuel system failure in customer vehicles.

Beyond retail seepage, fuel quality is vulnerable to chemical contaminants introduced during distillation,

dehydration, and transit.

Originating from agrochemical residues in sugarcane/grain feedstocks or chemical reagents used during distillery processing, trace chlorides form hydrochloric acid during combustion, causing severe corrosion in high-pressure fuel injectors and cylinder walls.

If dehydration units (molecular sieves) falter at distilleries, or transport tankers fail to maintain hermetic seals, excessive water content enters the supply chain prior to retail delivery.

Scientific divergence

The controversy deepened following a report from the Engine Research Laboratory at IIT Kanpur, asserting that E20 fuel causes no notable engine damage and that efficiency drops are restricted to under 5%. The institute attributed minor mileage fluctuations primarily to driving behaviours, localized traffic congestion, and variable ambient conditions rather than fuel chemistry alone.

However, these institutional findings have met with profound scepticism from independent automotive experts and consumer communities. Forums like r/CarsIndia have actively documented structural discrepancies, noting that labelling legacy, E10-calibrated engines entirely safe for E20 overlooks material science limitations. Reports highlight that auxiliary peripheral systems experience catastrophic wear even if engine blocks remain intact. Real-world logs from independent mechanics highlight premature fuel pump and injector failures, which they attribute to ethanol's low lubricity and aggressive solvent properties.

Adding significant weight to the technical debate are the leaked internal industry communications reviewed by Reuters and subsequent industry clarifications. The data reviewed by Reuters revealed that top automakers harboured deep private anxieties regarding chemical contaminants in E20 fuel, referencing tests of over 250 fuel samples across 21 States.

While official standards specify a maximum ceiling of 3 ppm, industry samples logged readings from 6 to 570 ppm in Rajasthan, 1.4 to 420 ppm in

Delhi, and 10 to 357 ppm in Maharashtra. Automakers noted modern high-pressure injectors have a tolerance threshold near 1 ppm. Water content was found to reach up to 12,500 ppm in Uttar Pradesh and 13,000 ppm in Andhra Pradesh (against standard operating thresholds). Internal emails warned that organic chlorides could ruin engine components "within 200 km".

Following the leak, the Society of Indian Automobile Manufacturers (SIAM) issued detailed media clarifications on August 4 and August 13. SIAM clarified that the withdrawn document contained preliminary data collected by very few OEMs intended solely for internal discussion, which had not been authenticated or reviewed by the broader membership. SIAM announced plans to conduct a comprehensive, validated scientific study, in collaboration with members and technical experts to guide future policy submissions.

The Ministry of Petroleum and Natural Gas confirmed that State-run fuel networks adhere to stringent testing, treating contamination reports as localised anomalies.

Need for balancing

To bridge the gap between national macro-economic ambitions and ground-level realities, a pragmatic, multi-pronged corrective framework is required.

Fuel retail outlets must be mandated to maintain dual-dispensing infrastructure, reintroducing lower-blend or unblended fuel (E0/E10) as a "protection-grade" option. This restores informed consumer choice under the Consumer Protection Act for owners of legacy two-wheelers and older passenger cars.

Clear, standardised visual labelling must be enforced at every retail fuel dispenser indicating ethanol content. Furthermore, oil marketing companies (OMCs) should publish regular batch-level quality metrics regarding moisture and chloride limits to prevent infrastructure-led contamination.

Regulatory bodies should incentivise the development and certification of affordable, aftermarket retrofit kits (such as ethanol-resistant fuel lines and reinforced seals) for legacy vehicles. Simultaneously, structured service guidelines should be issued to help vehicle owners mitigate the risks of phase separation and corrosion.

Moving beyond controlled laboratory trials, an independent, transparent, and multi-year empirical study tracking real-world pre-2023 fleet performance across diverse geographic and climatic conditions must be commissioned to permanently settle the scientific debate.

Brazil, one of the global leaders in biofuels, also faced similar bumps, but they steered clear of them successfully using shock absorbers. India can learn from their biofuel journey.

The way forward

The E20 mandate requires a consumer-centric pivot. To protect the interests of consumers who own over 240 million legacy vehicles, the government may introduce dual-fuel dispensing, ensuring unblended petrol accessibility as a user choice at petrol outlets. Beyond laboratory trials, independent field audits, clear pump labelling, and subsidised retrofit support, particularly for two-wheelers, are essential. Balancing macroeconomic energy goals with consumer protection measures is critical to regaining public trust.

(Prof. O R S Rao is the Chancellor of the ICAI University, Sikkim. Views are personal)

THE GIST

India's petrol fleet is divided between newer E20-compatible vehicles and a much larger legacy fleet built for E5 or E10.

Ethanol's solvent and water-absorbing properties can affect older fuel systems, including tanks, hoses, pumps and injectors.

While IIT Kanpur reports limited efficiency losses and no notable engine damage, industry data and consumer reports point to concerns over fuel contamination and component failures.

18A8. The road to E20 is not without bumps

E20 की ओर बढ़ने का मार्ग बाधाओं से रहित नहीं है

- India's rapid transition to a nationwide **E20 fuel regime** (petrol blended with 20% anhydrous ethanol) has triggered a complex multidimensional debate at the intersection of **macroeconomic energy policy**, automotive engineering, supply-chain quality control, and consumer protection.

भारत में राष्ट्रव्यापी E20 ईंधन व्यवस्था (20% निर्जल एथेनॉल के साथ मिश्रित पेट्रोल) की तीव्र ओर बढ़ते

संक्रमण ने समष्टि-आर्थिक ऊर्जा नीति, ऑटोमोटिव इंजीनियरिंग, आपूर्ति-श्रृंखला गुणवत्ता नियंत्रण और उपभोक्ता संरक्षण के बीच एक जटिल बहुआयामी बहस को जन्म दिया है।

- While championed by the Government of India to reduce crude oil import dependency, save foreign exchange, and reduce carbon emissions, the rollout has ignited widespread friction regarding real-world mileage drops, mechanical vulnerabilities in legacy vehicles, chemical contamination risks, and the elimination of unblended petrol (E0) as a user choice at retail pumps.

यद्यपि भारत सरकार द्वारा इसे कच्चे तेल के आयात पर निर्भरता कम करने, विदेशी मुद्रा की बचत करने और कार्बन उत्सर्जन घटाने के उद्देश्य से बढ़ावा दिया गया है, लेकिन इसके कार्यान्वयन ने वास्तविक परिस्थितियों में माइलेज में कमी, पुराने वाहनों की यांत्रिक कमजोरियों, रासायनिक संदूषण के जोखिमों तथा खुदरा पेट्रोल पंपों पर उपयोगकर्ताओं के लिए बिना मिश्रण वाले पेट्रोल (E0) के विकल्प को समाप्त करने को लेकर व्यापक असंतोष पैदा किया है।

The regulatory baseline नियामकीय आधाररेखा

- The Government of India notified on February 17, 2026, that, effective April 1, 2026, all States and Union Territories must sell petrol blended with up to 20% ethanol and a minimum Research Octane Number (RON) of 95.

भारत सरकार ने 17 फरवरी 2026 को अधिसूचित किया कि 1 अप्रैल 2026 से प्रभावी रूप से सभी राज्यों और केंद्रशासित प्रदेशों को अधिकतम 20% एथेनॉल मिश्रित तथा न्यूनतम 95 रिसर्च ऑक्टेन नंबर (RON) वाला पेट्रोल बेचना अनिवार्य होगा।

- It replaces the earlier 2021 notification that permitted blending of up to 10% ethanol. यह पूर्ववर्ती 2021 की अधिसूचना का स्थान लेता है, जिसमें अधिकतम 10% एथेनॉल मिश्रण की अनुमति दी गई थी।
- Earlier, the government mandated that all automobile manufacturers comply with the Bharat Stage 6 Phase 2 Real Driving Emissions (BS 6 Phase 2 RDE) norms starting in April 2023. इससे पहले, सरकार ने सभी ऑटोमोबाइल निर्माताओं के लिए अप्रैल 2023 से भारत स्टेज 6 चरण 2 रियल ड्राइविंग एमिशन (BS 6 Phase 2 RDE) मानदंडों का अनुपालन अनिवार्य किया था।
- Vehicles manufactured to comply with Real Driving Emissions (RDE) norms were factory-engineered with ethanol-resistant fluorinated rubber (FKM/Viton), upgraded fuel pump seals, and recalibrated Powertrain Control Modules (PCMs). रियल ड्राइविंग एमिशन (RDE) मानदंडों के अनुपालन के लिए निर्मित वाहनों में कारखाना स्तर पर एथेनॉल-प्रतिरोधी फ्लोरोनैटेड रबर (FKM/Viton), उन्नत ईंधन पंप सील और पुनः-कैलिब्रेटेड पावरट्रेन कंट्रोल मॉड्यूल (PCMs) लगाए गए थे।

- The legacy fleet, built before April 2023, was factory-calibrated for E5 or E10 configurations, featuring traditional Nitrile Butadiene Rubber (NBR) and metallic fuel system components lacking chemical shielding against higher alcohol concentrations. अप्रैल 2023 से पहले निर्मित पुराने वाहनों के बेड़े को कारखाना स्तर पर E5 या E10 विन्यास के लिए कैलिब्रेट किया गया था, जिनमें पारंपरिक नाइट्राइल ब्यूटाडाइन रबर (NBR) और धातु के ईंधन प्रणाली घटक होते थे, जिनमें उच्च अल्कोहल सांद्रता से सुरक्षा प्रदान करने वाली रासायनिक परत नहीं होती थी।
- Consumer surveys highlight widespread friction: over 66% of pre-2023 vehicle owners report mileage loss exceeding 10%, and 55% cite higher maintenance frequency and component wear-out.

उपभोक्ता सर्वेक्षण व्यापक असंतोष को उजागर करते हैं: 2023 से पहले के वाहनों के 66% से अधिक मालिकों ने 10% से अधिक माइलेज में कमी की सूचना दी, जबकि 55% ने अधिक बार रखरखाव की आवश्यकता और घटकों के घिसने की शिकायत की।

- In a written reply in Rajya Sabha, the Minister of State for Petroleum and Natural Gas, Suresh Gopi, informed the House that the Ministry of Heavy Industries had not conducted any formal assessment to determine the share of India's vehicle fleet that is genuinely E20-compatible.
राज्यसभा में लिखित उत्तर में पेट्रोलियम और प्राकृतिक गैस राज्य मंत्री सुरेश गोपी ने सदन को बताया कि भारी उद्योग मंत्रालय ने भारत के वाहन बेड़े में वास्तव में E20-अनुकूल वाहनों की हिस्सेदारी निर्धारित करने के लिए कोई औपचारिक आकलन नहीं किया था।
- India's active petrol-powered vehicle pool is estimated at roughly 310 million units and may be classified broadly as shown in Table 1, based on surveys and social media.
भारत में सक्रिय पेट्रोल-चालित वाहनों की संख्या लगभग 310 मिलियन इकाई होने का अनुमान है और सर्वेक्षणों तथा सोशल मीडिया के आधार पर इसे मोटे तौर पर तालिका 1 में दर्शाए अनुसार वर्गीकृत किया जा सकता है।
- While about 70 million post-April 2023 vehicles possess certified factory-level E20 compatibility, the remaining 240 million legacy vehicles, most of which are two-wheelers, rely on fuel delivery sub-assemblies built for E5 or E10 parameters.
जहाँ अप्रैल 2023 के बाद निर्मित लगभग 70 मिलियन वाहनों में प्रमाणित कारखाना-स्तरीय E20 अनुकूलता है, वहीं शेष 240 मिलियन पुराने वाहन, जिनमें अधिकांश दोपहिया वाहन हैं, E5 या E10 मानकों के लिए निर्मित ईंधन आपूर्ति उप-प्रणालियों पर निर्भर हैं।

Engineering realities

इंजीनियरिंग की वास्तविकताएँ

- Ethanol functions as a powerful polar solvent and natural detergent.**
एथेनॉल एक शक्तिशाली ध्रुवीय विलायक और प्राकृतिक डिटर्जेंट के रूप में कार्य करता है।
- In older legacy vehicles, steel fuel tanks inevitably develop microscopic oxidised scale, rust layers, and varnish residues from years of standard petrol usage.**
पुराने वाहनों में, वर्षों तक सामान्य पेट्रोल के उपयोग के कारण स्टील के ईंधन टैंकों में अनिवार्य रूप से सूक्ष्म ऑक्सीकृत परत, जंग की परतें और वार्निश के अवशेष विकसित हो जाते हैं।
- When E20 is introduced, the alcohol scours and dislodges these dormant rust particles, suspending them in the fuel stream.**
जब E20 का उपयोग शुरू किया जाता है, तो अल्कोहल इन निष्क्रिय जंग कणों को रगड़कर हटाता है और उन्हें ईंधन प्रवाह में निलंबित कर देता है।
- This suspended particulate sludge quickly clogs inline fuel filters, chokes fuel pump strainers, and abrades high-pressure fuel injector nozzles, causing erratic spray patterns and engine misfires.**
यह निलंबित कणीय अवसाद इनलाइन ईंधन फिल्टरों को तेजी से जाम करता है, ईंधन पंप स्ट्रेनरों को अवरुद्ध करता है और उच्च-दाब ईंधन इंजेक्टर नोजलों को घिसता है, जिससे अनियमित स्प्रे पैटर्न और इंजन मिसफायर होने लगते हैं।
- Being strongly hygroscopic, Ethanol draws ambient moisture directly from the air.**
अत्यधिक हाइग्रोस्कोपिक होने के कारण एथेनॉल वातावरण की नमी को सीधे हवा से अवशोषित करता है।
- In humid environments or during prolonged parking, the absorbed water reaches its saturation point, causing the ethanol-water mixture to separate from the gasoline (phase separation) and settle at the bottom of the fuel tank.
आर्द्र वातावरण में या लंबे समय तक वाहन खड़े रहने के दौरान, अवशोषित पानी अपनी संतृप्ति सीमा तक पहुँच जाता है, जिससे एथेनॉल-पानी का मिश्रण पेट्रोल से अलग (फेज सेपरेशन) होकर ईंधन टैंक के तल में बैठ जाता है।
- This stagnant, acidic water-alcohol layer directly attacks the bare metal base of legacy steel tanks, accelerating severe internal pitting and bottom-tank perforation.

यह स्थिर, अम्लीय जल-अल्कोहल परत पुराने स्टील टैंकों के खुले धातु वाले आधार पर सीधे हमला करती है, जिससे गंभीर आंतरिक पिंटिंग और टैंक के निचले हिस्से में छिद्रण की प्रक्रिया तेज हो जाती है।

- In pre-2023 fuel circuits, conventional NBR rubber hoses, O-rings, and pump diaphragms absorb ethanol, leading to swelling, premature hardening, embrittlement, and fuel leaks. **2023 से पहले की ईंधन प्रणालियों में पारंपरिक NBR रबर होज़, O-रिंग और पंप डायफ्राम एथेनॉल को अवशोषित करते हैं, जिससे फूलना, समय से पहले कठोर होना, भंगुरता और ईंधन रिसाव जैसी समस्याएँ उत्पन्न होती हैं।**
- Because ethanol contains roughly 30-35% less energy per unit volume than petrol, unadjusted ignition timing in older engines results in reduced thermal efficiency, mileage penalties, and localised carbon/soot accumulation on spark plugs and valves. **क्योंकि एथेनॉल में प्रति इकाई आयतन पेट्रोल की तुलना में लगभग 30-35% कम ऊर्जा होती है, इसलिए पुराने इंजनों में समायोजित न किया गया इग्निशन टाइमिंग तापीय दक्षता में कमी, माइलेज में गिरावट तथा स्पार्क प्लग और वाल्व पर स्थानीयकृत कार्बन/कालिख के जमाव का कारण बनता है।**

Major vulnerabilities

प्रमुख कमजोरियाँ

- The physical risks of ethanol blending are not limited to vehicle fuel tanks; they represent a major operational challenge at the retail dealer storage level. **एथेनॉल मिश्रण के भौतिक जोखिम केवल वाहन के ईंधन टैंकों तक सीमित नहीं हैं; वे खुदरा डीलरों के भंडारण स्तर पर भी एक बड़ी परिचालन चुनौती प्रस्तुत करते हैं।**
- Most retail petrol pumps in India utilise Underground Steel Tanks (UST). **भारत के अधिकांश खुदरा पेट्रोल पंप भूमिगत स्टील टैंकों (UST) का उपयोग करते हैं।**
- During heavy monsoons, waterlogging, or due to aged manhole gaskets, surface run-off can seep into UST vent pipes and inspection pits. **भारी मानसून, जलभराव या पुराने मैनहोल गैस्केट के कारण सतही बहाव का पानी UST की वेंट पाइपों और निरीक्षण गड्ढों में रिस सकता है।**
- While pure petrol floats on top of water with minimal mixing (allowing water to be pumped out from the bottom), E20 absorbs water instantaneously. **जहाँ शुद्ध पेट्रोल पानी के ऊपर तैरता है और उसका मिश्रण न्यूनतम होता है (जिससे पानी को नीचे से पंप करके बाहर निकाला जा सकता है), वहीं E20 पानी को तुरंत अवशोषित कर लेता है।**
- When moisture ingress in a dealer's UST exceeds the critical saturation threshold (typically around 0.5% water content), catastrophic phase separation occurs within thousands of litres of fuel. **जब किसी डीलर के UST में नमी का प्रवेश महत्वपूर्ण संतृप्ति सीमा (आमतौर पर लगभग 0.5% जल-सामग्री) से अधिक हो जाता है, तो हजारों लीटर ईंधन में गंभीर फेज सेपरेशन हो जाता है।**
- The separated, low-octane, highly corrosive water-ethanol layer is drawn by the submerged suction pumps directly into the dispensing nozzles, leading to catastrophic engine stalling and immediate fuel system failure in customer vehicles. **अलग हुई कम-ऑक्टेन और अत्यधिक संक्षारक जल-एथेनॉल परत को डूबे हुए सक्शन पंप सीधे डिस्पेंसिंग नोजल में खींच लेते हैं, जिससे ग्राहकों के वाहनों में गंभीर इंजन बंद होने और तत्काल ईंधन प्रणाली विफलता की स्थिति उत्पन्न हो सकती है।**
- Beyond retail seepage, fuel quality is vulnerable to chemical contaminants introduced during distillation, dehydration, and transit. **खुदरा स्तर पर रिसाव के अलावा, ईंधन की गुणवत्ता आसवन, निर्जलीकरण और परिवहन के दौरान प्रवेश करने वाले रासायनिक संदूषकों के प्रति भी संवेदनशील होती है।**
- Originating from agrochemical residues in sugarcane/grain feedstocks or chemical reagents used during distillery processing, trace chlorides form hydrochloric acid during combustion, causing severe corrosion in high-pressure fuel injectors and cylinder walls.



गन्ने/अनाज के फीडस्टॉक में मौजूद कृषि-रसायन अवशेषों या डिस्टिलरी प्रसंस्करण के दौरान उपयोग किए जाने वाले रासायनिक अभिकर्मकों से उत्पन्न सूक्ष्म मात्रा में मौजूद क्लोराइड, दहन के दौरान हाइड्रोक्लोरिक एसिड का निर्माण करते हैं, जिससे उच्च-दाब ईंधन इंजेक्टरों और सिलेंडर की दीवारों में गंभीर संक्षारण होता है।

- If dehydration units (molecular sieves) falter at distilleries, or transport tankers fail to maintain hermetic seals, excessive water content enters the supply chain prior to retail delivery. यदि डिस्टिलरियों में निर्जलीकरण इकाइयाँ (मॉलिक्यूलर सीव्स) ठीक से काम नहीं करतीं या परिवहन टैंकर हर्मेटिक सील बनाए रखने में विफल रहते हैं, तो खुदरा आपूर्ति से पहले ही अत्यधिक जल-सामग्री आपूर्ति श्रृंखला में प्रवेश कर जाती है।

Scientific divergence

वैज्ञानिक मतभिन्नता

- The controversy deepened following a report from the **Engine Research Laboratory at IIT Kanpur**, asserting that **E20 fuel causes no notable engine damage** and that efficiency drops are restricted to under 5%.
IIT कानपुर की इंजन अनुसंधान प्रयोगशाला की एक रिपोर्ट के बाद विवाद और गहरा गया, जिसमें कहा गया कि E20 ईंधन से इंजन को कोई उल्लेखनीय क्षति नहीं होती और दक्षता में गिरावट 5% से कम तक सीमित रहती है।
- The institute attributed minor mileage fluctuations primarily to **driving behaviours, localized traffic congestion, and variable ambient conditions** rather than fuel chemistry alone. संस्थान ने माइलेज में होने वाले मामूली उतार-चढ़ाव का मुख्य कारण केवल ईंधन की रासायनिक संरचना को न मानकर ड्राइविंग व्यवहार, स्थानीय यातायात जाम और परिवर्तनीय परिवेशीय परिस्थितियों को बताया।
- However, these institutional findings have met with profound scepticism from **independent automotive experts and consumer communities**. हालांकि, इन संस्थागत निष्कर्षों को स्वतंत्र ऑटोमोबाइल विशेषज्ञों और उपभोक्ता समुदायों की ओर से गहरे संदेह का सामना करना पड़ा है।
- Forums like r/CarsIndia have actively documented structural discrepancies, noting that labelling **legacy, E10-calibrated engines entirely safe for E20** overlooks material science limitations. r/CarsIndia जैसे मंचों ने संरचनात्मक विसंगतियों का सक्रिय रूप से दस्तावेजीकरण किया है और कहा है कि पुराने, E10 के अनुरूप कैलिब्रेट किए गए इंजनों को E20 के लिए पूरी तरह सुरक्षित बताना पदार्थ विज्ञान संबंधी सीमाओं की अनदेखी करता है।
- Reports highlight that **auxiliary peripheral systems** experience catastrophic wear even if engine blocks remain intact. रिपोर्टों में इस बात पर प्रकाश डाला गया है कि इंजन ब्लॉक सुरक्षित रहने के बावजूद सहायक परिधीय प्रणालियों में गंभीर क्षति हो सकती है।
- Real-world logs from independent mechanics highlight premature **fuel pump and injector failures**, which they attribute to ethanol's low lubricity and aggressive solvent properties. स्वतंत्र मैकेनिकों के वास्तविक परिस्थितियों में दर्ज किए गए रिकॉर्ड समय से पहले होने वाली ईंधन पंप और इंजेक्टर की खराबियों को उजागर करते हैं, जिन्हें वे इथेनॉल की कम स्नेहकता और आक्रामक विलायक गुणों के कारण होने वाला मानते हैं।
- Adding significant weight to the technical debate are the **leaked internal industry communications** reviewed by Reuters and subsequent industry clarifications. तकनीकी बहस को महत्वपूर्ण आधार प्रदान करने वाले साक्ष्यों में लीक हुए आंतरिक उद्योग संचार, जिनकी Reuters ने समीक्षा की थी, और उसके बाद उद्योग द्वारा जारी किए गए स्पष्टीकरण शामिल हैं।
- The data reviewed by Reuters revealed that top automakers harboured deep private anxieties regarding **chemical contaminants in E20 fuel**, referencing tests of over 250 fuel samples across 21 States.



Reuters द्वारा समीक्षा किए गए आंकड़ों से पता चला कि प्रमुख वाहन निर्माताओं को **E20 ईंधन में रासायनिक संदूषकों** को लेकर निजी तौर पर गहरी चिंताएं थीं; इसमें 21 राज्यों में 250 से अधिक ईंधन नमूनों के परीक्षण का उल्लेख किया गया था।

- While official standards specify a maximum ceiling of **3 ppm**, industry samples logged readings from 6 to 570 ppm in Rajasthan, 1.4 to 420 ppm in Delhi, and 10 to 357 ppm in Maharashtra.
जहां आधिकारिक मानकों में अधिकतम सीमा **3 ppm** निर्धारित की गई है, वहीं उद्योग के नमूनों में राजस्थान में 6 से 570 ppm, दिल्ली में 1.4 से 420 ppm और महाराष्ट्र में 10 से 357 ppm तक की मात्रा दर्ज की गई।
- Automakers noted modern **high-pressure injectors** have a tolerance threshold near 1 ppm. वाहन निर्माताओं ने बताया कि आधुनिक **उच्च-दाब इंजेक्टरों** की सहनशीलता सीमा लगभग 1 ppm है।
- Water content was found to reach up to **12,500 ppm in Uttar Pradesh and 13,000 ppm in Andhra Pradesh** (against standard operating thresholds).
जल की मात्रा **उत्तर प्रदेश में 12,500 ppm और आंध्र प्रदेश में 13,000 ppm** तक पाई गई (मानक परिचालन सीमाओं के मुकाबले)।
- Internal emails warned that **organic chlorides** could ruin engine components “within 200 km”.
आंतरिक ईमेल में चेतावनी दी गई कि **कार्बनिक क्लोराइड** “200 किलोमीटर के भीतर” इंजन के पुर्जों को नष्ट कर सकते हैं।
- Following the leak, the **Society of Indian Automobile Manufacturers (SIAM)** issued detailed media clarifications on August 4 and August 13.
लीक के बाद, **सोसाइटी ऑफ इंडियन ऑटोमोबाइल मैनुफैक्चरर्स (SIAM)** ने 4 अगस्त और 13 अगस्त को मीडिया के लिए विस्तृत स्पष्टीकरण जारी किए।
- SIAM clarified that the withdrawn document contained **preliminary data** collected by very few OEMs intended solely for internal discussion, which had not been authenticated or reviewed by the broader membership.
SIAM ने स्पष्ट किया कि वापस लिया गया दस्तावेज बहुत कम OEMs द्वारा एकत्र किए गए **प्रारंभिक आंकड़ों** से संबंधित था, जो केवल आंतरिक चर्चा के लिए थे और जिन्हें व्यापक सदस्यता द्वारा न तो प्रमाणित किया गया था और न ही उनकी समीक्षा की गई थी।
- SIAM announced plans to conduct a **comprehensive, validated scientific study**, in collaboration with members and technical experts to guide future policy submissions.
SIAM ने भविष्य की नीतिगत प्रस्तुतियों के मार्गदर्शन के लिए सदस्यों और तकनीकी विशेषज्ञों के सहयोग से एक **व्यापक और प्रमाणित वैज्ञानिक अध्ययन** करने की योजना की घोषणा की।
- The **Ministry of Petroleum and Natural Gas** confirmed that State-run fuel networks adhere to stringent testing, treating contamination reports as localised anomalies.
पेट्रोलियम और प्राकृतिक गैस मंत्रालय ने पुष्टि की कि सरकारी ईंधन नेटवर्क कठोर परीक्षण प्रक्रियाओं का पालन करते हैं और संदूषण संबंधी रिपोर्टों को **स्थानीय विसंगतियों** के रूप में देखते हैं।

Need for balancing संतुलन की आवश्यकता

- To bridge the gap between **national macro-economic ambitions and ground-level realities**, a pragmatic, multi-pronged corrective framework is required.
राष्ट्रीय व्यापक आर्थिक महत्वाकांक्षाओं और जमीनी वास्तविकताओं के बीच की खाई को पाटने के लिए एक व्यावहारिक और बहुआयामी सुधारात्मक ढांचे की आवश्यकता है।
- Fuel retail outlets must be mandated to maintain **dual-dispensing infrastructure**, reintroducing lower-blend or unblended fuel (E0/E10) as a “protection-grade” option.
ईंधन खुदरा केंद्रों के लिए **दोहरे-वितरण अवसंरचना** को बनाए रखना अनिवार्य किया जाना चाहिए, ताकि कम

मिश्रण वाला या बिना मिश्रण वाला ईंधन (E0/E10) एक “सुरक्षा-ग्रेड” विकल्प के रूप में फिर से उपलब्ध कराया जा सके।

- This restores informed consumer choice under the **Consumer Protection Act** for owners of legacy two-wheelers and older passenger cars.
इससे पुराने दोपहिया वाहनों और पुराने यात्री वाहनों के मालिकों के लिए **उपभोक्ता संरक्षण अधिनियम** के तहत सूचित उपभोक्ता विकल्प बहाल होगा।
- Clear, standardised visual labelling must be enforced at every retail fuel dispenser indicating **ethanol content**.
प्रत्येक खुदरा ईंधन डिस्पेंसर पर **इथेनॉल की मात्रा** दर्शाने वाला स्पष्ट और मानकीकृत दृश्य लेबल अनिवार्य किया जाना चाहिए।
- Furthermore, **oil marketing companies (OMCs)** should publish regular batch-level quality metrics regarding moisture and chloride limits to prevent infrastructure-led contamination.
इसके अतिरिक्त, **तेल विपणन कंपनियाँ (OMCs)** को अवसंरचना-जनित संदूषण को रोकने के लिए नमी और क्लोराइड की सीमाओं से संबंधित नियमित **बैच-स्तरीय गुणवत्ता आंकड़े** प्रकाशित करने चाहिए।
- Regulatory bodies should incentivise the development and certification of affordable, **aftermarket retrofit kits** (such as ethanol-resistant fuel lines and reinforced seals) for legacy vehicles.
नियामक निकायों को पुराने वाहनों के लिए किफायती **आफ्टरमार्केट रेट्रोफिट किट** (जैसे इथेनॉल-प्रतिरोधी ईंधन लाइन और मजबूत सील) के विकास और प्रमाणन को प्रोत्साहित करना चाहिए।
- Simultaneously, structured service guidelines should be issued to help vehicle owners mitigate the risks of **phase separation and corrosion**.
साथ ही, वाहन मालिकों को **चरण पृथक्करण और क्षरण** के जोखिम को कम करने में सहायता देने के लिए संरचित सेवा दिशानिर्देश जारी किए जाने चाहिए।
- Moving beyond controlled laboratory trials, an **independent, transparent, and multi-year empirical study** tracking real-world pre-2023 fleet performance across diverse geographic and climatic conditions must be commissioned to permanently settle the scientific debate.
नियंत्रित प्रयोगशाला परीक्षणों से आगे बढ़ते हुए, विभिन्न भौगोलिक और जलवायु परिस्थितियों में 2023 से पहले के वाहनों के बेड़े के वास्तविक प्रदर्शन पर नजर रखने वाला एक **स्वतंत्र, पारदर्शी और बहुवर्षीय अनुभवजन्य अध्ययन** कराया जाना चाहिए, ताकि वैज्ञानिक बहस का स्थायी समाधान किया जा सके।
- Brazil, one of the global leaders in biofuels, also faced similar bumps, but they steered clear of them successfully using shock absorbers.
जैव ईंधन के क्षेत्र में वैश्विक अग्रणी देशों में से एक **ब्राजील** को भी इसी प्रकार की बाधाओं का सामना करना पड़ा, लेकिन उसने **शॉक एब्जॉर्बर** का सफलतापूर्वक उपयोग करते हुए इनसे बचाव किया।
- India can learn from their **biofuel journey**.
भारत उनके **जैव ईंधन संबंधी अनुभव** से सीख सकता है।

The way forward

आगे की राह

- The **E20 mandate** requires a consumer-centric pivot.
E20 अनिवार्यता के लिए उपभोक्ता-केंद्रित दृष्टिकोण अपनाने की आवश्यकता है।
- To protect the interests of consumers who own over **240 million legacy vehicles**, the government may introduce dual-fuel dispensing, ensuring unblended petrol accessibility as a user choice at petrol outlets.
24 करोड़ से अधिक पुराने वाहनों के मालिक उपभोक्ताओं के हितों की रक्षा के लिए सरकार दोहरे ईंधन वितरण की व्यवस्था शुरू कर सकती है, जिससे पेट्रोल पंपों पर बिना मिश्रण वाला पेट्रोल उपयोगकर्ता की पसंद के रूप में उपलब्ध हो सके।
- Beyond laboratory trials, **independent field audits, clear pump labelling, and subsidised retrofit support**, particularly for two-wheelers, are essential.

प्रयोगशाला परीक्षणों से आगे स्वतंत्र क्षेत्रीय ऑडिट, स्पष्ट पंप लेबलिंग और सब्सिडी-युक्त रेट्रोफिट सहायता, विशेष रूप से दोपहिया वाहनों के लिए, आवश्यक हैं।

- Balancing macroeconomic energy goals with consumer protection measures is critical to regaining public trust.

व्यापक आर्थिक ऊर्जा लक्ष्यों और उपभोक्ता संरक्षण उपायों के बीच संतुलन सार्वजनिक विश्वास पुनः प्राप्त करने के लिए अत्यंत महत्वपूर्ण है।

Research Octane Number (RON)

- Research Octane Number (RON) is a measure of a petrol's resistance to abnormal combustion called engine knocking.
- In simple terms, it tells us how well petrol can withstand compression inside a petrol engine without igniting prematurely or burning abnormally.

What does RON 95 mean?

- RON 95 means that the petrol has an anti-knock performance equivalent, under the standard RON test, to a reference fuel containing 95% iso-octane and 5% n-heptane.
- These reference substances are assigned:
- Iso-octane = Octane Number 100 — highly resistant to knocking.
- n-Heptane = Octane Number 0 — knocks relatively easily.
- Therefore, 95 RON does not mean that petrol contains 95% octane. It is an anti-knock performance rating.

Why is a higher RON useful?

- Inside a petrol engine, the air-fuel mixture is compressed and then ignited by the spark plug. Ideally, combustion should occur in a controlled manner.
- If part of the mixture auto-ignites abnormally, pressure waves are produced, creating the characteristic metallic “knocking” or “pinging” sound.
- Higher-octane petrol is more resistant to such abnormal combustion.
- For example:
 - RON 91 → lower knock resistance
 - RON 95 → higher knock resistance
 - RON 97/100 → still higher knock resistance

GS Paper III: Disaster Management		18 August 2026
TOPICS COVERED		
18A8	7 killed, over a dozen injured in stampede at temple in Bihar बिहार के मंदिर में भगदड़ से 7 लोगों की मौत, एक दर्जन से अधिक घायल	



7 killed, over a dozen injured in stampede at temple in Bihar

GS III: Disaster Management
PATNA

At least seven devotees, all of them women, were killed and over a dozen injured in a stampede at the Ashok Dham temple in Lakhisarai district of Bihar on Monday.

"The incident happened at 6.40 a.m. due to a heavy rush of devotees. A barricade broke down, which triggered the sudden stampede," Lakhisarai District Magistrate Shailendra Kumar said.

Eyewitnesses said two trains full of devotees reached the Lakhisarai railway station at the same time on Monday, considered an auspicious day in the Hindu month of Shravan. The devotees, mostly women, rushed towards the temple located close to the railway station to offer water from the Ganga to the deity, Lord Shiva. In the surge, a bamboo barricade fell, while an electric pole snapped at the site. This triggered a rumour of power leakage, causing panic and resulting in the stampede.

Ex gratia announced

Bihar Chief Minister Samrat Choudhary expressed grief over the incident and announced an *ex gratia* of ₹4 lakh to the kin of the deceased. The amount was later handed over to the families. "Necessary instructions have been issued to the administration to ensure proper and prompt medical care for the injured," he wrote on X.

President Droupadi Murmu and Prime Minister Narendra Modi expressed

Hotel blaze in Bengal temple town kills eight

TARAPITH

Eight people were killed on Monday morning after a fire broke out from a suspected short circuit at a hotel in the temple town of Tarapith in West Bengal's Birbhum district. The temple town was handling a heavy footfall during the month of Shravan. » PAGE 4

their sorrow over the incident.

Tejashwi Yadav, Leader of the Opposition in the Bihar Assembly, accused the State's NDA government of failing to provide adequate security arrangements to manage the crowd during the festival.

Munger Divisional Commissioner Prem Singh Meena and Deputy Inspector General of Police Rakesh Kumar visited the Lakhisarai Sadar (Town) government hospital to meet the injured. "An inquiry will be conducted and the cause will come out," Mr. Meena told presspersons. Chairman of Bihar State Board of Religious Trust, Ranbir Nandan, said the board too will launch a probe.

The deceased were identified as Manmala Devi, 44; Rinku Devi, 50; Hemlata Devi, 55; Lalita Devi, 50; Savita Kumari, 35; Saroj Devi, 65; and Savitri Devi, 49. Among those injured, three are in critical condition and have been referred to Patna for better medical assistance.

Meanwhile, devotees kept thronging the temple and offering prayers.

18A8. 7 killed, over a dozen injured in stampede at temple in Bihar

बिहार के मंदिर में भगदड़ से 7 लोगों की मौत, एक दर्जन से अधिक घायल

- At least seven devotees, all of them women, were killed and over a dozen injured in a stampede at the **Ashok Dham temple in Lakhisarai district of Bihar** on Monday.

सोमवार को बिहार के लखीसराय जिले के अशोक धाम मंदिर में भगदड़ में कम-से-कम सात श्रद्धालुओं, सभी महिलाओं, की मौत हो गई और एक दर्जन से अधिक लोग घायल हो गए।

- Eyewitnesses said two trains full of devotees reached the Lakhisarai railway station at the same time on Monday, considered an **auspicious day in the Hindu month of Shravan**.

प्रत्यक्षदर्शियों ने बताया कि सोमवार को श्रद्धालुओं से भरी दो ट्रेनें एक ही समय पर लखीसराय रेलवे स्टेशन पहुँचीं, हिंदू माह श्रावण में सोमवार को एक शुभ दिन माना जाता है।

- The devotees, mostly women, rushed towards the temple located close to the railway station to offer water from the Ganga to the deity, Lord Shiva.

श्रद्धालु, जिनमें अधिकांश महिलाएँ थीं, रेलवे स्टेशन के पास स्थित मंदिर की ओर भगवान शिव को गंगा का जल अर्पित करने के लिए दौड़ पड़े।