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Museum moments



Timeless art: Students admiring the photo exhibition in Hyderabad, Telangana, on heritage structures spanning ancient temples, medieval forts, and Nizam-era palaces on the occasion of International Museum Day at the State Museum in the city on Monday. NAGARA GOPAL

Timeless art: Students admiring the photo exhibition in Hyderabad, Telangana, on heritage structures spanning ancient temples, medieval forts, and Nizam-era palaces on the occasion of **International Museum Day (18 May)** at the State Museum in the city on Monday.

Questions and Answers to the previous day's daily quiz: 1.

Which is the world's largest museum and research complex? **Ans: The Smithsonian Institution in Washington, DC**

2. When was Indian Museum in Kolkata established and by which body? **Ans: 1814 by the Asiatic Society of Bengal**

3. Name the largest museum in the world dedicated to a single civilisation. **Ans: Grand Egyptian Museum on the Giza Plateau**

4. In which Indian State capitals can one marvel at the Didarganj Yakshi and reliefs and sculptures? **Ans: Patna and Chennai**

5. One of the weirdest in the world was established in 1992 by Dr. Bindeshwar Pathak. What is the theme? **Ans: Sulabh International**

19M. QUIZ: World's Largest Museum and Research Complex

- The **Smithsonian Institution, established in 1846 in Washington, D.C., is the world's largest museum and research complex.** It operates more than 20 museums, libraries, research centres, and the National Zoo.

Indian Museum, Kolkata

- The **Indian Museum was established in 1814 by the Asiatic Society.**
- Explanation**
- The **Indian Museum, established in 1814, is the oldest and one of the largest museums in India.** It was founded by the Asiatic Society under the guidance of Danish botanist Nathaniel Wallich

Largest Museum Dedicated to a Single Civilisation

- The **largest museum dedicated to a single civilisation is the Grand Egyptian Museum.**
- Explanation**
- The **Grand Egyptian Museum is located near the Giza Pyramids in Egypt and is dedicated entirely to ancient Egyptian civilisation.** It is considered the world's largest archaeological museum devoted to a single civilisation.

- The **museum houses more than 100,000 artefacts, including the complete treasures of Pharaoh Tutankhamun.** Developed with modern conservation and exhibition technologies, it highlights Egypt's ancient history, culture, religion, and royal heritage while promoting archaeological research, tourism, and global cultural understanding.

Didarganj Yakshi and Sculptural Heritage

- In which Indian State capitals can one marvel at the **Didarganj Yakshi and reliefs and sculptures?**
- The famous **Didarganj Yakshi sculpture is displayed in the Bihar Museum in Patna.** It is a polished sandstone sculpture belonging to the Mauryan or early post-Mauryan period and is known for its artistic excellence.
- Chennai is renowned for the rich collection of temple reliefs and South Indian sculptures preserved in the Government Museum Chennai.**

Sulabh International Museum of Toilets



- One of the weirdest museums in the world was established in 1992 by Dr. Bindeshwar Pathak. What is the theme?
- **Answer**
- The theme is the **Sulabh International Museum of Toilets**.
- **Explanation**
- The **Sulabh International Museum of Toilets** was established in 1992 by social reformer **Bindeshwar Pathak** in **New Delhi**. The museum presents the historical evolution of sanitation systems and toilets from ancient to modern times.

PCS: GS Paper VI

Waiting for the storm

Despite the predictability of weather events, India remains vulnerable

Late last week, a pacy pre-monsoon weather system barrelled into Uttar Pradesh, bringing a compound of thunderstorms, dust storms, lightning, heavy rain, and thundersqualls to multiple districts at once. By May 14, the toll was 111 deaths and 72 injuries across 26 districts, rendering the storms among the deadliest weather-related disasters in Uttar Pradesh in recent times. The State has experienced similar weather events in May-June since 2018, if not before. The distinction this year seems to have been the intensity, with winds capable of uprooting trees. The storm appears to have been driven by a pre-monsoon convective system, with a fresh western disturbance over the northwest further destabilising conditions. The India Meteorological Department (IMD) had issued thunderstorm and lightning alerts before the event and the Uttar Pradesh government reportedly issued more than 34 crore red and orange alert messages via the SACHET portal. However, it is not clear whether these warnings were sufficiently geographically precise or reached their intended beneficiaries in time – and in fact if they simply warned of impending adverse weather or carried instructions for people to act on.

Indeed, advance preparation is pertinent for two reasons. The State is sometimes in a convergence zone as the hot, dry, 'loo' winds from the Thar move east over the plains while moisture-laden winds from the Bay of Bengal push in from the southeast. Second, over the undulating Vindhya hills in Mirzapur and Sonbhadra, the convergent air masses may lift rapidly, producing thunderstorms over specific parts of the State. Effectively, while no authority could have predicted the storms' local intensity, the underlying risk was hardly unforeseeable. Their recurrence at this time of the year and place should raise sharp questions about why so many deaths still occurred. Part of the answer is surely the proximate causes of death and damage, including housing and public infrastructure. Uttar Pradesh has a large number of structurally vulnerable rural and peri-urban households. If a storm strikes at dusk or later, people are often indoors or resting under fragile roofs. In addition, people are also vulnerable to improperly placed or poorly installed hoardings, electrical wiring, and public signage. The State was aware of the kinds of damage such storms could cause as it announced separate relief packages depending on the type of farming, crop, and loss. The underlying risk was foreseeable, yet the vulnerability was high.

इसी प्रकार की मौसमीय घटनाओं का अनुभव करता रहा है।

- The storm appears to have been driven by a **pre-monsoon convective system**, with a **fresh western disturbance** over the northwest further destabilising conditions.

Museo Nacional del Prado

- The answer is the Museo Nacional del Prado in Madrid.
- **Explanation**
- The **Museo Nacional del Prado**, established in 1819, is among the world's most visited art museums.
- The term "Prado" means "meadow" in Spanish, referring to the historic area where the museum stands in Madrid.
- **Painting Opposite the Mona Lisa**
- Name the **painting that is located directly opposite the Mona Lisa**.
- The **painting is The Wedding Feast at Cana by Paolo Veronese**.
- **Explanation**
- The **Wedding Feast at Cana** is displayed directly opposite **Leonardo da Vinci's Mona Lisa** in the **Louvre Museum**. Painted in 1563 by Italian Renaissance artist **Paolo Veronese**, it is one of the largest paintings in the Louvre.

19M. Waiting for the storm

तूफान की प्रतीक्षा

- Late last week, a pacy pre-monsoon weather system barrelled into **Uttar Pradesh**, bringing a compound of **thunderstorms, dust storms, lightning, heavy rain, and thundersqualls** to multiple districts at once.

पिछले सप्ताह के अंत में, एक तीव्र गति वाली प्री-मानसून मौसम प्रणाली **उत्तर प्रदेश** में प्रवेश कर गई, जिसने एक साथ अनेक जिलों में **आंधी-तूफान, धूल भरी आँधी, बिजली गिरने, भारी वर्षा तथा तेज़ गर्जनात्मक तूफानों** का मिश्रित प्रभाव उत्पन्न किया।

- **By May 14, the toll was 111 deaths and 72 injuries across 26 districts**, rendering the storms among the **deadliest weather-related disasters in Uttar Pradesh** in recent times.

14 मई तक, 26 जिलों में 111 लोगों की मृत्यु तथा 72 लोगों के घायल होने की सूचना प्राप्त हुई, जिससे ये तूफान हाल के समय में **उत्तर प्रदेश** की सबसे घातक मौसम संबंधी आपदाओं में शामिल हो गए।

- The **State has experienced similar weather events in May-June since 2018**, if not before.

यदि उससे पहले नहीं, तो कम-से-कम वर्ष 2018 से राज्य मई-जून के दौरान



यह तूफान एक प्री-मानसून संवहन प्रणाली से प्रेरित प्रतीत होता है, जबकि उत्तर-पश्चिम के ऊपर सक्रिय एक नए पश्चिमी विक्षोभ ने परिस्थितियों को और अधिक अस्थिर बना दिया।

- The **India Meteorological Department (IMD)** had issued thunderstorm and lightning alerts before the event and the **Uttar Pradesh** government reportedly issued more than 34 crore red and orange alert messages via the **SACHET** portal.

भारतीय मौसम विज्ञान विभाग (आईएमडी) ने घटना से पूर्व आंधी-तूफान और बिजली गिरने के संबंध में चेतावनियाँ जारी की थीं तथा उत्तर प्रदेश सरकार ने कथित रूप से सचेत पोर्टल के माध्यम से 34 करोड़ से अधिक रेड और ऑरेंज अलर्ट संदेश जारी किए थे।

- However, it is not clear whether these warnings were sufficiently geographically precise or reached their intended beneficiaries in time — and in fact if they simply warned of impending adverse weather or carried instructions for people to act on.

हालाँकि, यह स्पष्ट नहीं है कि ये चेतावनियाँ भौगोलिक दृष्टि से पर्याप्त रूप से सटीक थीं अथवा समय पर अपने लक्षित लाभार्थियों तक पहुँचीं — और वास्तव में क्या उन्होंने केवल प्रतिकूल मौसम की चेतावनी दी या लोगों के लिए पालन करने योग्य निर्देश भी प्रदान किए।

- Indeed, advance preparation is pertinent for two reasons. निश्चित रूप से, पूर्व तैयारी दो कारणों से अत्यंत महत्वपूर्ण है।

- The State is sometimes in a convergence zone as the hot, dry, 'loo' winds from the **Thar** move east over the plains while moisture-laden winds from the **Bay of Bengal** push in from the southeast.

राज्य कभी-कभी एक अभिसरण क्षेत्र में स्थित हो जाता है, जब थार से आने वाली गर्म एवं शुष्क 'लू' की हवाएँ मैदानों के ऊपर पूर्व की ओर बढ़ती हैं, जबकि बंगाल की खाड़ी से आने वाली आर्द्र हवाएँ दक्षिण-पूर्व दिशा से प्रवेश करती हैं।

- Second, over the undulating **Vindhya hills** in **Mirzapur** and **Sonbhadra**, the convergent air masses may lift rapidly, producing thunderstorms over specific parts of the State.

दूसरा, मिर्जापुर और सोनभद्र की उतार-चढ़ाव वाली विंध्य पहाड़ियों के ऊपर अभिसरित वायु-द्रव्यमान तीव्रता से ऊपर उठ सकते हैं, जिससे राज्य के विशिष्ट भागों में आंधी-तूफान उत्पन्न हो सकते हैं।



19M. Former England Test captain MJK Smith passes away at 92

पूर्व इंग्लैंड टेस्ट कप्तान एमजेके स्मिथ का 92 वर्ष की आयु में निधन

- Former England Test captain **Mike Smith** passed away at the age of **92**.

पूर्व इंग्लैंड टेस्ट कप्तान **माइक स्मिथ** का 92 वर्ष की आयु में निधन हो गया।

- The bespectacled batter, known by his initials **MJK**, played **50 Tests** for **England**, captaining on **25 occasions**, and was also a **rugby union international**, earning one cap against **Wales** in **1956**.

चश्मा पहनने वाले बल्लेबाज़, जिन्हें उनके initials **MJK** के नाम से जाना जाता था, ने इंग्लैंड के लिए **50 टेस्ट** खेले, जिनमें **25 मौकों** पर कप्तानी की, और वे एक **रग्बी यूनियन अंतरराष्ट्रीय खिलाड़ी** भी थे, जिन्होंने **1956** में वेल्स के खिलाफ एक मैच खेला था।

- He made his **Test debut** against **New Zealand** in **1958** and played his final **Test** against **Australia** in **1972**.

Former England Test captain MJK Smith passes away at 92

PCS

Former England Test captain Mike Smith passed away at the age of 92. The bespectacled batter, known by his initials MJK, played 50 Tests for England, captaining on 25 occasions, and was also a rugby union international, earning one cap against Wales in 1956. He made his Test debut against New Zealand in 1958 and played his final Test against Australia in 1972.



उन्होंने 1958 में न्यूज़ीलैंड के खिलाफ अपना टेस्ट पदार्पण किया और 1972 में ऑस्ट्रेलिया के खिलाफ अपना अंतिम टेस्ट मैच खेला।

GS Paper 1: History		19 May 2026
TOPICS COVERED		
19M	U.S. civil rights veterans see history repeating after court guts Voting Rights Act अमेरिकी नागरिक अधिकार आंदोलन के दिग्गजों को अदालत द्वारा वोटिंग राइट्स एक्ट कमजोर किए जाने के बाद इतिहास दोहराता दिख रहा है	

Bullish market



Festive sale: A sacrificial bull is off-loaded from a truck at a cattle market ahead of the Id-ul-Azha celebrations in Peshawar, Pakistan, on Monday. The festival of sacrifice is celebrated across the world on various dates in the last week of May.

Festive sale: A sacrificial bull is off-loaded from a truck at a cattle market ahead of the **Id-ul-Azha celebrations** in Peshawar, Pakistan, on Monday. The festival of sacrifice is celebrated across the world on various dates in the last week of May.

Eid al-Adha

- The festival commemorates the devotion and **obedience of Prophet Ibrahim (Abraham)**.
- According to Islamic tradition:
 - **Allah tested Prophet Ibrahim** by asking him to sacrifice his beloved son.
 - Prophet Ibrahim agreed to obey God's command.
 - Before the sacrifice took place, Allah replaced the son with a ram.
 - This event symbolizes:
 - Faith
 - Obedience
 - Sacrifice
 - Devotion to God
 - Eid al-Adha is celebrated on the **10th day of Dhu al-Hijjah**, the last month of the Islamic lunar calendar.
 - It coincides with the annual **Hajj pilgrimage** in Mecca.
 - The exact date changes every year according to moon sighting.
 - **Special Prayers:** Muslims gather in mosques and open grounds for Eid prayers.

Qurbani (Sacrifice)

- Animals such as:
 - Goats
 - Sheep
 - Camels
 - Cows
- are sacrificed according to Islamic guidelines.

Distribution of Meat

- The meat is generally divided into three parts:
 - One part for the family.
 - One part for relatives and friends.



- One part for poor and needy people.

U.S. civil rights veterans see history repeating after court guts Voting Rights Act

Reuters
SELMA, ALABAMA

Betty Strong Boynton marched into history as a teenager in the 1960s, when she was among the hundreds of peaceful protesters attacked by club-wielding Alabama state troopers on Bloody Sunday — a day that marked a turning point in the struggle for civil rights. Decades later, at 77, Ms. Boynton retraced the route of the historic Selma-to-Montgomery march and joined a protest against Alabama's plans to eliminate one of two seats in Congress held by Black politicians through rushed re-districting drives ahead of the November midterm elections. Such efforts by Republican-led southern states — Alabama as well as Louisiana, South Carolina and Tennessee follow a Supreme Court ruling last month that gutted key provisions of the Voting Rights Act.

In the wake of that decision, Reuters visited Sel-

ma, the city most associated with the Voting Rights Act, and spoke to three veterans of the civil rights era who described feeling a deep sense of loss.

"We're going to have to get out there in the streets. We're going to have to go door-to-door," explaining the decision's impact and urging people to vote, Ms. Boynton said. She spoke from her home in Selma, which is decorated with photos of the civil rights era.

Turning point
The brutality on March 7, 1965, captured in footage that was seen around the world, prompted President Lyndon B. Johnson, a Democrat, to send troops to Alabama to protect marchers on a 54-mile trek to Montgomery, the state capital.

Ms. Boynton was 16 when she ran from the Edmund Pettus Bridge on Bloody Sunday, and said she narrowly escaped a whip-wielding man on horseback. Another woman

who was there, Amelia Boynton Robinson, who was depicted in one of the most searing photos of that day — beaten bloody and unconscious — would go on to become her mother-in-law.

Four months later, Mr. Johnson, citing "the outrage of Selma," signed the Voting Rights Act. He knew the political cost, accurately predicting an exodus of white Democrats to the Republican Party. In the majority ruling for the Supreme Court, Justice Samuel Alito stripped out protections in Section 2 of the Voting Rights Act, which had been used for decades to overturn voting maps deemed to have racially discriminatory impact.

"The history of struggle for voting rights is personal," said lawyer Bryan Stevenson, who is from Delaware and founded a human rights organization in Montgomery in 1989. "Every person who grew up in this community, every person who has a con-



Betty Strong Boynton holds a copy of an article that includes a picture of her marching in 1965 in Selma, Alabama, the U.S. REUTERS

nection to this community, knows the pain of exclusion, knows the extent to which people in power have tried to keep Black people from participating in democracy."

Fighting on
Initially, the Supreme Court ruling made Barbara Barge, who took part in Selma protests leading to Bloody Sunday, feel "that what we did was nothing. That it had no merit."

Then Ms. Barge, who works as a tour guide to ci-

vil rights sites, remembered a chance encounter decades ago with an 88-year-old man in Mississippi. He was moved to see her car licence plate was from Selma's Dallas County.

He placed her hand on his chest, she said, and thanked her for giving him the right to vote before he died.

Civil rights activist Faya Rose Toure moved to Selma in the 1970s to open a law firm, drawn by the history of the movement. The

city of 18,000 is more than 80% Black.

Her law firm's reception desk is stocked with voter registration forms and sample ballots.

The office is near a cemetery shaded by live oaks with a well-maintained Confederate memorial dotted with secessionist flags. Ms. Toure sees the flags as anti-democratic, saying they represent the endurance of white supremacist ideas.

She said she urges Black people to work with national groups that are broadly concerned about the state of America's democracy.

"Prior to the passage of the Voting Rights Act, there was no democracy in America," she said.

Re-districting push
Black voters make up a quarter of the electorate in Alabama. Yet no Black politician currently holds statewide office in the state.

In 2024, Alabama voters for the first time elected two Black members to

Congress, returning Terri Sewell, whose district includes Selma and parts of Birmingham, for an eighth term, as well as newcomer Shomari Figures, whose district includes Montgomery. Both are Democrats.

White Republicans hold the state's five other House seats.

Alabama Attorney General Steve Marshall, a Republican, said in a statement that the Supreme Court decision was an acknowledgment that the South has changed. "Laws designed for a different era do not reflect the present reality," the statement said. Alabama Republicans have targeted Mr. Figures' seat as part of a broader nationwide re-districting push ahead of the midterms, an effort civil rights leaders and experts say could diminish Black political power and representation across the South.

If Alabama, Louisiana, and South Carolina join Tennessee in passing new maps, the re-districting that followed the Supreme

Court ruling will eliminate at least four districts with a majority or plurality of Black voters.

In a video statement on May 11, Mr. Marshall said his job was "to put the legislature in the best possible legal position to draw a congressional map that favors Republicans 7-0."

Mr. Marshall did not respond to requests for comment from Reuters.

Mr. Figures, speaking to Reuters within sight of the capitol steps where Martin Luther King Jr. spoke to the marchers in 1965, said Alabama has made progress since then, but not enough. Without the guardrails of the Voting Rights Act, further gains are uncertain, he said. "Martin Luther King used to always warn that progress never rolled in on the wheels of inevitability," Mr. Figures said. "It was something that happened because people pushed, people fought, people asked for it, people demanded, people stood up, people protested."

19M. U.S. civil rights veterans see history repeating after court guts Voting Rights Act

अमेरिकी नागरिक अधिकार आंदोलन के दिग्गजों को अदालत द्वारा वोटिंग राइट्स एक्ट कमजोर किए जाने के बाद इतिहास दोहराता दिख रहा है

- Decades later, at 77, Ms. Boynton retraced the route of the historic **Selma-to-Montgomery** march and joined a protest against **Alabama's** plans to eliminate one of two seats in Congress held by Black politicians through rushed re-districting drives ahead of the November midterm elections.

दशकों बाद, 77 वर्ष की आयु में, सुश्री बॉयंटन ने ऐतिहासिक **सेल्मा-से-मॉन्टगोमरी** मार्च के मार्ग को दोबारा तय किया और नवंबर के मध्यावधि चुनावों से पहले जल्दबाजी में किए गए पुनर्निर्धारण के माध्यम से अश्वेत नेताओं द्वारा धारित कांग्रेस की दो सीटों में से एक को समाप्त करने की अलबामा की योजना के खिलाफ प्रदर्शन में शामिल हुईं।

- Such efforts by Republican-led southern states — Alabama as well as Louisiana, South Carolina and Tennessee follow a Supreme Court ruling last month that gutted key provisions of the **Voting Rights Act**.

अलबामा, लुइसियाना, साउथ कैरोलाइना और टेनेसी जैसे रिपब्लिकन-शासित दक्षिणी राज्यों के ऐसे प्रयास पिछले महीने सुप्रीम कोर्ट के उस फैसले के बाद सामने आए हैं, जिसने **वोटिंग राइट्स एक्ट** के प्रमुख प्रावधानों को कमजोर कर दिया।

- The brutality on March 7, 1965, captured in footage that was seen around the world, prompted President **Lyndon B. Johnson**, a Democrat, to send troops to Alabama to protect marchers on a 54-mile trek to Montgomery, the state capital.

7 मार्च 1965 की बर्बरता, जिसकी तस्वीरें पूरी दुनिया ने देखीं, ने डेमोक्रेट राष्ट्रपति **लिंडन बी. जॉनसन** को अलबामा में सैनिक भेजने के लिए प्रेरित किया ताकि मॉन्टगोमरी, राज्य की राजधानी, तक 54 मील की यात्रा कर रहे प्रदर्शनकारियों की सुरक्षा की जा सके।

- **Four months later, Mr. Johnson, citing "the outrage of Selma," signed the Voting Rights Act.** चार महीने बाद, श्री जॉनसन ने "सेल्मा की त्रासदी" का हवाला देते हुए **वोटिंग राइट्स एक्ट** पर हस्ताक्षर किए।



- He knew the political cost, accurately predicting an exodus of white Democrats to the Republican Party.
उन्हें इसकी राजनीतिक कीमत का अंदाजा था और उन्होंने सही अनुमान लगाया था कि श्वेत डेमोक्रेट्स रिपब्लिकन पार्टी की ओर चले जाएंगे।
- In the majority ruling for the Supreme Court, Justice **Samuel Alito** stripped out protections in Section 2 of the Voting Rights Act, which had been used for decades to overturn voting maps deemed to have racially discriminatory impact.
सुप्रीम कोर्ट के बहुमत वाले फैसले में न्यायाधीश **सैमुअल अलिटो** ने वोटिंग राइट्स एक्ट की धारा 2 के संरक्षणों को हटा दिया, जिसका उपयोग दशकों से नस्लीय भेदभावपूर्ण प्रभाव वाले निर्वाचन नक्शों को निरस्त करने के लिए किया जाता था।
- The city of 18,000 is more than 80% Black.
18,000 की आबादी वाले इस शहर में 80% से अधिक लोग अश्वेत हैं।
- Black voters make up a quarter of the electorate in Alabama.
अलबामा में अश्वेत मतदाता कुल मतदाताओं का एक-चौथाई हिस्सा हैं।
- Yet no Black politician currently holds statewide office in the state.
फिर भी वर्तमान में राज्य स्तर पर कोई अश्वेत राजनेता पद पर नहीं है।
- In 2024, Alabama voters for the first time elected two Black members to Congress, returning **Terri Sewell**, whose district includes Selma and parts of Birmingham, for an eighth term, as well as newcomer **Shomari Figures**, whose district includes Montgomery.
2024 में अलबामा के मतदाताओं ने पहली बार दो अश्वेत सदस्यों को कांग्रेस के लिए चुना, जिनमें **टेरी सिवेल** शामिल थीं, जिनका निर्वाचन क्षेत्र सेल्मा और बर्मिंघम के कुछ हिस्सों को कवर करता है, और नए सदस्य **शोमारी फिगर्स**, जिनका क्षेत्र मॉन्टगोमरी को शामिल करता है।
- Mr. Figures, speaking to Reuters within sight of the capitol steps where **Martin Luther King Jr. spoke to the marchers in 1965**, said Alabama has made progress since then, but not enough.
श्री फिगर्स ने रॉयटर्स से उस कैपिटल सीढ़ियों के पास बात करते हुए कहा, जहाँ 1965 में **मार्टिन लूथर किंग जूनियर** ने प्रदर्शनकारियों को संबोधित किया था, कि अलबामा ने तब से प्रगति की है, लेकिन वह पर्याप्त नहीं है।
- “Martin Luther King used to always warn that progress never rolled in on the wheels of inevitability,” Mr. Figures said.
श्री फिगर्स ने कहा, “मार्टिन लूथर किंग हमेशा चेतावनी देते थे कि प्रगति कभी भी अपने आप निश्चित रूप से नहीं आती।”
- “It was something that happened because people pushed, people fought, people asked for it, people demanded, people stood up, people protested.”
“यह इसलिए हुआ क्योंकि लोगों ने प्रयास किया, संघर्ष किया, इसकी मांग की, आवाज उठाई और विरोध प्रदर्शन किए।”

GS Paper 1: Society		19 May 2026
TOPICS COVERED		
19M	Gender, caregiving, the law in Indian research funding भारतीय अनुसंधान वित्तपोषण में लैंगिकता, देखभाल और कानून	



Gender, caregiving, the law in Indian research funding

GS I: Society

India's scientific ambitions are increasingly visible in space missions, pharmaceutical research, and peer-reviewed scholarship. Yet, its institutional culture that sustains this continues to marginalise many researchers. Women in academia, especially in mid-career stages, face a convergence of professional and domestic responsibilities that their male peers rarely experience to the same extent. Age relaxation provisions in research grants were introduced to address this gap, but as these policies evolve, they require closer scrutiny to improve their effectiveness rather than weaken them.

The legal foundation for gender-sensitive research policy in India is not merely permissive; it is, in important respects, directive. Article 15(3) of the Constitution allows the state to make special provisions for women and children, and this has long been read as enabling affirmative measures in employment and public opportunity. Article 16 reinforces equality of opportunity without precluding measures that correct historical disadvantage and read alongside the Directive Principles which speak of equal right to an adequate means of livelihood. There is a coherent constitutional argument that funding agencies have not just the authority but also a degree of responsibility to ensure women researchers are not structurally penalised for caregiving.

Article 51A(e), the fundamental duty to renounce practices derogatory to the dignity of women, adds another dimension. A policy environment that routinely produces grant cohorts with negligible female representation is not a neutral outcome – it reflects accumulated disadvantages that the constitutional framework obliges institutions to address.

The legislative gap at heart of the problem
The Maternity Benefit (Amendment) Act, 2017 remains the most substantive legal protection available to women. The 2017 amendment extended paid maternity leave to 26 weeks for women with fewer than two surviving children and introduced provisions for crèche facilities in larger establishments. For women in academic research, this matters – but imperfectly. Many researchers at the postdoctoral or early career stage are employed on fellowships, project positions, or contractual appointments that fall outside the clear ambit of the Act.

Equally overlooked in current frameworks is the return to research after childbirth. Women returning from maternity leave often face disrupted laboratory work, changed collaborations, and misaligned grant timelines,



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The structural gender gaps in India's research ecosystem must be addressed

with little formal support for reintegration or reduced workload. The expectation of immediate full productivity after childbirth is unrealistic and requires clear policy intervention rather than informal goodwill from supervisors.

India has no central legislation on paternity leave. Central government employees receive 15 days under the Central Civil Services (Leave) Rules, 1972, but this is administrative rather than statutory, and no comparable entitlement exists for researchers funded through extramural grants. This legislative asymmetry – generous maternity protection, minimal paternity provision – is not incidental. It shapes how institutions and funding agencies think about caregiving, and it partly explains why age relaxation policies have been designed exclusively around women rather than around the act of caregiving itself.

The case for women-specific support in research funding is supported by persistent data, not assumption. The All India Survey on Higher Education (2021-22) shows that the higher education system had nearly 16 lakh faculty in 2021-22 with 57% male and 43% female. Women remain underrepresented in faculty positions across central universities and especially in science and technology institutions. The Science and Engineering Research Board (SERB) has also reported consistently lower application and success rates among women researchers.

The pattern is clear. Women who complete doctoral degrees in their mid-to-late twenties enter postdoctoral work at the same time as peak domestic responsibilities. Balancing grant cycles, publication pressure, travel, and childcare is not shared equally in academic households. Studies on dual-career faculty, including at the Tata Institute of Social Sciences, show that women typically bear a greater share of domestic work regardless of professional status. The consequences are measurable: delayed publications, gaps in grant records, and reduced international visibility. Age relaxation, in this context, is a partial remedy for a documented structural disadvantage.

What the courts have suggested

The Supreme Court of India's reasoning in *Vijay Lakshmi vs Punjab University And Others* (2003) is relevant here. Addressing preferential provisions for women in service matters, the Court drew a clear distinction between formal equality and substantive equality, which accounts for unequal outcomes.

It held that measures favouring women are constitutionally valid when they address demonstrated disadvantages. This logic applies to

research grants as well: extending eligibility windows for women is not preferential treatment, but a corrective to structural disadvantage.

None of this implies that current policy is adequate. Age relaxation policies such as those under SERB address eligibility at the application stage but not the everyday conditions of research. A five-year extension to the upper age limit may allow women to apply for grants they would otherwise miss, but it does not provide childcare support during proposal writing, institutional support during maternity leave, or re-entry funding after career breaks.

There is also the question of who the policy excludes. A single father or a man caring for an ailing parent may also face significant career disruption, but the policy does not recognise him. This is not an argument to weaken protections for women, as evidence shows that caregiving burdens are not equal in Indian academia. Rather, it calls for an additional layer of support for documented caregiving responsibilities, while retaining and strengthening women-specific provisions that address the more widespread disadvantage.

What more considered policy would be

The National Education Policy 2020 gestures toward institutional flexibility and faculty wellbeing, but these commitments have not yet translated into binding research funding policy. That gap is overdue to be addressed. Funding agencies should consider no-cost grant extensions for documented caregiving periods, re-entry fellowships for women returning to research, and flexible milestone reporting for researchers with caregiving responsibilities. Several European research councils have implemented similar measures, showing that gender-neutral caregiving support, alongside gender-specific provisions, can improve equity without appearing arbitrary.

Gender-based age relaxation in Indian research grants is constitutionally grounded and empirically justified. The disadvantage it addresses is real, documented, and persistent. Removing it in the name of gender neutrality would be a policy error not supported by evidence. What is needed instead is a layered approach that retains support for women researchers while adding provisions for other caregivers. India's research institutions owe their women scholars not just formal access to grants but the structural conditions in which a sustained research career is genuinely possible. Age relaxation is a beginning. It should not be mistaken for an ending

19M. Gender, caregiving, the law in Indian research funding

भारतीय अनुसंधान वित्तपोषण में लैंगिकता, देखभाल और कानून

- **Article 15(3)** of the Constitution allows the state to make special provisions for women and children, and this has long been read as enabling affirmative measures in employment and public opportunity.
संविधान का अनुच्छेद 15(3) राज्य को महिलाओं और बच्चों के लिए विशेष प्रावधान करने की अनुमति देता है, और इसे लंबे समय से रोजगार एवं सार्वजनिक अवसरों में सकारात्मक उपायों को सक्षम बनाने वाले प्रावधान के रूप में समझा जाता रहा है।
- **Article 16** reinforces equality of opportunity without precluding measures that correct historical disadvantage and read alongside the Directive Principles which speak of equal right to an adequate means of livelihood.
अनुच्छेद 16 अवसर की समानता को सुदृढ़ करता है, जबकि ऐतिहासिक असमानताओं को सुधारने वाले उपायों



को निषिद्ध नहीं करता, और इसे राज्य के नीति-निर्देशक सिद्धांतों के साथ पढ़ा जाता है जो आजीविका के पर्याप्त साधनों के समान अधिकार की बात करते हैं।

- **Article 51A(e)**, the fundamental duty to renounce practices derogatory to the dignity of women, adds another dimension.

अनुच्छेद 51A(e), जो महिलाओं की गरिमा के विरुद्ध प्रथाओं का त्याग करने के मौलिक कर्तव्य की बात करता है, इस विषय में एक और आयाम जोड़ता है।

- The **Maternity Benefit (Amendment) Act, 2017** remains the most substantive legal protection available to women.

मातृत्व लाभ (संशोधन) अधिनियम, 2017 महिलाओं को उपलब्ध सबसे महत्वपूर्ण कानूनी संरक्षण बना हुआ है।

- The 2017 amendment extended paid maternity leave to 26 weeks for women with fewer than two surviving children and introduced provisions for crèche facilities in larger establishments.

वर्ष 2017 के संशोधन ने दो से कम जीवित बच्चों वाली महिलाओं के लिए सवेतन मातृत्व अवकाश को 26 सप्ताह तक बढ़ा दिया तथा बड़े संस्थानों में क्रेच सुविधाओं के प्रावधान भी जोड़े।

- Women returning from maternity leave often face disrupted laboratory work, changed collaborations, and misaligned grant timelines, with little formal support for reintegration or reduced workload.

मातृत्व अवकाश से लौटने वाली महिलाएँ प्रायः बाधित प्रयोगशाला कार्य, परिवर्तित सहयोग व्यवस्थाओं तथा असंगत अनुदान समय-सीमाओं का सामना करती हैं, जबकि पुनः समावेशन अथवा कार्यभार में कमी हेतु औपचारिक समर्थन बहुत कम उपलब्ध होता है।

- **India has no central legislation on paternity leave.**

भारत में पितृत्व अवकाश पर कोई केंद्रीय कानून उपलब्ध नहीं है।

- Central government employees receive 15 days under the **Central Civil Services (Leave) Rules, 1972**, but this is administrative rather than statutory, and no comparable entitlement exists for researchers funded through extramural grants.

केंद्रीय सरकारी कर्मचारियों को **केंद्रीय सिविल सेवा (अवकाश) नियम, 1972** के अंतर्गत 15 दिनों का अवकाश प्राप्त होता है, किन्तु यह वैधानिक के बजाय प्रशासनिक प्रावधान है, और बाह्य अनुदानों से वित्तपोषित शोधकर्ताओं के लिए ऐसा कोई समान अधिकार उपलब्ध नहीं है।

- The **All India Survey on Higher Education (2021-22)** shows that the higher education system had nearly 16 lakh faculty in 2021-22 with 57% male and 43% female.

अखिल भारतीय उच्च शिक्षा सर्वेक्षण (2021-22) के अनुसार, वर्ष 2021-22 में उच्च शिक्षा प्रणाली में लगभग 16 लाख शिक्षक थे, जिनमें 57% पुरुष और 43% महिलाएँ थीं।

- Women remain underrepresented in faculty positions across central universities and especially in science and technology institutions.

केंद्रीय विश्वविद्यालयों तथा विशेषकर विज्ञान एवं प्रौद्योगिकी संस्थानों में शिक्षकीय पदों पर महिलाओं का प्रतिनिधित्व अब भी कम बना हुआ है।

- The **Science and Engineering Research Board (SERB)** has also reported consistently lower application and success rates among women researchers.

विज्ञान एवं अभियांत्रिकी अनुसंधान बोर्ड (एसईआरबी) ने भी महिला शोधकर्ताओं के बीच लगातार कम आवेदन तथा सफलता दर की सूचना दी है।

- The **Supreme Court of India's reasoning in Vijay Lakshmi vs Punjab University And Others (2003)** is relevant here.

यहाँ **भारत के सर्वोच्च न्यायालय का विजय लक्ष्मी बनाम पंजाब विश्वविद्यालय एवं अन्य (2003)** मामले में दिया गया तर्क प्रासंगिक है।

- Addressing preferential provisions for women in service matters, the Court drew a clear distinction between formal equality and substantive equality, which accounts for unequal outcomes.



सेवा संबंधी मामलों में महिलाओं के लिए विशेष प्रावधानों पर विचार करते हुए न्यायालय ने औपचारिक समानता तथा वास्तविक समानता के बीच स्पष्ट अंतर स्थापित किया, जो असमान परिणामों को ध्यान में रखती है।

- It held that measures favouring women are constitutionally valid when they address demonstrated disadvantages.

न्यायालय ने यह माना कि जब महिलाओं के पक्ष में किए गए उपाय स्पष्ट रूप से सिद्ध असमानताओं को दूर करने के उद्देश्य से हों, तब वे संवैधानिक रूप से वैध हैं।

- This logic applies to research grants as well: extending eligibility windows for women is not preferential treatment, but a corrective to structural disadvantage.

यह तर्क अनुसंधान अनुदानों पर भी लागू होता है: महिलाओं के लिए पात्रता अवधि का विस्तार कोई विशेष पक्षपातपूर्ण व्यवहार नहीं, बल्कि संरचनात्मक असमानता को सुधारने का उपाय है।

- A single father or a man caring for an ailing parent may also face significant career disruption, but the policy does not recognise him.

कोई एकल पिता अथवा बीमार माता-पिता की देखभाल करने वाला पुरुष भी गंभीर कैरियर व्यवधान का सामना कर सकता है, किन्तु यह नीति उसे मान्यता नहीं देती।

GS Paper 1: Geography

19 May 2026

TOPICS COVERED

19M Russia launches attacks on Odessa and Dnipro as Ukraine targets Belgorod
यूक्रेन द्वारा बेलगोरोद को निशाना बनाने के बीच रूस ने ओडेसा और ड्नीप्रो पर हमले किए

Steps of ascension



Trail of endurance: A long queue of climbers heads for the summit of Mount Everest in the Solukhumbu district, also known as the Everest region, in Nepal on Monday. A record 492 permits have been issued this season. REUTERS

Trail of endurance: A long queue of climbers heads for the summit of Mount Everest in the **Solukhumbu district**, also known as the Everest region, in Nepal on Monday. A record 492 permits have been issued this season.

Russia launches attacks on Odesa and Dnipro as Ukraine targets Belgorod

GS 1: Geography, Mapping
Reuters
ODESA

Russia struck the Ukrainian cities of Odesa and Dnipro in missile and drone attacks that damaged residential buildings and injured dozens of people, and Russian officials reported two deaths in Ukrainian drone strikes.

Ukraine's air force said Russia had launched 524 drones and 22 missiles in attacks that began on Sunday evening and continued overnight. The attacks followed a heavy Ukrainian drone attack on Moscow at the weekend.

Twenty-two people were hurt in Dnipro and a further eight were injured in the surrounding region,



Picking up the pieces: Municipal workers clean debris following an air attack in Dnipro on Monday. AFP

officials said. Regional governor Oleksandr Hanzha said apartment blocks, a religious institution and a university were damaged.

"Russia relies on ballistic missiles, and that is precisely why we in Europe must do everything possi-

ble to ensure reliable protection against this," Ukrainian President Volodymyr Zelenskyy wrote on X after what he said was a more than six-hour attack on Dnipro.

Ukrainian energy firm Naftogaz said drones had

struck several of its facilities in the region.

Russian drones also damaged residential buildings, a school and a kindergarten in Odesa, local officials said.

Two killed, ships hit

Russian drones hit three foreign-flagged ships in the Black Sea heading to ports in the Odesa region, including a Chinese-owned cargo vessel, Ukrainian authorities said.

In Russia, drones were downed overnight in Rostov and Belgorod, Interfax news agency quoted the Defence Ministry as saying. Two people were killed and two injured in Belgorod region, local authorities said.

19M. Russia launches attacks on Odesa and Dnipro as Ukraine targets Belgorod

यूक्रेन द्वारा बेलगोरोद को निशाना बनाने के बीच रूस ने ओडेसा और ड्नीप्रो पर हमले किए

- Russia struck the Ukrainian cities of **Odesa and Dnipro** in missile and drone attacks that damaged residential buildings and injured dozens of people, and Russian officials reported two deaths in Ukrainian drone strikes.

रूस ने यूक्रेन के शहरों ओडेसा और ड्नीप्रो पर मिसाइल और ड्रोन हमले किए, जिनमें रिहायशी इमारतों को नुकसान पहुंचा और दर्जनों लोग घायल



TELEGRAM CHANNEL: <https://t.me/patrioticIAS>

YOUTUBE CHANNEL: <https://www.youtube.com/@PatrioticIAS>

CONTACT: 9971932488



हुए, जबकि रूसी अधिकारियों ने यूक्रेनी ड्रोन हमलों में दो लोगों की मौत की सूचना दी।

- In Russia, drones were downed overnight in **Rostov and Belgorod**.

GS Paper II: Polity		19 May 2026
TOPICS COVERED		
19M	SC has 'reservations' on its own bail decision सुप्रीम कोर्ट को अपने ही जमानत फैसले पर 'आपत्तियाँ' हैं	
19M	CAA applicants must declare passport status, surrender foreign passports: Ministry CAA आवेदकों को पासपोर्ट स्थिति घोषित करनी होगी, विदेशी पासपोर्ट जमा करने होंगे: मंत्रालय	
19M	Jairam initiates privilege notice against Pradhan over 'impugned' remarks जयराम ने 'आपत्तिजनक' टिप्पणियों को लेकर प्रधान के खिलाफ विशेषाधिकार नोटिस शुरू किया	
19M	'Political decision must on cut-off for mid-term polls under the simultaneous election system' 'एक साथ चुनाव प्रणाली के तहत मध्यावधि चुनावों के कट-ऑफ पर राजनीतिक निर्णय होना चाहिए'	
19M	Justice Varma case: inquiry panel submits probe report न्यायमूर्ति वर्मा मामला: जांच पैनल ने जांच रिपोर्ट सौंपी	

SC has 'reservations' on its own bail decision

Judgment in a narco-terrorism case refers to Delhi riots case involving Umar Khalid, Sharjeel Imam

Court says an accused cannot be held indefinitely because prosecution faces a low bar under UAPA

If State shows accusations were 'prima facie' true, bail would be 'absolutely impermissible'

GS II: Polity
GS III: Internal Security
NEW DELHI

MOB

The Supreme Court on Monday voiced "serious reservations" about "various aspects" of its January judgment refusing bail to former JNU student leader Umar Khalid and co-accused Sharjeel Imam in the Delhi riots "larger conspiracy" case, including the foreshadowing of their right to seek bail for a year.

The rare act of self-reproach came over a year after the court condemned Mr. Khalid and Mr. Imam as "alleged masterminds" who hatched the conspiracy behind the 2020 Delhi riots. At the time of the rejection of his bail plea, Mr. Khalid had already spent over five years in prison as an undertrial.

The Delhi Police had

booked Mr. Khalid and other activists under the anti-terror law, the Unlawful Activities (Prevention) Act or the UAPA, for their involvement in organising protests over the Citizenship (Amendment) Act.

'Not an empty slogan' On Monday, a Bench of Justices B.V. Nagarathna and Ujjal Bhuyan said bail was indeed the rule in UAPA cases too.

Justice Bhuyan, who authored the judgment, said the catchphrase "bail is the rule and jail is the exception" was not just an empty slogan, but a constitutional principle flowing from the fundamental rights to life, speedy trial and freedom from arbitrary arrests and detentions.

The apex court's observations on Monday came

Once it is obvious that a timely trial would not be possible and the accused has suffered incarceration for a significant period of time, the courts would ordinarily be obligated to enlarge the accused on bail... The presence of statutory restrictions... per se does not oust the ability of the courts to grant bail.

JUSTICE UJJAL BHUYAN refers to KA Najeeb judgment



in a judgment allowing bail to a Jammu and Kashmir man accused in a narco-terrorism case in which he had been incarcerated as an undertrial under the UAPA for five years.

It said an accused cannot be indefinitely incarcerated merely because the state was able to "satisfy" the low bar to refuse bail in UAPA cases. Justice Bhuyan said the right to

personal liberty and speedy trial "cannot become 'subordinate' to the draconian bail provision, Section 43-D(5), of the UAPA. He said that the UAPA had drawn the threshold for denying bail so low that the state had to only show that the accusations against an accused were "prima facie" true.

Once that was done, bail would be "absolutely im-

permissible" for him.

"The state need only satisfy a low prima facie threshold while the trial may continue for years with the result that pre-trial incarceration begins to acquire a post-trial punitive character, and even then, no court could ever grant bail no matter the length of period of such incarceration because the case stood prima facie made out against the accused," Justice Bhuyan noted.

He said the potency of Section 43-D(5) should be "melted" down by constitutional courts intervening and granting bail in UAPA cases in which the accused had already suffered prolonged incarceration due to delayed trial. A point in case was that of Mr. Khalid.

"Constitutional courts can always intervene to

grant bail despite satisfaction of the 'prima facie' threshold under Section 43-D(5). The Section need not control the grant of bail if the accused person's liberty is infringed for a prolonged period of time," Justice Bhuyan observed.

Section 43-D(5)

The power of a constitutional court to protect the right to life of a UAPA accused against arbitrary detentions cannot be diminished merely by a provision like Section 43-D(5) in a statute, the Bench highlighted.

"Section 43-D(5) remains subordinate to Article 21 [fundamental right to life] at all times. A constitutional court need not hold back bail to the accused in the garb of Section 43-D(5)," the Supreme Court underscored.

Justice Bhuyan said the basic principle that a person was presumed innocent until proven guilty was the "cornerstone of any civilised society governed by the rule of law". Section 43-D(5) converted delay in trial itself into punishment.

The court said statutes like the UAPA may calibrate the manner in which the presumption of innocence was applied, particularly in cases involving national security or terrorist offences, but they cannot altogether invert the constitutional relationship between liberty and detention. The court expressed deep concern about certain of its verdicts "hollowing out" larger Bench verdicts like in the K.A. Najeeb case, which championed personal liberty against state abuse.

19M. SC has 'reservations' on its own bail decision

सुप्रीम कोर्ट को अपने ही जमानत फैसले पर 'आपत्तियाँ' हैं

- Judgment in a narco-terrorism case refers to Delhi riots case involving Umar Khalid, Sharjeel Imam.

नार्को-आतंकवाद मामले में दिया गया फैसला दिल्ली दंगों के मामले का उल्लेख करता है, जिसमें उमर खालिद और शरजील इमाम शामिल हैं।



- Court says an accused cannot be held indefinitely because prosecution faces a low bar under UAPA.

अदालत ने कहा कि किसी आरोपी को अनिश्चितकाल तक हिरासत में नहीं रखा जा सकता क्योंकि अभियोजन पक्ष को UAPA के तहत कम स्तर की कसौटी का सामना करना पड़ता है।

- If State shows accusations were 'prima facie' true, bail would be 'absolutely impermissible'.

यदि राज्य यह दिखा दे कि आरोप 'प्रथम दृष्टया' सही हैं, तो जमानत 'पूरी तरह अस्वीकार्य' होगी।

- The Supreme Court on Monday voiced "serious reservations" about "various aspects" of its January judgment refusing bail to former JNU student leader Umar Khalid and co-accused Sharjeel Imam in the Delhi riots 'larger conspiracy' case, including the foreclosing of their right to seek bail for a year.

सुप्रीम कोर्ट ने सोमवार को पूर्व JNU छात्र नेता उमर खालिद और सह-आरोपी शरजील इमाम को दिल्ली दंगों की 'बड़ी साजिश' मामले में जमानत देने से इनकार करने वाले अपने जनवरी के फैसले के "विभिन्न पहलुओं" पर "गंभीर आपत्तियाँ" जताईं, जिसमें एक वर्ष तक जमानत मांगने के उनके अधिकार को समाप्त करना भी शामिल था।

- The rare act of self-reproach came over a year after the court condemned Mr. Khalid and Mr. Imam as "alleged masterminds" who hatched the conspiracy behind the 2020 Delhi riots.

आत्म-आलोचना का यह दुर्लभ कदम उस समय आया जब अदालत ने एक वर्ष पहले श्री खालिद और श्री इमाम को 2020 के दिल्ली दंगों के पीछे की साजिश रचने वाले "कथित मास्टरमाइंड" बताया था।

- Justice Bhuyan, who authored the judgment, said the catchphrase 'bail is the rule and jail is the exception' was not just an empty slogan, but a constitutional principle flowing from the fundamental rights to life, speedy trial and freedom from arbitrary arrests and detentions.

फैसला लिखने वाले न्यायमूर्ति भुइयां ने कहा कि 'जमानत नियम है और जेल अपवाद' केवल एक खोखला नारा नहीं है, बल्कि यह जीवन, त्वरित सुनवाई और मनमानी गिरफ्तारी तथा हिरासत से स्वतंत्रता के मौलिक अधिकारों से उत्पन्न एक संवैधानिक सिद्धांत है।

- The apex court's observations on Monday came in a judgment allowing bail to a Jammu and Kashmir man accused in a narco-terrorism case in which he had been incarcerated as an undertrial under the UAPA for five years.

सोमवार को शीर्ष अदालत की ये टिप्पणियाँ एक जम्मू-कश्मीर के व्यक्ति को जमानत देने वाले फैसले में आईं, जिस पर नार्को-आतंकवाद मामले में आरोप था और जो UAPA के तहत पाँच वर्षों से विचाराधीन कैदी के रूप में जेल में था।

- It said an accused cannot be indefinitely incarcerated merely because the state was able to "satisfy" the low bar to refuse bail in UAPA cases.

अदालत ने कहा कि किसी आरोपी को केवल इसलिए अनिश्चितकाल तक कैद नहीं रखा जा सकता क्योंकि राज्य UAPA मामलों में जमानत अस्वीकार करने की कम कसौटी को "संतुष्ट" करने में सफल हो गया।

- Justice Bhuyan said the right to permissibility for him.

न्यायमूर्ति भुइयां ने कहा कि उसके लिए अधिकार अनुमेय है।

- "The state need only satisfy a low prima facie threshold while the trial may continue for years with the result that pre-trial incarceration begins to acquire a post-trial punitive character, and even then, no court could ever grant bail no matter the length of period of such incarceration because the case stood prima facie made out against the accused," Justice Bhuyan noted.

न्यायमूर्ति भुइयां ने कहा, "राज्य को केवल एक कम प्रथम दृष्टया कसौटी को संतुष्ट करना होता है, जबकि मुकदमा वर्षों तक चल सकता है, जिसके परिणामस्वरूप मुकदमे से पहले की कैद सजा जैसी प्रकृति ग्रहण करने लगती है, और तब भी कोई अदालत जमानत नहीं दे सकती, चाहे हिरासत की अवधि कितनी भी लंबी क्यों न हो, क्योंकि आरोपी के खिलाफ मामला प्रथम दृष्टया स्थापित माना जाता है।"

- He said the potency of Section 43-D(5) should be "melted" down by constitutional courts intervening and granting bail in UAPA cases in which the accused had already suffered prolonged incarceration due to delayed trial.

उन्होंने कहा कि धारा 43-D(5) की कठोरता को संवैधानिक अदालतों द्वारा हस्तक्षेप कर और उन UAPA



मामलों में जमानत देकर “कम” किया जाना चाहिए, जिनमें आरोपी पहले ही मुकदमे में देरी के कारण लंबी कैद भुगत चुका है।

- A point in case was that of Mr. Khalid.
ऐसा ही एक उदाहरण श्री खालिद का मामला था।
- “Constitutional courts can always intervene to grant bail despite satisfaction of the ‘prima facie’ threshold under **Section 43-D(5)**.
“संवैधानिक अदालतें धारा 43-D(5) के तहत ‘प्रथम दृष्टया’ कसौटी पूरी होने के बावजूद जमानत देने के लिए हमेशा हस्तक्षेप कर सकती हैं।
- The **Section need not control the grant of bail if the accused person’s liberty is infringed for a prolonged period of time,**” Justice Bhuyan observed.
यदि आरोपी की स्वतंत्रता का लंबे समय तक हनन हो रहा हो, तो यह धारा जमानत देने को नियंत्रित नहीं कर सकती,” न्यायमूर्ति भुइयां ने कहा।

Section 43-D(5)

धारा 43-D(5)

- The power of a constitutional court to protect the right to life of a **UAPA** accused against arbitrary detentions cannot be diminished merely by a provision like **Section 43-D(5)** in a statute, the Bench highlighted.
पीठ ने रेखांकित किया कि मनमानी हिरासत के खिलाफ किसी **UAPA** आरोपी के जीवन के अधिकार की रक्षा करने की संवैधानिक अदालत की शक्ति को केवल धारा 43-D(5) जैसे प्रावधान से कम नहीं किया जा सकता।
- “**Section 43-D(5)** remains subordinate to **Article 21** [fundamental right to life] at all times.
“धारा 43-D(5) हर समय अनुच्छेद 21 [जीवन के मौलिक अधिकार] के अधीन रहती है।
- A constitutional court need not hold back bail to the accused in the garb of **Section 43-D(5)**,” the **Supreme Court** underscored.
सुप्रीम कोर्ट ने जोर देकर कहा कि संवैधानिक अदालत को धारा 43-D(5) की आड़ में आरोपी की जमानत नहीं रोकनी चाहिए।
- Justice Bhuyan said the basic principle that a person was presumed innocent until proven guilty was the “cornerstone of any civilised society governed by the rule of law”.
न्यायमूर्ति भुइयां ने कहा कि किसी व्यक्ति को दोषी सिद्ध होने तक निर्दोष मानने का मूल सिद्धांत “कानून के शासन वाले किसी भी सभ्य समाज की आधारशिला” है।
- **Section 43-D(5)** converted delay in trial itself into punishment.
धारा 43-D(5) ने मुकदमे में देरी को ही सजा में बदल दिया।
- The court said statutes like the **UAPA** may calibrate the manner in which the presumption of innocence was applied, particularly in cases involving national security or terrorist offences, but they cannot altogether invert the constitutional relationship between liberty and detention.
अदालत ने कहा कि **UAPA** जैसे कानून निर्दोषता की धारणा को लागू करने के तरीके को नियंत्रित कर सकते हैं, विशेषकर राष्ट्रीय सुरक्षा या आतंकवादी अपराधों से जुड़े मामलों में, लेकिन वे स्वतंत्रता और हिरासत के बीच संवैधानिक संबंध को पूरी तरह उलट नहीं सकते।
- The court expressed deep concern about certain of its verdicts “hollowing out” larger Bench verdicts like in the **K.A. Najeer** case, which championed personal liberty against state abuse.
अदालत ने इस बात पर गहरी चिंता व्यक्त की कि उसके कुछ फैसले **K.A. Najeer** मामले जैसे बड़ी पीठ के फैसलों को “खोखला” कर रहे हैं, जिन्होंने राज्य के दुरुपयोग के खिलाफ व्यक्तिगत स्वतंत्रता का समर्थन किया था।



CAA applicants must declare passport status, surrender foreign passports: Ministry

GS II: Polity

Vijaita Singh
NEW DELHI

Applicants seeking citizenship under the Citizenship Amendment Act (CAA), 2019 will have to submit an affidavit declaring whether they hold a valid or an expired passport from Pakistan, Afghanistan or Bangladesh, according to an amendment to the Citizenship Rules notified by the Union Home Ministry on Monday.

The move comes days after the Bharatiya Janata Party (BJP) came to power for the first time in West Bengal where a large number of the Matua community, the intended beneficiaries of CAA, reside.

Most of the Matuas, who migrated from neighbouring Bangladesh during different time-periods, do not have sufficient documents to apply for citizenship under the CAA. The 2019 legislation, which became effective on March 11, 2024 through the notification of

CAA Rules, requires an applicant to declare that they are foreigners along with a document issued by any government authority in Afghanistan, Bangladesh or Pakistan establishing their roots in the three countries.

The CAA Rules also enable local priests or a "locally reputed community institution" to issue the mandatory certificates certifying the faith of an applicant.

CAA facilitates citizenship to six non-Muslim communities – Hindu, Sikh, Parsi, Jain, Buddhist and Christian – from the three countries of Pakistan, Bangladesh and Afghanistan who entered India before December 31, 2014.

On Monday, the Ministry inserted a paragraph in Schedule 1C of the CAA application form where the applicant must declare if he/she is "not in possession of a valid and/or expired passport(s) issued by

the Government of Pakistan/Afghanistan/Bangladesh." The form requires the applicant to provide the date and month of their entry to India and adds that they can be deprived of citizenship if the information is found to be incorrect.

The inserted paragraph added that if the applicant is "in possession" of a valid or expired passport, then details such as the passport number, date and place of issue, date of expiry are to be provided and the passport is to be surrendered before the Senior Superintendent of Post or Superintendent of Post within 15 days of approval of citizenship application, the notification said.

Before the Assembly elections were declared in West Bengal, the MHA, in the months of February and March, notified four committees headed by Central government officials to clear the citizenship applications.

19M. CAA applicants must declare passport status, surrender foreign passports: Ministry

CAA आवेदकों को पासपोर्ट

स्थिति घोषित करनी होगी, विदेशी

पासपोर्ट जमा करने होंगे: मंत्रालय

• Applicants seeking citizenship under the **Citizenship Amendment Act (CAA), 2019** will have to submit an affidavit declaring whether they hold a valid or an expired passport from **Pakistan, Afghanistan or Bangladesh**, according to an amendment to the Citizenship Rules notified by the **Union Home Ministry** on Monday.

नागरिकता संशोधन अधिनियम (CAA),

2019 के तहत नागरिकता चाहने वाले

आवेदकों को यह घोषित करते हुए एक

शपथपत्र जमा करना होगा कि उनके पास

पाकिस्तान, अफगानिस्तान या बांग्लादेश

का वैध या समाप्त हो चुका पासपोर्ट है या

नहीं, यह जानकारी सोमवार को **केंद्रीय**

गृह मंत्रालय द्वारा अधिसूचित

नागरिकता नियमों में संशोधन के अनुसार

दी गई।

- A large number of the **Matua** community, the intended beneficiaries of **CAA**, reside.

यह कदम **भारतीय जनता पार्टी (BJP)** के पहली बार **पश्चिम बंगाल** में सत्ता में आने के कुछ दिनों बाद उठाया गया है, जहाँ **CAA** के इच्छित लाभार्थी **मतुआ** समुदाय की बड़ी आबादी रहती है।

- Most of the Matuas, who migrated from neighbouring **Bangladesh** during different time-periods, do not have sufficient documents to apply for citizenship under the **CAA**.

अधिकांश मतुआ, जो अलग-अलग समय में पड़ोसी **बांग्लादेश** से आए थे, उनके पास **CAA** के तहत नागरिकता के लिए आवेदन करने हेतु पर्याप्त दस्तावेज नहीं हैं।

- The **2019** legislation, which became effective on **March 11, 2024** through the notification of **CAA Rules**, requires an applicant to declare that they are foreigners along with a document issued by any government authority in **Afghanistan, Bangladesh or Pakistan** establishing their roots in the three countries.

2019 का यह कानून, जो 11 मार्च 2024 को **CAA Rules** की अधिसूचना के माध्यम से प्रभावी हुआ, आवेदक से यह घोषित करने की मांग करता है कि वह विदेशी है, साथ ही **अफगानिस्तान, बांग्लादेश या पाकिस्तान** की किसी सरकारी प्राधिकरण द्वारा जारी दस्तावेज भी प्रस्तुत करना होगा जो उन तीन देशों में उसकी जड़ों को स्थापित करे।

- The **CAA Rules** also enable local priests or a "locally reputed community institution" to issue the mandatory certificates certifying the faith of an applicant.



TELEGRAM CHANNEL: <https://t.me/patrioticIAS>

YOUTUBE CHANNEL: <https://www.youtube.com/@PatrioticIAS>

CONTACT: 9971932488



CAA Rules स्थानीय पुजारियों या “स्थानीय रूप से प्रतिष्ठित सामुदायिक संस्थानों” को भी आवेदक के धर्म की पुष्टि करने वाले अनिवार्य प्रमाणपत्र जारी करने की अनुमति देते हैं।

- **CAA facilitates citizenship to six non-Muslim communities — Hindu, Sikh, Parsi, Jain, Buddhist and Christian — from the three countries of Pakistan, Bangladesh and Afghanistan who entered India before December 31, 2014.**

CAA के तहत हिंदू, सिख, पारसी, जैन, बौद्ध और ईसाई समुदायों के लोगों को नागरिकता देने की सुविधा दी जाती है, जो पाकिस्तान, बांग्लादेश और अफगानिस्तान से 31 दिसंबर 2014 से पहले भारत आए थे।

- On Monday, the Ministry inserted a paragraph in **Schedule 1C** of the **CAA** application form where the applicant must declare if he/she is “not in possession of a valid and/or expired passport(s) issued by the Government of Pakistan/Afghanistan/Bangladesh.”

सोमवार को मंत्रालय ने **CAA** आवेदन पत्र के **Schedule 1C** में एक पैराग्राफ जोड़ा, जिसमें आवेदक को यह घोषित करना होगा कि उसके पास “पाकिस्तान/अफगानिस्तान/बांग्लादेश सरकार द्वारा जारी वैध और/या समाप्त पासपोर्ट नहीं है।”

- The form requires the applicant to provide the date and month of their entry to India and adds that they can be deprived of citizenship if the information is found to be incorrect.

फॉर्म में आवेदक को भारत में प्रवेश की तिथि और महीना बताना आवश्यक है और यह भी कहा गया है कि यदि जानकारी गलत पाई जाती है तो उसकी नागरिकता छीनी जा सकती है।

- The inserted paragraph added that if the applicant is “in possession” of a valid or expired passport, then details such as the passport number, date and place of issue, date of expiry are to be provided and the passport is to be surrendered before the **Senior Superintendent of Post** or **Superintendent of Post** within 15 days of approval of citizenship application, the notification said.

अधिसूचना में कहा गया है कि यदि आवेदक के पास वैध या समाप्त पासपोर्ट “मौजूद” है, तो पासपोर्ट नंबर, जारी करने की तिथि और स्थान, समाप्ति तिथि जैसी जानकारी देनी होगी और नागरिकता आवेदन स्वीकृत होने के 15 दिनों के भीतर पासपोर्ट को **सीनियर सुपरिंटेंडेंट ऑफ पोस्ट** या **सुपरिंटेंडेंट ऑफ पोस्ट** के समक्ष जमा करना होगा।



Jairam initiates privilege notice against Pradhan over 'impugned' remarks

GS II: Polity

The Hindu Bureau
NEW DELHI

Jairam Ramesh, Congress Chief Whip in the Rajya Sabha, on Monday moved a privilege notice against Union Education Minister Dharmendra Pradhan for his "derogatory" remarks that allegedly lowered the dignity of Parliament.

In his notice, Mr. Ramesh cited the Union Minister's remarks at a press conference on May 15.

The Minister, responding to a question on why the government did not implement the recommendations of the Parliamentary Standing Committee on Education on the National Testing Agency (NTA), said, "I will not comment on Parliamentary Standing Committee red flags. I will speak about the High-Level Committee of Experts (HLCE)/Radhakrishnan Committee. The Parliament Standing Committee has members from the Opposition. They write things in a certain manner; you also know that. Hence, I won't speak on the standing committee."

Mr. Ramesh said these "derogatory" comments revealed the Minister's "contempt for Parlia-



House row: Dharmendra Pradhan's comments lowered the dignity of Parliament, says Jairam Ramesh. SHIV KUMAR PUSHPAKAR/PTI

ment". "He has made these outrageous remarks while presiding over the rot in the Education Ministry that is destroying the future of lakhs of youth across the country," he said in a post on X.

He said the parliamentary committees were an extension of Parliament and were rightly referred to as mini-Parliament. "They [comments] are highly derogatory and seek to malign parliamentarians, parliamentary committees and the Parliament of India," he said. He also underlined that members of a parliamentary standing committee were drawn from all political parties.

"The Minister's impugned comments clearly indicate and reveal his contempt for the Parliament, parliamentary commit-

tees, members of the parliamentary committee that are drawn from all political parties and India's constitutional democracy itself," the former Union Minister said.

Mr. Ramesh said Mr. Pradhan had "deliberately lowered the stature and prestige of the institution of the standing committee simply because of its bipartisan nature".

"The Minister's comments are also tantamount to imputing dishonourable motives to members of parliamentary committees themselves," he said, and added, it was well established that any derogatory references to parliamentary committees or members of parliamentary committees constituted a "gross contempt" of parliamentary committees.

19M. Jairam initiates privilege notice against Pradhan over 'impugned' remarks

जयराम ने 'आपत्तिजनक'

टिप्पणियों को लेकर प्रधान के खिलाफ विशेषाधिकार नोटिस शुरू किया

- **Jairam Ramesh**, Congress Chief Whip in the Rajya Sabha, on Monday moved a privilege notice against Union Education Minister **Dharmendra Pradhan** for his "derogatory" remarks that allegedly lowered the dignity of Parliament.

राज्यसभा में कांग्रेस के मुख्य सचेतक

जयराम रमेश ने सोमवार को केंद्रीय

शिक्षा मंत्री धर्मेंद्र प्रधान के खिलाफ उनके

"अपमानजनक" बयानों को लेकर

विशेषाधिकार नोटिस दिया, जिनसे

कथित तौर पर संसद की गरिमा कम हुई।

- The Minister, responding to a question on why the government did not implement the recommendations of the **Parliamentary Standing Committee on Education on the National Testing Agency (NTA)**, said, "I will not comment on Parliamentary Standing Committee red flags.

मंत्री ने राष्ट्रीय परीक्षण एजेंसी (NTA)

पर शिक्षा संबंधी संसदीय स्थायी समिति

की सिफारिशों को सरकार द्वारा लागू न किए जाने के सवाल पर कहा, "मैं संसदीय स्थायी समिति के रेड फ्लैग्स पर टिप्पणी नहीं करूंगा।

- I will speak about the **High-Level Committee of Experts (HLCE)/Radhakrishnan Committee**. मैं हाई-लेवल कमेटी ऑफ एक्सपर्ट्स (HLCE)/राधाकृष्णन समिति के बारे में बात करूंगा।
- The **Parliament Standing Committee** has **members from the Opposition**. संसदीय स्थायी समिति में विपक्ष के सदस्य होते हैं।
- Mr. Ramesh said these "derogatory" comments revealed the Minister's "contempt for Parliament". श्री रमेश ने कहा कि ये "अपमानजनक" टिप्पणियाँ मंत्री की "संसद के प्रति अवमानना" को दर्शाती हैं।



'Political decision must on cut-off for mid-term polls under the simultaneous election system'

SS II: Polity
The Hindu Bureau
BENGALURU

A decision on the definition of the "remainder of the term" of the Lok Sabha or the Assemblies before an election is held will be a political one to be taken in consultation with political parties, P.P. Choudhary, Chairman of Joint Parliamentary Committee on simultaneous elections, said on Monday.

"Assuming the government loses majority after two-and-a-half years, mid-term election for the remaining two-and-a-half years' period can be held. However, a decision has to be made for a situation when the majority is lost with six months or three months left before the end

of the term. The decision to have a cut-off time to determine the remainder of the term will have to be a political one in consultation with parties," Mr. Choudhary told presspersons here.

He was speaking after holding consultations with various stakeholders on the Constitution (129th Amendment) Bill, 2024 and the Union Territories Laws (Amendment) Bill on the issue of simultaneous elections.

He suggested that an amendment to anti-defection legislation would be required while President's Rule can be applied for the remainder of the term.

Asked about a situation where a fractured mandate prevents formation of go-



P.P. Choudhary

vernment, Mr. Choudhary said that there is a mechanism to resolve it.

"Fractured mandate can be in any system. Various suggestions have come on how the synchronisation can be achieved.

Discussions are under way on the remainder of term."

Pointing out that the Constitution's 93rd amendment for local bodies that has addressed the remainder of the term, Choudhary said, "When that can be achieved at the grassroots level, why cannot it be incorporated in State Assemblies and Parliament? There could also be a possibility of electing a Chief Minister by the Assembly."

Old dilemma

"Nowhere in the world you see elections taking place for five or six Assemblies every year. Every one is affected in the chain. Programmes are not reaching people. Teachers are burdened with election work.

It is important for elections to be conducted together."

He pointed out that general elections and elections to State Assemblies were conducted simultaneously in four elections between 1952 and 1967.

To another question on whether it was going to be 'One Nation-One Party' system, Mr. Choudhary asked, "Do you think what happened between 1952 and 1967 was for one party? It is not being proposed by the Prime Minister [Narendra Modi]. The Election Commission had recommended it in 1980; Law Commission of India has recommended thrice in the past; and Parliamentary Standing Committee has recommended simultaneous elections in 2015."

19M. 'Political decision must on cut-off for mid-term polls under the simultaneous election system'

'एक साथ चुनाव प्रणाली के तहत मध्यावधि चुनावों के कट-ऑफ पर राजनीतिक निर्णय होना चाहिए'

- A decision on the definition of the "remainder of the term" of the Lok Sabha or the Assemblies before an election is held will be a political one to be taken in consultation with political parties, P.P. Choudhary, Chairman of Joint Parliamentary Committee on simultaneous elections, said on Monday.
लोकसभा या विधानसभाओं के "शेष कार्यकाल" की परिभाषा पर चुनाव होने से पहले लिया जाने वाला निर्णय एक राजनीतिक निर्णय होगा, जिसे राजनीतिक दलों से परामर्श करके लिया जाएगा, यह बात एक साथ चुनावों पर गठित संयुक्त संसदीय समिति के अध्यक्ष पी.पी. चौधरी ने सोमवार को कही।
- "Assuming the government loses majority after two-and-a-half years, mid-term election for the remaining two-and-a-half years' period can be held.
"मान लीजिए कि सरकार ढाई साल बाद बहुमत खो देती है, तो शेष ढाई वर्षों की अवधि के लिए मध्यावधि चुनाव कराए जा सकते हैं।
- However, a decision has to be made for a situation when the majority is lost with six months or three months left before the end of the term.
हालांकि, ऐसी स्थिति के लिए निर्णय लेना होगा जब कार्यकाल समाप्त होने से छह महीने या तीन महीने पहले बहुमत खो जाए।
- He was speaking after holding consultations with various stakeholders on the Constitution (129th Amendment) Bill, 2024 and the Union Territories Laws (Amendment) Bill on the issue of simultaneous elections.
वह एक साथ चुनावों के मुद्दे पर संविधान (129वाँ संशोधन) विधेयक, 2024 और केंद्र शासित प्रदेश कानून (संशोधन) विधेयक पर विभिन्न हितधारकों के साथ विचार-विमर्श करने के बाद बोल रहे थे।
- He suggested that an amendment to anti-defection legislation would be required while President's Rule can be applied for the remainder of the term.



उन्होंने सुझाव दिया कि दलबदल विरोधी कानून में संशोधन की आवश्यकता होगी, जबकि शेष कार्यकाल के लिए राष्ट्रपति शासन लागू किया जा सकता है।

- Pointing out that the Constitution's **93rd amendment for local bodies has addressed the remainder of the term**, Choudhary said, "When that can be achieved at the grassroots level, why cannot it be incorporated in State Assemblies and Parliament?"

यह बताते हुए कि स्थानीय निकायों के लिए संविधान के **93वें संशोधन** ने शेष कार्यकाल के मुद्दे को संबोधित किया है, चौधरी ने कहा, "जब इसे जमीनी स्तर पर लागू किया जा सकता है, तो इसे राज्य विधानसभाओं और संसद में क्यों नहीं शामिल किया जा सकता?"

Justice Varma case: inquiry panel submits probe report

GS II: Polity
Press Trust of India
NEW DELHI

The Judges Inquiry Committee investigating allegations against Justice Yashwant Varma – against whom impeachment proceedings were initiated over the discovery of unaccounted cash from his official residence during a fire – submitted its report to Lok Sabha Speaker Om Birla on Monday.

The report, which was presented in accordance with statutory requirements under the Judges (Inquiry) Act, 1968, will be laid before both Houses of Parliament in due course, officials said.

The three-member inquiry committee was constituted by the Speaker on August 12, 2025.

During a fire that broke out in the official residence of Justice Varma on the night of March 14, 2025, firefighters discovered massive amounts of burnt currency inside a storeroom.

An in-house committee constituted by former Chief Justice of India Sanjiv Khanna concluded that Justice Varma had "active or tacit control" over the specific storeroom where the cash was hidden.

In July 2025, over 200 MPs signed a motion to impeach the judge.

अधिकारियों ने कहा कि **जजेज (इन्क्वायरी) अधिनियम, 1968** के तहत वैधानिक आवश्यकताओं के अनुसार प्रस्तुत की गई यह रिपोर्ट उचित समय पर संसद के दोनों सदनों के समक्ष रखी जाएगी।

- The three-member inquiry committee was constituted by the Speaker on August 12, 2025. तीन सदस्यीय जांच समिति का गठन अध्यक्ष द्वारा 12 अगस्त 2025 को किया गया था।
- An in-house committee constituted by former **Chief Justice of India Sanjiv Khanna** concluded that **Justice Varma** had "active or tacit control" over the specific storeroom where

- "Nowhere in the world you see elections taking place for five or six Assemblies every year.

"दुनिया में कहीं भी आप हर साल पाँच या छह विधानसभाओं के चुनाव होते नहीं देखते।

- Every one is affected in the chain.

इससे पूरी व्यवस्था प्रभावित होती है।

- Programmes are not reaching people.

योजनाएँ लोगों तक नहीं पहुँच पा रही हैं।

- Teachers are burdened with election work.

शिक्षकों पर चुनावी कार्य का बोझ पड़ता है।

- He pointed out that **general elections and elections to State Assemblies were conducted simultaneously in four elections between 1952 and 1967.**

उन्होंने बताया कि 1952 से 1967 के बीच चार बार आम चुनाव और राज्य विधानसभाओं के चुनाव एक साथ कराए गए थे।

- The **Election Commission** had recommended it in 1980; **Law Commission of India** has recommended thrice in the past; and **Parliamentary Standing Committee** has recommended simultaneous elections in 2015."

चुनाव आयोग ने 1980 में इसकी सिफारिश की थी; भारत के विधि आयोग ने अतीत में तीन बार इसकी सिफारिश की है; और संसदीय स्थायी समिति ने 2015 में एक साथ चुनाव कराने की सिफारिश की थी।" 9616406099

19M. Justice Varma case: inquiry panel submits probe report न्यायमूर्ति वर्मा मामला: जांच पैनल ने जांच रिपोर्ट सौंपी

- The **Judges Inquiry Committee** investigating allegations against **Justice Yashwant Varma** — against whom impeachment proceedings were initiated over the discovery of unaccounted cash from his official residence during a fire — submitted its report to **Lok Sabha Speaker Om Birla** on Monday.

न्यायमूर्ति यशवंत वर्मा के खिलाफ आरोपों की जांच कर रही जजेज इन्क्वायरी कमेटी — जिनके खिलाफ आग लगने के दौरान उनके सरकारी आवास से बेहिसाब नकदी मिलने पर महाभियोग की कार्यवाही शुरू की गई थी — ने सोमवार को अपनी रिपोर्ट लोकसभा अध्यक्ष ओम बिरला को सौंप दी।

- The report, which was presented in accordance with statutory requirements under the **Judges (Inquiry) Act, 1968**, will be laid before both Houses of Parliament in due course, officials said.



the cash was hidden.

पूर्व भारत के मुख्य न्यायाधीश संजीव खन्ना द्वारा गठित एक आंतरिक समिति ने निष्कर्ष निकाला कि जिस विशेष स्टोररूम में नकदी छिपाई गई थी, उस पर न्यायमूर्ति वर्मा का "सक्रिय या मौन नियंत्रण" था।

GS Paper II: Governance		19 May 2026
TOPICS COVERED		
19M	Panel to review reforms of National Testing Agency राष्ट्रीय परीक्षण एजेंसी के सुधारों की समीक्षा करेगा पैनल	
19M	RTI Act does not apply to Cricket Board, says CIC order आरटीआई अधिनियम क्रिकेट बोर्ड पर लागू नहीं होता, सीआईसी के आदेश में कहा गया	

Panel to review reforms of National Testing Agency

GS II: Governance
The Hindu Bureau

NEW DELHI

The Parliamentary Standing Committee on Education, Women, Children, Youth and Sports will on May 21 seek the views of top Education Ministry officials on the alleged NEET-UG paper leak and on reforms of the National Testing Agency (NTA), which conducts centralised admission tests for various higher education courses, a Rajya Sabha notice said.

The agenda includes a review of the implementation of the K. Radhakrishnan Committee report on NTA reforms, as well as an update on the investigation into the alleged paper leak.

The committee, headed by senior Congress leader Digvijaya Singh, has summoned the Secretary of the Department of Higher Education, Ministry of Education, Vineet Joshi, and NTA Chairperson Pradeep Kumar Joshi for deliberations.

The NTA cancelled the NEET-UG held on May 3 amid allegations of irregularities. Nearly 23 lakh candidates had registered for the test, which was administered across the country.



SFI stages protest against the cancellation of NEET UG 2026 in Kochi. THULASI KAKKAT

Education Minister Dharmendra Pradhan on Friday announced that the NEET-UG re-examination would be held on June 21, adding that the medical entrance exam would be conducted in a computer-based format from next year.

Students' employability
The panel will also deliberate on the impact of Artificial Intelligence (AI) on education and on strategies to enhance students' employability.

Representatives from Anthropic India, Pratham, IIT Kanpur, Infosys and IIT Madras are among those summoned for the discussions.

enhance students' employability.

पैनल शिक्षा पर आर्टिफिशियल इंटेलिजेंस (AI) के प्रभाव और छात्रों की रोजगार क्षमता बढ़ाने की रणनीतियों पर भी विचार-विमर्श करेगा।

- Representatives from Anthropic India, Pratham, IIT Kanpur, Infosys and IIT Madras are among those summoned for the discussions.

19M. Panel to review reforms of National Testing Agency

राष्ट्रीय परीक्षण एजेंसी के सुधारों की समीक्षा करेगा पैनल

- The Parliamentary Standing Committee on Education, Women, Children, Youth and Sports will on May 21 seek the views of top Education Ministry officials on the alleged NEET-UG paper leak and on reforms of the National Testing Agency (NTA), which conducts centralised admission tests for various higher education courses, a Rajya Sabha notice said.

शिक्षा, महिला, बाल, युवा और खेल संबंधी संसदीय स्थायी समिति 21 मई को कथित NEET-UG पेपर लीक और विभिन्न उच्च शिक्षा पाठ्यक्रमों के लिए केंद्रीकृत प्रवेश परीक्षाएँ आयोजित करने वाली राष्ट्रीय परीक्षण एजेंसी (NTA) के सुधारों पर शीर्ष शिक्षा मंत्रालय अधिकारियों के विचार जानेगी, ऐसा राज्यसभा की एक सूचना में कहा गया।

- The agenda includes a review of the implementation of the K. Radhakrishnan Committee report on NTA reforms, as well as an update on the investigation into the alleged paper leak.

कार्यसूची में NTA सुधारों पर के. राधाकृष्णन समिति की रिपोर्ट के कार्यान्वयन की समीक्षा और कथित पेपर लीक की जांच पर अद्यतन जानकारी शामिल है।

- The committee, headed by senior Congress leader Digvijaya Singh, has summoned the Secretary of the Department of Higher Education, Ministry of Education, Vineet Joshi, and NTA Chairperson Pradeep Kumar Joshi for deliberations.

वरिष्ठ कांग्रेस नेता दिग्विजय सिंह की अध्यक्षता वाली समिति ने विचार-विमर्श के लिए उच्च शिक्षा विभाग, शिक्षा मंत्रालय के सचिव विनीत जोशी और NTA अध्यक्ष प्रदीप कुमार जोशी को तलब किया है।

- The panel will also deliberate on the impact of Artificial Intelligence (AI) on education and on strategies to



चर्चा के लिए बुलाए गए लोगों में Anthropic India, Pratham, IIT Kanpur, Infosys और IIT Madras के प्रतिनिधि शामिल हैं।

RTI Act does not apply to Cricket Board, says CIC order

GS II: Governance
 Aaratrika Bhaumik
 NEW DELHI

The Central Information Commission (CIC) on Monday held that the BCCI does not fall within the ambit of a "public authority" under the RTI Act, observing that the cricket board functions as an autonomous body neither "directly nor indirectly" financed by the government.

Information Commissioner P.R. Ramesh held that the BCCI, registered under the Tamil Nadu Societies Registration Act, 1975, was "neither established by the Constitution, nor created by any legislation or government order". "Since the Board of Control for Cricket in India is neither materially dependent upon nor sustained by government funds, it does not satisfy the requirement of being "substantially financed, directly or indirectly, by funds provided by the appropriate government" under Section 2(h)(d) of the Right to Information Act, 2005 and therefore cannot be regarded as a 'Public Authority' thereunder", held the CIC while dismissing the plea, filed by Geeta Rani.

19M. RTI Act does not apply to Cricket Board, says CIC order आरटीआई अधिनियम क्रिकेट बोर्ड पर लागू नहीं होता, सीआईसी के आदेश में कहा गया

- The **Central Information Commission (CIC)** on Monday held that the **BCCI** does not fall within the ambit of a "public authority" under the **RTI Act**, observing that the cricket board functions as an autonomous body neither "directly nor indirectly" financed by the government.

केंद्रीय सूचना आयोग (CIC) ने सोमवार को कहा कि **BCCI**, **RTI Act** के तहत "लोक प्राधिकरण" की परिभाषा में नहीं आता, क्योंकि क्रिकेट बोर्ड एक स्वायत्त संस्था के रूप में कार्य करता है जिसे सरकार द्वारा न तो "प्रत्यक्ष रूप से और न ही अप्रत्यक्ष रूप से" वित्तपोषित किया जाता है।

- Information Commissioner **P.R. Ramesh** held that the **BCCI**, registered under the **Tamil Nadu Societies Registration Act, 1975**, was "neither established by the Constitution, nor created by any legislation or government order".

सूचना आयुक्त **पी.आर. रमेश** ने कहा कि **तमिलनाडु सोसायटी पंजीकरण अधिनियम, 1975** के तहत पंजीकृत **BCCI** "न तो संविधान द्वारा स्थापित किया गया है और न ही किसी कानून या सरकारी आदेश द्वारा बनाया गया है।"

- "Since the **Board of Control for Cricket in India** is neither materially dependent upon nor sustained by government funds, it does not satisfy the requirement of being "substantially financed, directly or indirectly, by funds provided by the appropriate government" under **Section 2(h)(d)** of the **Right to Information Act, 2005** and therefore cannot be regarded as a 'Public Authority' thereunder", held the **CIC** while dismissing the plea, filed by **Geeta Rani**.

"चूंकि **भारतीय क्रिकेट कंट्रोल बोर्ड** न तो सरकारी धन पर भौतिक रूप से निर्भर है और न ही उससे संचालित होता है, इसलिए यह सूचना का अधिकार अधिनियम, 2005 की धारा 2(h)(d) के तहत 'उपयुक्त सरकार द्वारा प्रत्यक्ष या अप्रत्यक्ष रूप से पर्याप्त वित्तपोषित' होने की शर्त को पूरा नहीं करता और इसलिए इसे 'लोक प्राधिकरण' नहीं माना जा सकता," **CIC** ने **गीता रानी** द्वारा दायर याचिका को खारिज करते हुए कहा।

GS Paper II: International Relations		19 May 2026
TOPICS COVERED		
19M	Modi meets Norwegian PM as they upgrade their ties to Green Strategic Partnership मोदी ने नॉर्वे के प्रधानमंत्री से मुलाकात की, दोनों देशों ने संबंधों को ग्रीन स्ट्रैटेजिक पार्टनरशिप तक बढ़ाया	
19M	Strategic spark in India-South Korea defence ties भारत-दक्षिण कोरिया रक्षा संबंधों में रणनीतिक नई ऊर्जा	



Modi meets Norwegian PM as they upgrade their ties to Green Strategic Partnership

GS II: IR

MOB

Suhasini Haidar
OSLO

India and Norway have differences, but they must unite against countries that “weaponise” diplomacy, trade, and technology, said Norwegian Prime Minister Jonas Gahr Støre here on Monday after talks with Prime Minister Narendra Modi, as the two countries upgraded ties to a “Green Strategic Partnership”.

In statements to the media, both leaders emphasised their discussions on geopolitical conflicts in Ukraine and West Asia, with Mr. Modi contrasting the “instability and uncertainty” brought by the conflicts while India and Europe are entering a “new golden era” in ties.

“Both India and Norway believe in a rules-based order, dialogue, and diplomacy. We are unanimous that no issue can be resolved through military conflict. Whether it is Ukraine or West Asia, we support, and will continue to support, an early end to conflict and every effort toward peace,” he said.

He said that the Trade and Economic Partnership Agreement signed last year with Norway and three EFTA countries — Switzerland, Iceland, Liechtenstein — as well as the Green Strategic Partnership announced on Monday, would combine India’s scale, speed, and talent with Norway’s technology and capital.

“From the Arctic to outer space, from green shipping to the blue economy, and from energy security to food security, our cooperation is touching new frontiers,” Mr. Modi added, saying that the EFTA deal



Vital meeting: Prime Minister Narendra Modi with his Norwegian counterpart in Oslo on Monday. ANI

would aim to create \$100 billion in investment and “one million jobs in India”.

Mr. Støre called India “a leading global force in technology, innovation, and renewable energy”.

In a possible reference to the Russia-Ukraine war, Mr. Støre acknowledged there were differences between India and Norway, but that it was necessary to work through them. Norway, which has urged India to condemn the Russian invasion of Ukraine in the past and to reduce its intake of Russian oil, is also hoping to offer India alternative supplies of oil and gas that Norway is a major exporter of.

“Trade weaponisation”

“We have to stand up against those who weaponise diplomacy, who weaponise trade, and who weaponise technology. At a time of rising protectionism and more tense geopolitical dynamics, it is more important than ever to stand together for a rule-based order,” Mr. Støre said, possibly referring not only to Russia, but also the U.S. and China on unilateralism and protectionism, as well as Iran for the Strait

of Hormuz blockade that has held up energy trade.

Mr. Støre said that Norway and India “do not always see eye to eye on all issues”, which was common. “We are both respectful democracies who handle those issues in ways that live up to democratic standards,” he added.

As the two leaders completed their statements, the event saw an unusual moment when a Norwegian journalist stood up to protest the fact that the Prime Ministers did not take questions from the media from both countries present. At Mr. Modi’s earlier stop in the Netherlands too, local Dutch media had objected to the lack of a press conference as is customary there. While Mr. Modi did not respond to the question, PM Støre returned to the media room afterwards, and gave interviews to local media.

The two Prime Ministers will join leaders of Sweden, Denmark, Iceland and Finland for the Nordic-India summit on Tuesday.

(The reporter is in Norway at the invitation of the Norwegian Ministry of Foreign Affairs to cover the Nordic Summit)

19M. Modi meets Norwegian PM as they upgrade their ties to Green Strategic Partnership

मोदी ने नॉर्वे के प्रधानमंत्री से मुलाकात की, दोनों देशों ने संबंधों को ग्रीन स्ट्रैटेजिक पार्टनरशिप तक बढ़ाया

- He said that the **Trade and Economic Partnership Agreement** signed last year with Norway and three EFTA countries — **Switzerland, Iceland, Liechtenstein** — as well as the **Green Strategic Partnership** announced on Monday, would combine India’s scale, speed, and talent with Norway’s technology and capital.

उन्होंने कहा कि पिछले वर्ष नॉर्वे और तीन EFTA देशों —

स्विट्जरलैंड, आइसलैंड, लिक्टेनस्टीन — के साथ हस्ताक्षरित

व्यापार और आर्थिक साझेदारी समझौता तथा सोमवार को

घोषित ग्रीन स्ट्रैटेजिक पार्टनरशिप, भारत के पैमाने, गति और

प्रतिभा को नॉर्वे की तकनीक और पूंजी के साथ जोड़ेंगे।

- “From the **Arctic** to outer space, from green shipping to the blue economy, and from energy security to food security, our cooperation is touching new frontiers,” Mr. Modi added, saying that the EFTA deal would aim to create \$100 billion in investment and “one million jobs in India”.

“आर्कटिक से लेकर अंतरिक्ष तक, हरित शिपिंग से लेकर ब्लू

इकोनॉमी तक, और ऊर्जा सुरक्षा से लेकर खाद्य सुरक्षा तक,

हमारा सहयोग नई सीमाओं को छू रहा है,” श्री मोदी ने कहा और

जोड़ा कि EFTA समझौते का लक्ष्य 100 अरब डॉलर का निवेश

और “भारत में दस लाख नौकरियाँ” पैदा करना है।

- The two Prime Ministers will join leaders of **Sweden, Denmark, Iceland and Finland** for the **Nordic-India summit** on Tuesday.

दोनों प्रधानमंत्री मंगलवार को स्वीडन, डेनमार्क, आइसलैंड और

फिनलैंड के नेताओं के साथ नॉर्डिक-इंडिया शिखर सम्मेलन में

शामिल होंगे।



Strategic spark in India-South Korea defence ties

The visit of the Indian Defence Minister to Seoul (May 19-21), following the South Korean President's visit to India (April 19-21, 2026), underscores the growing momentum and strategic significance of the India-South Korea partnership in recent years.

What began as limited defence engagement has evolved into a multidimensional partnership in defence manufacturing, technology transfer, and military modernisation. The K9 Vajra-T programme, developed under the 'Make in India' initiative, has become the flagship project of India-South Korea defence cooperation, paving the way for several other successful initiatives.

Project areas

Today, bilateral defence cooperation is expanding rapidly, with several new projects under consideration. Submarine collaboration has emerged as a key focus area, driven by South Korea's expertise in conventional submarines, lithium-ion battery systems, and air-independent propulsion technologies through companies such as Hanwha Ocean. South Korea's advancing aerospace sector, including the KF-21 fighter programme and the FA-50 light combat aircraft, has opened new avenues for collaboration in fighter technologies, engines, avionics, missile integration, and maintenance systems.

As one of the world's leading shipbuilding powers, South Korea can significantly contribute to India's growing maritime ambitions in the Indo-Pacific through cooperation in destroyers, logistics vessels, submarine support systems, smart shipyards, and naval propulsion technologies.

Discussions are also progressing in areas such as light tanks, utility helicopters, future ready combat vehicles, military lithium batteries, and defence electronics. Indian and Korean defence firms are pursuing joint ventures and industrial partnerships across multiple sectors.

Importantly, the partnership is evolving



Lakhvinder Singh
Director of Peace and Security Studies at the Asia Institute in Seoul, South Korea

Expanding defence cooperation will reflect shared regional security priorities

beyond conventional weapons systems toward innovation-driven cooperation. Both countries are promoting defence innovation ecosystems linking startups, universities, research institutions, incubators, and investors. The proposed Korea-India Defence Accelerator (KIND-X) reflects this future-oriented approach.

At the strategic level, military exchanges, naval exercises, coast guard cooperation, and defence dialogues are strengthening interoperability and mutual trust. For India, South Korea offers advanced technology and manufacturing expertise, while India provides a large market, strategic geography, and long-term industrial opportunities. Together, the two countries have the potential to build one of Asia's most significant defence partnerships.

Cooperation in the defence industrial sector represents a significant indicator of the growing maturity and strategic depth of bilateral relations. However, it would be a serious strategic miscalculation for both countries to confine this partnership solely to these domains.

An evolving Indo-Pacific environment

The rapidly evolving Indo-Pacific geopolitical environment requires India and South Korea to expand their defence cooperation beyond industrial ties toward a broader strategic partnership focused on regional stability and shared security goals.

The next phase of defence engagement should, therefore, focus on formulating an institutionalised and forward-looking defence road map encompassing emerging security threats across the wider Indo-Pacific region. Such a framework must move beyond the current primarily defence-industrial focus of cooperation and evolve into a multidimensional partnership grounded in shared security concerns, geopolitical stability, and regional resilience.

The geopolitical landscape around the Korean Peninsula is changing rapidly. North Korea's

growing missile and nuclear capabilities continue to pose a serious threat to South Korea, while expanding Russia-North Korea military cooperation is reshaping Northeast Asia's security architecture.

China's growing naval assertiveness around the Korean Peninsula has created new strategic concerns for South Korea. Beijing's expanding influence and military presence in the South China Sea also carry major implications for South Korea, as a significant share of its energy imports and maritime trade passes through these waters.

South Korea is also facing serious structural challenges. Its declining demographic profile and shrinking pool of military recruits are weakening the long-term sustainability of its conventional defence posture. Combined with a rapidly changing security environment, these internal vulnerabilities create a complex strategic situation requiring urgent and sustained policy attention from countries seeking long-term strategic cooperation with Seoul.

Need for a strategic convergence

In this context, it is essential for India's strategic thinkers and defence planners to pay closer attention to changing geopolitical realities in South Korea. Ignoring these developments could undermine both South Korea's security and India's broader Indo-Pacific interests.

If India seeks to substantially expand its defence-industrial cooperation with South Korea, it must recognise that such cooperation depends on South Korea's security, stability, and strategic resilience. Strengthening South Korea's ability to address its security challenges should be central to this partnership.

The Indian Defence Minister's visit to Seoul should lead to the beginning of a new phase in India-South Korea defence cooperation – one that moves beyond defence-industrial ties toward a broader partnership grounded in shared security interests and Indo-Pacific stability.

19M. Strategic spark in India-South Korea defence ties

भारत-दक्षिण कोरिया रक्षा संबंधों में रणनीतिक नई ऊर्जा

- The visit of the **Indian Defence Minister to Seoul (May 19-21)**, following the **South Korean President's visit to India (April 19-21, 2026)**, underscores the growing momentum and strategic significance of the **India-South Korea partnership** in recent years.
भारतीय रक्षा मंत्री की सियोल यात्रा (19-21 मई), जो **दक्षिण कोरिया के राष्ट्रपति की भारत यात्रा (19-21 अप्रैल, 2026)** के पश्चात हुई, हाल के वर्षों में **भारत-दक्षिण कोरिया साझेदारी** की बढ़ती गति और रणनीतिक महत्त्व को रेखांकित करती है।
- The **K9 Vajra-T programme**, developed under the **'Make in India'** initiative, has become the **flagship project of India-South Korea defence cooperation**, paving the way for several other successful initiatives.
'मेक इन इंडिया' पहल के अंतर्गत विकसित **के9 वज्र-टी कार्यक्रम**, **भारत-दक्षिण कोरिया रक्षा सहयोग** की प्रमुख परियोजना बन चुका है, जिसने अनेक अन्य सफल पहलों के लिए मार्ग प्रशस्त किया है।
- Submarine collaboration** has emerged as a key focus area, driven by **South Korea's** expertise in conventional submarines, lithium-ion battery systems, and air-independent propulsion technologies through companies such as **Hanwha Ocean**.
पनडुब्बी सहयोग एक प्रमुख केंद्रबिंदु के रूप में उभरा है, जिसे पारंपरिक पनडुब्बियों, लिथियम-आयन बैटरी प्रणालियों तथा वायु-स्वतंत्र प्रणोदन प्रौद्योगिकियों में **दक्षिण कोरिया** की विशेषज्ञता ने प्रेरित किया है, विशेषकर **हनवहा ओशन** जैसी कंपनियों के माध्यम से।
- South Korea's** advancing aerospace sector, including the **KF-21 fighter programme** and the **FA-50 light combat aircraft**, has opened new avenues for collaboration in fighter technologies,



engines, avionics, missile integration, and maintenance systems.

दक्षिण कोरिया का उन्नत होता एयरोस्पेस क्षेत्र, जिसमें केएफ-21 लड़ाकू कार्यक्रम तथा एफए-50 हल्का लड़ाकू विमान शामिल हैं, लड़ाकू प्रौद्योगिकियों, इंजनों, एवियोनिक्स, मिसाइल एकीकरण तथा रखरखाव प्रणालियों में सहयोग के नए अवसर खोल रहा है।

- As one of the world's leading shipbuilding powers, South Korea can significantly contribute to India's growing maritime ambitions in the Indo-Pacific through cooperation in destroyers, logistics vessels, submarine support systems, smart shipyards, and naval propulsion technologies.

विश्व की अग्रणी जहाज़ निर्माण शक्तियों में से एक होने के नाते, दक्षिण कोरिया विध्वंसक पोतों, लॉजिस्टिक जहाज़ों, पनडुब्बी समर्थन प्रणालियों, स्मार्ट शिपयार्ड तथा नौसैनिक प्रणोदन प्रौद्योगिकियों में सहयोग के माध्यम से हिंद-प्रशांत क्षेत्र में भारत की बढ़ती समुद्री महत्वाकांक्षाओं में महत्वपूर्ण योगदान दे सकता है।

- The proposed Korea-India Defence Accelerator (KIND-X) reflects this future-oriented approach.

प्रस्तावित कोरिया-भारत रक्षा त्वरक (काइंड-एक्स) इस भविष्य-उन्मुख दृष्टिकोण को प्रतिबिंबित करता है।

- For India, South Korea offers advanced technology and manufacturing expertise, while India provides a large market, strategic geography, and long-term industrial opportunities.

भारत के लिए, दक्षिण कोरिया उन्नत प्रौद्योगिकी एवं विनिर्माण विशेषज्ञता प्रदान करता है, जबकि भारत एक विशाल बाज़ार, रणनीतिक भौगोलिक स्थिति तथा दीर्घकालिक औद्योगिक अवसर उपलब्ध कराता है।

GS Paper III: Economy		19 May 2026
TOPICS COVERED		
19M	Unlearnt lessons न सीखे गए सबक	
19M	Improving efficiency of fertilizer use in India भारत में उर्वरकों के उपयोग की दक्षता में सुधार	
19M	The warning signs in India's import bill भारत के आयात बिल में चेतावनी के संकेत	
19M	EU chief wants to seal pact on investment with India यूरोपीय संघ प्रमुख भारत के साथ निवेश समझौते को अंतिम रूप देना चाहती हैं	
19M	Food Corporation to raise short-term debt of ₹50,000 crore भारतीय खाद्य निगम ₹50,000 करोड़ का अल्पकालिक ऋण जुटाएगा	



GS III: Economy

Unlearnt lessons

India's inadequate strategic petroleum and gas reserves stand exposed

Last week, the Centre hiked retail petroleum product prices after a gap of four years. This was expected, since the government had been warning about high crude prices, and how public sector oil marketing companies (OMCs) had been bleeding heavily due to under-recoveries. It was also expected that this would happen after the results of the five Assembly elections. But the Prime Minister's appeal for austerity due to the drain on foreign exchange, the sharp depreciation of the rupee in recent months and the April's inflation prints point to a much deeper problem that India could have addressed decades earlier – the country's inadequate strategic petroleum and gas reserves. India did build out a strategic petroleum reserve (SPR) of about 36.7 million-39 million barrels, a programme conceived following the post-1991 vulnerability and formalised in the early 2000s. But today, this covers about seven days of consumption demand at 5.5 million barrels per day (mbpd). Combined with inventories of OMCs and import cover, this amounts to more than 70 days of stock. But over the years, India has emerged as the world's third-largest automobile market after the U.S. and China, and a comparison with those nations reveals the scale of India's vulnerability.

While the U.S. built its SPRs in the aftermath of the 1973 oil shock – which, at 714 million barrels, is 18 times larger than India's – China's roughly 900 million barrels is even larger. The U.S. has about 400 million barrels currently in its reserve system, providing it with roughly 20 days of consumption. The country has emerged as the world's largest oil producer in the past 10 years with an output of about 13 mbpd and a commercial system wide inventory, pushing it above the 90 day-mark recommended by the International Energy Agency for reserves. The same applies to China, which is comparable with India as a more oil import-dependent nation. These numbers become even starker when compared with reserves for liquefied petroleum gas (LPG) and liquefied natural gas (LNG), where India is most exposed. India has about 1.4 lakh tonnes of LPG storage, while its daily consumption is about 80,000 tonnes – more than half its reserve capacity. As for LNG, India largely relies on stocks at regasification facilities of Petronet LNG and BPCL, without any underground storage for a fuel vital to produce fertilizers. Both the U.S. and China have heavily invested in underground LNG storage. The EU was quick to adapt following the Russia-Ukraine war as it drew down its dependence on Russian gas. These reserves have enabled advanced economies to hedge against supply disruptions by relying on long-term contracts at times of supply disruptions, cushioning them from spot market spikes. As for China, its defiance of American sanctions against Russian oil has paid off handsomely. India would have benefited too, had it maintained greater strategic autonomy.

- Combined with inventories of OMCs and import cover, this amounts to more than 70 days of stock. ओएमसीs के भंडार तथा आयात सुरक्षा के साथ मिलाकर यह कुल मिलाकर 70 दिनों से अधिक का भंडार बनता है।
- But over the years, India has emerged as the world's third-largest automobile market after the U.S. and China, and a comparison with those nations reveals the scale of India's vulnerability.

किन्तु वर्षों के दौरान, भारत अमेरिका और चीन के बाद विश्व का तीसरा सबसे बड़ा ऑटोमोबाइल बाज़ार बनकर उभरा है, और इन देशों के साथ तुलना करने पर भारत की संवेदनशीलता का स्तर स्पष्ट होता है।

19M. Unlearnt lessons

न सीखे गए सबक

India's inadequate strategic petroleum and gas reserves stand exposed.

भारत के अपर्याप्त रणनीतिक पेट्रोलियम तथा गैस भंडार उजागर हो गए हैं।

Last week, the Centre hiked retail petroleum product prices after a gap of four years.

पिछले सप्ताह, केंद्र सरकार ने चार वर्षों के अंतराल के बाद खुदरा पेट्रोलियम उत्पादों की कीमतों में वृद्धि की।

This was expected, since the government had been warning about high crude prices, and how public sector oil marketing companies (OMCs) had been bleeding heavily due to under-recoveries.

यह अपेक्षित था, क्योंकि सरकार उच्च कच्चे तेल की कीमतों तथा सार्वजनिक क्षेत्र की तेल विपणन कंपनियों (ओएमसीs) को कम वसूली के कारण हो रहे भारी नुकसान के बारे में चेतावनी देती रही थी।

It was also expected that this would happen after the results of the five Assembly elections.

यह भी अपेक्षित था कि यह कदम पाँच विधानसभा चुनावों के परिणाम आने के बाद उठाया जाएगा।

But the Prime Minister's appeal for austerity due to the drain on foreign exchange, the sharp depreciation of the rupee in recent months and the April's inflation prints point to a much deeper problem that India could have addressed decades earlier – the country's inadequate strategic petroleum and gas reserves.

किन्तु विदेशी मुद्रा भंडार पर दबाव के कारण प्रधानमंत्री द्वारा मितव्ययिता की अपील, हाल के महीनों में रुपये का तीव्र अवमूल्यन तथा अप्रैल की मुद्रास्फीति दरें एक कहीं अधिक गंभीर समस्या की ओर संकेत करती हैं, जिसे भारत दशकों पहले संबोधित कर सकता था — देश के अपर्याप्त रणनीतिक पेट्रोलियम एवं गैस भंडार।

India did build out a strategic petroleum reserve (SPR) of about 36.7 million-39 million barrels, a programme conceived following the post-1991 vulnerability and formalised in the early 2000s.

भारत ने लगभग 36.7 मिलियन से 39 मिलियन बैरल का रणनीतिक पेट्रोलियम भंडार (एसपीआर) अवश्य विकसित किया, जिसकी परिकल्पना 1991 के बाद उत्पन्न संवेदनशीलता के पश्चात की गई थी और जिसे 2000 के दशक के प्रारंभ में औपचारिक रूप दिया गया।

But today, this covers about seven days of consumption demand at 5.5 million barrels per day (mbpd).

किन्तु आज यह 5.5 मिलियन बैरल प्रतिदिन (एमबीपीडी) की खपत मांग के अनुसार केवल लगभग सात दिनों की आवश्यकता को ही पूरा करता है।



- While the **U.S.** built its **SPRs** in the aftermath of the 1973 oil shock — which, at 714 million barrels, is 18 times larger than **India's** — **China's** roughly 900 million barrels is even larger. जहाँ अमेरिका ने 1973 के तेल संकट के बाद अपने **रणनीतिक पेट्रोलियम भंडार** विकसित किए — जो 714 मिलियन बैरल के साथ **भारत** के भंडार से 18 गुना बड़े हैं — वहीं **चीन** का लगभग 900 मिलियन बैरल का भंडार इससे भी बड़ा है।
- The **U.S.** has about 400 million barrels currently in its reserve system, providing it with roughly 20 days of consumption. वर्तमान में **अमेरिका** के भंडार प्रणाली में लगभग 400 मिलियन बैरल तेल उपलब्ध है, जो उसे लगभग 20 दिनों की खपत सुरक्षा प्रदान करता है।
- The country has emerged as the world's largest oil producer in the past 10 years with an output of about 13 mbpd and a commercial system wide inventory, pushing it above the 90 day-mark recommended by the **International Energy Agency** for reserves. पिछले 10 वर्षों में यह देश लगभग 13 **एमबीपीडी** उत्पादन तथा व्यापक वाणिज्यिक भंडार के साथ विश्व का सबसे बड़ा तेल उत्पादक बनकर उभरा है, जिससे यह भंडार के लिए **अंतरराष्ट्रीय ऊर्जा एजेंसी** द्वारा अनुशंसित 90 दिनों की सीमा से ऊपर पहुँच गया है।
- The same applies to **China**, which is comparable with **India** as a more oil import-dependent nation. यही स्थिति **चीन** पर भी लागू होती है, जो तेल आयात पर अधिक निर्भर राष्ट्र के रूप में **भारत** के समान है।
- These numbers become even starker when compared with reserves for **liquefied petroleum gas (LPG)** and **liquefied natural gas (LNG)**, where **India** is most exposed. ये आँकड़े तब और अधिक गंभीर प्रतीत होते हैं जब उनकी तुलना द्रवीकृत पेट्रोलियम गैस (**एलपीजी**) तथा द्रवीकृत प्राकृतिक गैस (**एलएनजी**) के भंडार से की जाती है, जहाँ **भारत** सबसे अधिक संवेदनशील है।
- **India** has about 1.4 lakh tonnes of **LPG** storage, while its daily consumption is about 80,000 tonnes — more than half its reserve capacity. **भारत** के पास लगभग 1.4 लाख टन **एलपीजी** भंडारण क्षमता है, जबकि इसकी दैनिक खपत लगभग 80,000 टन है — जो उसकी कुल भंडारण क्षमता के आधे से अधिक है।
- As for **LNG**, **India** largely relies on stocks at regasification facilities of **Petronet LNG** and **BPCL**, without any underground storage for a fuel vital to produce fertilizers. जहाँ तक **एलएनजी** का प्रश्न है, **भारत** मुख्यतः **पेट्रोनेट एलएनजी** और **बीपीसीएल** की पुनर्गैसीकरण सुविधाओं में उपलब्ध भंडार पर निर्भर है, जबकि उर्वरक उत्पादन के लिए अत्यंत महत्वपूर्ण इस ईंधन हेतु कोई भूमिगत भंडारण उपलब्ध नहीं है।
- Both the **U.S.** and **China** have heavily invested in underground **LNG** storage. **अमेरिका** और **चीन** दोनों ने भूमिगत **एलएनजी** भंडारण में भारी निवेश किया है।
- The **EU** was quick to adapt following the **Russia-Ukraine war** as it drew down its dependence on Russian gas. **यूरोपीय संघ** ने **रूस-यूक्रेन युद्ध** के बाद रूसी गैस पर अपनी निर्भरता कम करते हुए शीघ्रता से अनुकूलन कर लिया।
- These reserves have enabled advanced economies to hedge against supply disruptions by relying on long-term contracts at times of supply disruptions, cushioning them from spot market spikes. इन भंडारों ने विकसित अर्थव्यवस्थाओं को आपूर्ति व्यवधान के समय दीर्घकालिक अनुबंधों पर निर्भर रहकर आपूर्ति संकट से सुरक्षा प्राप्त करने तथा स्पॉट बाज़ार में अचानक बढ़ती कीमतों के प्रभाव से बचने में सक्षम बनाया है।
- As for **China**, its dependence of American sanctions against Russian oil has paid off handsomely. जहाँ तक **चीन** का संबंध है, रूसी तेल के विरुद्ध अमेरिकी प्रतिबंधों की अवहेलना करना उसके लिए अत्यंत लाभकारी सिद्ध हुआ है।



- **India** would have benefited too, had it maintained greater strategic autonomy.
यदि भारत ने अधिक रणनीतिक स्वायत्तता बनाए रखी होती, तो उसे भी इसका लाभ प्राप्त हो सकता था।

Improving efficiency of fertilizer use in India

GS III: Economy

The ongoing war in West Asia and the rising costs of fuel and fertilizers give India an

opportunity to enhance fertilizer use efficiency and moderate demand. India produces 80% of its urea requirement domestically and imports the rest while also boosting domestic production capacities to become fully self-reliant. But India's urea industry relies too heavily on imported fuel. While green ammonia produced from the electrolysis of water using solar energy is an option, it is not sustainable in water-stressed areas. The situation is worse for phosphatic fertilizers, as India lacks mineral rock phosphate and therefore has to import such fertilizers almost entirely.

Together, both the nitrogen (mostly urea) and phosphorus components of fertilizers define India's food security. While the government has been enhancing subsidies to maintain fertilizer prices for farmers, over two-thirds of the ₹2 lakh crore spent on annual subsidies is not harvested as food, and is lost to pollution.

The fertilizer trap

Inefficient, excessive or unbalanced use of fertilizer nutrients not only wastes money but also damages the soil, water, air, human health, biodiversity, and causes climate change and global warming. The more fertilizers we use, the more they deplete the soil's organic matter and its holding capacity for water and nutrients, threatening crop yields and pushing farmers to add more fertilizers. This 'fertilizer trap' explains why India's national demand for fertilizers never saturates, even as supply has increased over the decades.

Therefore, it is high time to move beyond supply side management and boost fertilizer use efficiency to moderate demand. Efficiency means producing more crop per kg of fertilizer used, or maintaining yields while reducing fertilizer



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The more fertilizers we use, the more they deplete the soil's organic matter and its holding capacity for water and nutrients, threatening crop yields and pushing farmers to add more fertilizers

input. The government's 'nutrient-based subsidy' did not improve efficiencies or reduce demand as urea was not included in the scheme. While neem-coated urea was meant to improve nitrogen-use efficiency, it could not stop the loss of most of the urea as ammonia to air pollution. Similarly, most of the phosphatic fertilizers are also lost to water pollution.

Lack of coordination

While pulses, other leguminous cover crops, manures, composts and biochar could reduce fertilizers to a large extent, they are no longer the mainstay of our farming systems. Last month, the Union government directed the State governments to promote green manure but did not emphasise on fertilizer savings.

In November 2017, the Prime Minister had, in his *Man ki Baat* address to the nation, called for halving fertilizer usage within five years. However, fertilizer consumption has only increased due to the lack of inter-ministerial and interdepartmental coordination to address farming systems in an integrated manner. For example, though the government announces Minimum Support Prices (MSPs) for over 20 crops, actual government procurement is limited to rice, wheat and sugarcane, which is why farmers prefer to grow only these three crops. These crops consume over two-thirds of all the urea in India. This destroys traditional crop rotations involving pulses/legumes and pushes farmers into the fertilizer trap.

Pulse-cereal rotations sustained agriculture for thousands of years before fertilizers were invented, as most pulses leave behind some of the fixed nitrogen in the soil for the next crop. India must incentivise pulses/legume-based crop rotations or multicropping, as legumes fix atmospheric nitrogen, and need no urea or only 10% of the urea used for cereals. They are also ideal for rain-fed areas facing deficit

monsoons (as predicted this year).

The Dalhan Aatmanirbharta Mission launched in October 2025 promised 100% procurement of Tur, Urad, and Masoor at MSP for four years. Under it, ₹11,440 crore was allocated to scale up production to 350 lakh tonnes per year in five years by expanding the area under cultivation. But according to the April 2026 data released by the government, the area for sowing pulses grew only 1.26% over last year. This is negligible compared to the 10% fall in area between 2021-22 to 2024-25. This calls for better implementation, as recommended by the Supreme Court in March.

Enhancing efficiency

India must also triple the recycling of manure, compost and biochar (residue from biogas plants) to replace fertilizers and boost soil health. Fertilizer recommendations need to be revised in order to ensure that organics form the basal dose and fertilizers are used only as a top-up to meet any shortfall, after exhausting all locally available organic sources. Coordinated crop trials across India showed that upto half of the recommended doses of fertilizers can be replaced with manure, biochar or compost with no loss of crop yield.

There should also be investment when it comes to alternatives for efficient nitrogen/phosphorus sources for crop improvement. The adoption of an improved but existing variety is what the farmer needs – not fancy capital-intensive technologies or drones. India's own research shows that the rice germplasm alone has the potential to double nitrogen use efficiency, in terms of grain yield per unit urea supplied. To ensure the inter-sectoral coordination required to implement the above, the Union government should revive the Interministerial National Nitrogen Steering Committee. Its tenure expired before any of its recommendations were acted upon.

19M. Improving efficiency of fertilizer use in India

भारत में उर्वरकों के उपयोग की दक्षता में सुधार

- The ongoing war in **West Asia** and the rising costs of fuel and fertilizers give **India** an opportunity to enhance fertilizer use efficiency and moderate demand.
पश्चिम एशिया में जारी युद्ध तथा ईंधन और उर्वरकों की बढ़ती कीमतें **भारत** को उर्वरक उपयोग दक्षता बढ़ाने और मांग को नियंत्रित करने का अवसर प्रदान करती हैं।
- **India** produces 80% of its **urea** requirement domestically and imports the rest while also **boosting domestic production capacities to become fully self-reliant**.
भारत अपनी **यूरिया** आवश्यकता का 80% घरेलू स्तर पर उत्पादन करता है और शेष का आयात करता है, साथ ही पूर्ण आत्मनिर्भर बनने के लिए घरेलू उत्पादन क्षमताओं को भी बढ़ा रहा है।



- But **India's** urea industry relies too heavily on imported fuel.
किन्तु **भारत** का यूरिया उद्योग आयातित ईंधन पर अत्यधिक निर्भर है।
- While **green ammonia produced from the electrolysis of water using solar energy** is an option, it is not sustainable in water-stressed areas.
यद्यपि सौर ऊर्जा द्वारा जल के विद्युत अपघटन से उत्पादित **ग्रीन अमोनिया** एक विकल्प है, किन्तु जल-संकट वाले क्षेत्रों में यह टिकाऊ नहीं है।
- The **situation is worse for phosphatic fertilizers, as India lacks mineral rock phosphate and therefore has to import such fertilizers almost entirely.**
फॉस्फेटिक उर्वरकों की स्थिति और भी गंभीर है, क्योंकि **भारत** में खनिज रॉक फॉस्फेट का अभाव है और इसलिए ऐसे उर्वरकों का लगभग पूर्णतः आयात करना पड़ता है।
- Together, **both the nitrogen (mostly urea) and phosphorus components of fertilizers define India's food security.**
सामूहिक रूप से, उर्वरकों के नाइट्रोजन (मुख्यतः **यूरिया**) तथा फॉस्फोरस घटक **भारत** की खाद्य सुरक्षा को परिभाषित करते हैं।
- While the government has been enhancing subsidies to maintain fertilizer prices for farmers, over two-thirds of the ₹2 lakh crore spent on annual subsidies is not harvested as food, and is lost to pollution.
यद्यपि सरकार किसानों के लिए उर्वरकों की कीमतें स्थिर रखने हेतु सब्सिडी बढ़ा रही है, फिर भी वार्षिक सब्सिडी पर खर्च किए जाने वाले ₹2 लाख करोड़ से अधिक का दो-तिहाई हिस्सा खाद्य उत्पादन में परिवर्तित नहीं होता और प्रदूषण के रूप में नष्ट हो जाता है।

The fertilizer trap

उर्वरक जाल

- Inefficient, excessive or unbalanced use of fertilizer nutrients not only wastes money but also damages the soil, water, air, human health, biodiversity, and causes climate change and global warming.
उर्वरक पोषक तत्वों का अक्षम, अत्यधिक अथवा असंतुलित उपयोग न केवल धन की बर्बादी करता है, बल्कि मिट्टी, जल, वायु, मानव स्वास्थ्य तथा जैव विविधता को भी क्षति पहुँचाता है और जलवायु परिवर्तन एवं वैश्विक तापन का कारण बनता है।
- The more fertilizers we use, the more they deplete the soil's organic matter and its holding capacity for water and nutrients, threatening crop yields and pushing farmers to add more fertilizers.
जितना अधिक उर्वरकों का उपयोग किया जाता है, उतना ही वे मिट्टी के जैविक पदार्थ तथा जल एवं पोषक तत्वों को धारण करने की क्षमता को कम करते हैं, जिससे फसल उत्पादन खतरे में पड़ता है और किसान अधिक उर्वरक डालने के लिए विवश होते हैं।
- This '**fertilizer trap**' explains why **India's** national demand for fertilizers never saturates, even as supply has increased over the decades.
यह '**उर्वरक जाल**' स्पष्ट करता है कि दशकों के दौरान आपूर्ति बढ़ने के बावजूद **भारत** में उर्वरकों की राष्ट्रीय मांग कभी संतृप्त क्यों नहीं होती।
- Therefore, it is high time to move beyond supply side management and boost fertilizer use efficiency to moderate demand.
अतः अब समय आ गया है कि केवल आपूर्ति-पक्ष प्रबंधन से आगे बढ़कर उर्वरक उपयोग दक्षता को बढ़ाया जाए ताकि मांग को नियंत्रित किया जा सके।
- Efficiency means producing more crop per kg of fertilizer used, or maintaining yields while reducing fertilizer input.
दक्षता का अर्थ है प्रयुक्त प्रत्येक किलोग्राम उर्वरक से अधिक फसल उत्पादन करना अथवा उर्वरक निवेश घटाते हुए उत्पादन बनाए रखना।



- The government's 'nutrient-based subsidy' did not improve efficiencies or reduce demand as urea was not included in the scheme.
सरकार की 'पोषक-आधारित सब्सिडी' योजना दक्षता बढ़ाने या मांग कम करने में सफल नहीं हुई, क्योंकि इसमें यूरिया को शामिल नहीं किया गया था।
- While neem-coated urea was meant to improve nitrogen-use efficiency, it could not stop the loss of most of the urea as ammonia to air pollution.
यद्यपि नीम-लेपित यूरिया का उद्देश्य नाइट्रोजन उपयोग दक्षता बढ़ाना था, फिर भी यह अधिकांश यूरिया को अमोनिया के रूप में वायु प्रदूषण में परिवर्तित होने से नहीं रोक सका।
- Similarly, most of the phosphatic fertilizers are also lost to water pollution.
इसी प्रकार, अधिकांश फॉस्फेटिक उर्वरक भी जल प्रदूषण के रूप में नष्ट हो जाते हैं।

Lack of coordination

समन्वय का अभाव

- While pulses, other leguminous cover crops, manures, composts and biochar could reduce fertilizers to a large extent, they are no longer the mainstay of our farming systems.
यद्यपि दलहन, अन्य लेग्युमिनस आवरण फसलें, गोबर खाद, कम्पोस्ट तथा बायोचार उर्वरकों की आवश्यकता को काफी हद तक कम कर सकते हैं, फिर भी वे अब हमारी कृषि प्रणालियों का मुख्य आधार नहीं रहे हैं।
- Last month, the Union government directed the State governments to promote green manure but did not emphasise on fertilizer savings.
पिछले महीने, केंद्र सरकार ने राज्य सरकारों को हरी खाद को बढ़ावा देने के निर्देश दिए, किन्तु उर्वरक बचत पर विशेष बल नहीं दिया।
- In November 2017, the Prime Minister had, in his Man ki Baat address to the nation, called for halving fertilizer usage within five years.
नवंबर 2017 में, प्रधानमंत्री ने अपने मन की बात संबोधन में पाँच वर्षों के भीतर उर्वरक उपयोग को आधा करने का आह्वान किया था।
- However, fertilizer consumption has only increased due to the lack of inter-ministerial and interdepartmental coordination to address farming systems in an integrated manner.
हालाँकि, कृषि प्रणालियों को समग्र रूप से संबोधित करने के लिए मंत्रालयों एवं विभागों के बीच समन्वय के अभाव के कारण उर्वरक खपत केवल बढ़ी ही है।
- For example, though the government announces Minimum Support Prices (MSPs) for over 20 crops, actual government procurement is limited to rice, wheat and sugarcane, which is why farmers prefer to grow only these three crops.
उदाहरण के लिए, यद्यपि सरकार 20 से अधिक फसलों के लिए न्यूनतम समर्थन मूल्य (एमएसपी) घोषित करती है, फिर भी वास्तविक सरकारी खरीद केवल धान, गेहूँ और गन्ने तक सीमित रहती है, जिसके कारण किसान मुख्यतः इन्हीं तीन फसलों की खेती करना पसंद करते हैं।
- These crops consume over two-thirds of all the urea in India.
ये फसलें भारत में उपयोग किए जाने वाले कुल यूरिया का दो-तिहाई से अधिक उपभोग करती हैं।
- This destroys traditional crop rotations involving pulses/legumes and pushes farmers into the fertilizer trap.
यह दलहन एवं लेग्युमिनस फसलों पर आधारित पारंपरिक फसल चक्रों को नष्ट करता है और किसानों को उर्वरक जाल की ओर धकेलता है।
- Pulse-cereal rotations sustained agriculture for thousands of years before fertilizers were invented, as most pulses leave behind some of the fixed nitrogen in the soil for the next crop.
उर्वरकों के आविष्कार से पहले, दलहन-अनाज फसल चक्रों ने हजारों वर्षों तक कृषि को बनाए रखा, क्योंकि अधिकांश दलहन अगली फसल के लिए मिट्टी में स्थिर नाइट्रोजन का कुछ भाग छोड़ जाते हैं।
- India must incentivise pulses/legume-based crop rotations or multicropping, as legumes fix atmospheric nitrogen, and need no urea or only 10% of the urea used for cereals.
भारत को दलहन/लेग्युम आधारित फसल चक्रों अथवा बहुफसली प्रणाली को प्रोत्साहित करना चाहिए, क्योंकि



TELEGRAM CHANNEL: <https://t.me/patrioticIAS>

YOUTUBE CHANNEL: <https://www.youtube.com/@PatrioticIAS>

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लेग्युम वायुमंडलीय नाइट्रोजन को स्थिर करते हैं और उन्हें यूरिया की आवश्यकता नहीं होती अथवा अनाज फसलों की तुलना में केवल 10% यूरिया की आवश्यकता होती है।

- They are also ideal for rain-fed areas facing deficit monsoons (as predicted this year). वे अल्प वर्षा वाले मानसून का सामना करने वाले वर्षा-आधारित क्षेत्रों के लिए भी आदर्श हैं, जैसा कि इस वर्ष अनुमानित किया गया है।
- The **Dalhan Aatmanirbharta Mission** launched in October 2025 promised 100% procurement of Tur, Urad, and Masoor at **MSP** for four years. अक्टूबर 2025 में प्रारंभ किए गए **दलहन आत्मनिर्भरता मिशन** ने चार वर्षों तक तूर, उड़द और मसूर की **एमएसपी** पर 100% खरीद का वादा किया।
- Under it, ₹11,440 crore was allocated to scale up production to 350 lakh tonnes per year in five years by expanding the area under cultivation. इसके अंतर्गत खेती के क्षेत्र का विस्तार करके पाँच वर्षों में उत्पादन को बढ़ाकर 350 लाख टन प्रतिवर्ष करने हेतु ₹11,440 करोड़ आवंटित किए गए।
- But according to the April 2026 data released by the government, the area for sowing pulses grew only 1.26% over last year. किन्तु सरकार द्वारा जारी अप्रैल 2026 के आँकड़ों के अनुसार, दलहनों की बुआई का क्षेत्र पिछले वर्ष की तुलना में केवल 1.26% बढ़ा।
- **India** must also triple the recycling of manure, compost and biochar (residue from biogas plants) to replace fertilizers and boost soil health. **भारत** को उर्वरकों के विकल्प तथा मृदा स्वास्थ्य में सुधार के लिए गोबर खाद, कम्पोस्ट और बायोचार (बायोगैस संयंत्रों से प्राप्त अवशेष) के पुनर्चक्रण को तीन गुना बढ़ाना चाहिए।
- To ensure the inter-sectoral coordination required to implement the above, the **Union government** should revive the **Interministerial National Nitrogen Steering Committee**. उपरोक्त उपायों के कार्यान्वयन हेतु आवश्यक अंतर-क्षेत्रीय समन्वय सुनिश्चित करने के लिए **केंद्र सरकार** को **अंतर-मंत्रालयी राष्ट्रीय नाइट्रोजन संचालन समिति** को पुनर्जीवित करना चाहिए।



The warning signs in India's import bill

PM's appeal to reduce spending on petroleum products, edible oils, gold and foreign travel shows concern over India's import dependence; with foreign currency outgo increasing due to higher imports of crude oil, fertilizers, electronic components, pressure is mounting on foreign exchange reserves and the rupee

GS III: Economy

ECONOMIC NOTES

Biswajit Dhar

Last week, Prime Minister Narendra Modi urged citizens to reduce spending on petroleum products, cut edible oil consumption, delay non-essential gold purchases by a year, avoid unnecessary foreign travel, and prioritise the purchase of locally made products. He also advised increased use of public transport and electric vehicles, and called for the revival of Covid-era measures such as work-from-home, all aimed at reducing petrol and diesel consumption.

Mr. Modi's appeals have a singular focus – reducing the country's foreign currency spending. This is an alarm bell that no government has sounded before, not even during the severe economic crisis of 1991, when the country's foreign exchange reserves were less than \$1 billion, barely enough to finance imports for a fortnight. The Reserve Bank of India was then forced to pledge the country's gold to the Bank of England, the Bank of Japan, and later to the Union Bank of Switzerland to avoid defaulting on international debt obligations.

A widening trade deficit

The Prime Minister's announcement seems to be in response to the delicate situation India is facing in its merchandise trade account. In 2025-26, India's merchandise trade deficit reached a record \$333 billion, an increase of over 17% as compared to the immediately preceding year. The bulge in trade deficit was caused by imports rising 7% to an all-time high of \$775 billion, while exports remained nearly stagnant at \$442 billion.

Higher crude oil prices in the international market following the U.S.-Israel war against Iran are yet to be reflected in the import figures. According to the International Monetary Fund's (IMF) crude oil price index, prices have risen by 53% since the war began. When these numbers are reflected in India's



GETTY IMAGES

import bill, the situation could be really worrying. This could be the reason for the Prime Minister to press the alarm bell.

India's imports in 2025-26 were driven by four product groups – gold and silver, edible oils, fertilizers, and electronic components. Imports of precious metals, valued at over \$90 billion, accounted for about 12% of the import bill, marking them the third largest product group in the import basket after crude oil and electronics. Overall imports of gems and jewellery increased by almost 25% over the previous year, with most of the increase driven by gold imports, which rose by 24%, and silver imports, which surged by 150%. Exports of gems and jewellery, on the other hand, declined by over 5%, indicating that the increased imports of the precious metals were mostly absorbed domestically.

Import dependence

The unprecedented rise in gold imports has continued into the new financial year, increasing by 82% in April 2026 compared to the year before. This raises the question of whether the Prime Minister's appeal to postpone non-essential gold purchases, along with last week's increase in customs duty on gold and silver

imports to 15%, will be enough to arrest this upward trend.

The probability of lower gold imports may seem low, as continued stock market volatility has pushed retail investors into diversifying their portfolios by opting for both physical and gold ETFs. In fact, there are expectations that a higher import duty on physical gold will increase the shift towards ETF gold.

India's dependence on the international market for edible oils has been the most disappointing aspect of the country's agricultural performance. Edible oil imports increased by over 12% in 2025-26 and accelerated to 40% in April 2026 (over April 2025). These numbers are a pointer that import dependence on this critical commodity may have worsened. Imports accounted for over 56% of India's edible oil demand in 2023-24, the most recent year for which official data are available. Since the government has failed to find a way to increase domestic oilseed production, it needs citizens to reduce edible oil consumption to reduce imports, and thus save foreign currency.

Imports have brought bad news for agriculture. Spiralling fertilizer prices in international markets are not only causing

the country to lose foreign currency due to its high import dependence, but they are also likely to raise the fertilizer subsidy bill. Globally, fertilizer prices increased by 46% between December 2025 and April 2026, while urea prices doubled during this period.

Over the past five years, fertilizer imports have met between 31% and 37% of India's requirements. However, this share is expected to exceed 50% in 2025-26 as urea imports increased by over 60%. Disruptions caused by the war in West Asia have pushed India's fertilizer import bill up by nearly 80% in 2025-26. As in the case of edible oil, it remains a mystery why domestic production was not ramped up to reduce foreign exchange outgo.

Pressure on the rupee

Though Mr. Modi has urged citizens to "prioritise Made in India products," the Atmanirbhar Bharat Abhiyan, launched in 2020 to reduce dependence on Chinese imports, has not made much headway in several key industries. Even after six years and huge budgetary outlays under the PLI scheme, India remains significantly dependent on imports of electronic components, which grew by over 20% in the previous fiscal year.

Domestic production of accumulators and batteries was also to be stepped up to reduce the import content of electric vehicles, but in 2025-26, imports of these products increased by 50%. India's transition towards greater technological sophistication is thus coming at the cost of considerable foreign currency outgo.

Finally, a rising trade deficit could create another significant irritant as the already weakened rupee could slide further. Over the past several months, the RBI has been selectively intervening to prevent a free-fall of the currency. However, RBI needs to carefully calibrate its market interventions since foreign currency reserves have fallen by over \$21 billion since the end of February 2026, and a further decline may not be prudent. (Biswajit Dhar is former professor, Jawaharlal Nehru University)

THE GIST

India's record merchandise trade deficit and rising import dependence have increased concerns over foreign currency outgo and pressure on the rupee.

Increases in imports of gold, edible oils, fertilizers and electronic components have exposed the country's continued dependence on international markets.

19M. The warning signs in India's import bill

भारत के आयात बिल में चेतावनी के संकेत

- This is an alarm bell that no government has sounded before, not even during the severe economic crisis of 1991, when the country's foreign exchange reserves were less than \$1 billion, barely enough to finance imports for a fortnight.

यह ऐसी चेतावनी है जिसे इससे पहले किसी सरकार ने नहीं दिया था, यहाँ तक कि वर्ष 1991 के गंभीर आर्थिक संकट के दौरान भी नहीं, जब देश का विदेशी मुद्रा भंडार \$1 अरब से भी कम था और केवल दो सप्ताह के आयात के लिए पर्याप्त था।

- The Reserve Bank of India was then forced to pledge the country's gold to the Bank of England, the Bank of Japan, and later to the Union Bank of Switzerland to avoid defaulting on international debt obligations.

तत्कालीन परिस्थितियों में भारतीय रिज़र्व बैंक को अंतरराष्ट्रीय ऋण दायित्वों में चूक से बचने के लिए देश के स्वर्ण को बैंक ऑफ इंग्लैंड, बैंक ऑफ जापान, तथा बाद में यूनियन बैंक ऑफ स्विट्ज़रलैंड के पास गिरवी रखना पड़ा था।

A widening trade de• cit

बढ़ता व्यापार घाटा



- The Prime Minister's announcement seems to be in response to the delicate situation **India** is facing in its merchandise trade account.
प्रधानमंत्री की घोषणा वस्तु व्यापार खाते में **भारत** के सामने उत्पन्न नाजुक स्थिति के प्रति प्रतिक्रिया प्रतीत होती है।
- In 2025-26, **India's** merchandise trade deficit reached a record \$333 billion, an increase of over 17% as compared to the immediately preceding year.
वर्ष 2025-26 में **भारत** का वस्तु व्यापार घाटा रिकॉर्ड \$333 अरब तक पहुँच गया, जो पिछले वर्ष की तुलना में 17% से अधिक की वृद्धि थी।
- India's** imports in 2025-26 were driven by four product groups — gold and silver, edible oils, fertilizers, and electronic components.
वर्ष 2025-26 में **भारत** के आयात चार प्रमुख उत्पाद समूहों द्वारा संचालित रहे — स्वर्ण एवं रजत, खाद्य तेल, उर्वरक तथा इलेक्ट्रॉनिक घटक।
- The unprecedented rise in **gold imports** has continued into the new financial year, increasing by 82% in April 2026 compared to the year before.
स्वर्ण आयात में अभूतपूर्व वृद्धि नए वित्तीय वर्ष में भी जारी रही, जो अप्रैल 2026 में पिछले वर्ष की तुलना में 82% बढ़ गई।
- India's** dependence on the international market for edible oils has been the most disappointing aspect of the country's agricultural performance.
खाद्य तेलों के लिए अंतरराष्ट्रीय बाज़ार पर **भारत** की निर्भरता देश के कृषि प्रदर्शन का सबसे निराशाजनक पक्ष रही है।
- Edible oil imports increased by over 12% in 2025-26 and accelerated to 40% in April 2026 (over April 2025).
वर्ष 2025-26 में खाद्य तेल आयात में 12% से अधिक की वृद्धि हुई और अप्रैल 2026 में यह अप्रैल 2025 की तुलना में 40% तक पहुँच गया।

EU chief wants to seal pact on investment with India

GS III: Economy

Suhasini Haidar
T.C.A. Sharad Raghavan
OSLO/NEW DELHI

President of the European Commission Ursula von der Leyen once again called for an investment pact between India and the European Union (EU), terming it a "missing piece of the puzzle" in bilateral cooperation plans.

Ms. von der Leyen was speaking at the European Business Round Table for Industry in Gothenburg, Sweden, where PM Narendra Modi also addressed.

The investment pact, being negotiated alongside the trade deal, was not finalised as the two sides could not agree on some key aspects, notable being dispute resolution.

'Half the equation'

"But trade is only half the equation," Ms. von der Leyen said. "Our next step must be to deliver an investment agreement. This is the missing piece of the puzzle in our reinforced economic cooperation, especially in a world where



Narendra Modi with Swedish PM Ulf Kristersson and Ursula von der Leyen in Gothenburg.

supply chains are being reshaped and economic security challenges us as never before. Deepening investment ties will help us to de-risk and diversify."

During his address, Mr. Modi did not touch upon the investment agreement but instead highlighted the benefits of the trade deal and other pacts signed between the EU and India.

"The India-EU FTA will create new opportunities for industries, investors, and innovators," he said.

"The India-EU Trade and Technology Council has further deepened our cooperation. We are work-

ing together in areas such as digital technology, clean energy, semiconductors, resilient supply chains, and innovation."

'Opened the door'

In the 26 years between January 2000 and December 2025, European countries have invested a little more than \$110 billion as direct investment in India, making up for about 14% of the total foreign direct investment India attracted during the period. However, the most recent years saw considerable volatility in the inflows from Europe.

For example, FDI from Europe stood at about \$5.5 billion in 2025, having fallen from about \$10.6 billion in 2024.

'Holding back pact'

People tracking India-EU talks said the biggest factor holding up the investment agreement were the differences between the two economies on dispute resolution. Other issues were concerns over land acquisition, judicial protection and exit clauses.

19M. EU chief wants to seal pact on investment with India

यूरोपीय संघ प्रमुख भारत के साथ निवेश समझौते को अंतिम रूप देना चाहती हैं

- The investment pact, being negotiated alongside the trade deal, was not finalized as the two sides could not agree on some key aspects, notable being dispute resolution.

व्यापार समझौते के साथ-साथ बातचीत में चल रहा निवेश समझौता अंतिम रूप नहीं ले सका क्योंकि दोनों पक्ष कुछ प्रमुख मुद्दों, विशेष रूप से विवाद समाधान, पर सहमत नहीं हो पाए।



Food Corporation to raise short-term debt of ₹50,000 crore

GS III: Economy

Press Trust of India
NEW DELHI

The Food Corporation of India (FCI) will raise short-term debt of ₹50,000 crore from scheduled banks for a three-month tenure with a green shoe option to mop up an additional ₹25,000 crore, a senior government official said on Monday.

The funds are being raised to bridge cash flow mismatches arising from procurement and distribution of foodgrains. Tenders submitted in this regard will be opened on May 22.

Total borrowings under the tender will not exceed ₹75,000 crore at any point of time, the official added.

The short-term loans will be on an unsecured basis. Government of India guarantee of ₹6,000 crore available for food credit to FCI will not be extended to these borrowings.

Offers must remain valid up to August 31, with loan disbursements to be made in tranches in line with FCI's



FCI is in the midst of the active wheat procurement season.

operational requirements. FCI, the government's nodal agency for procurement and distribution of foodgrains to ration card holders and beneficiaries under welfare schemes, is currently in the midst of the active wheat procurement season.

In the ongoing 2026-27 marketing season (March-April), FCI and state agencies have together procured 22.97 million tonnes of wheat directly from farmers so far at minimum support price.

19M. Food Corporation to raise short-term debt of ₹50,000 crore

भारतीय खाद्य निगम ₹50,000 करोड़ का अल्पकालिक ऋण जुटाएगा

The Food Corporation of India (FCI) will raise short-term debt of ₹50,000 crore from scheduled banks for a three-month tenure with a green shoe option to mop up an additional ₹25,000 crore, a senior government official said on Monday.

एक वरिष्ठ सरकारी अधिकारी ने सोमवार को कहा कि भारतीय खाद्य निगम (FCI) तीन महीने की अवधि के लिए अनुसूचित बैंकों से ₹50,000 करोड़ का अल्पकालिक ऋण जुटाएगा, जिसमें अतिरिक्त ₹25,000 करोड़ जुटाने के लिए ग्रीन शू विकल्प भी होगा।

The funds are being raised to bridge cash flow mismatches arising from procurement and distribution of foodgrains.

यह धनराशि खाद्यान्नों की खरीद और वितरण से उत्पन्न नकदी प्रवाह असंतुलन को दूर करने के लिए जुटाई जा रही है।

Government of India guarantee of ₹6,000 crore available for food credit to FCI will not be extended to these borrowings.

FCI को खाद्य ऋण के लिए उपलब्ध भारत सरकार की ₹6,000 करोड़ की गारंटी इन उधारियों पर लागू नहीं होगी।

GS Paper III: Science and Technology		19 May 2026
TOPICS COVERED		
19M	9 Indian space start-ups sign strategic partnerships in Italy 9 भारतीय स्पेस स्टार्ट-अप्स ने इटली में रणनीतिक साझेदारियों पर हस्ताक्षर किए	
19M	India still short on expertise, tools to manage fungal health burden भारत अभी भी फंगल स्वास्थ्य बोझ के प्रबंधन हेतु विशेषज्ञता और उपकरणों की कमी से जूझ रहा है।	
19M	Why has the WHO declared a PHEIC over the Ebola outbreak? डब्ल्यूएचओ ने इबोला प्रकोप पर पीएचईआईसी क्यों घोषित किया है?	



9 Indian space start-ups sign strategic partnerships in Italy

GS III: S&T

The Hindu Bureau

BENGALURU

Nine Indian space-tech companies, which were part of the delegation led by Indian National Space Promotion and Authorisation Centre (IN-SPACe), have signed multiple partnerships and collaborations at the recently held Space Meetings Veneto 2026 at Venice, Italy.

The Indian delegation also held strategic engagements with the Italian Space Industry Study Group to explore opportunities for deeper commercial and technological cooperation between the two countries.

IN-SPACe which is the

single-window agency for all space sector activities of private entities said that the nine Indian space-tech companies, including Astrogate Labs, Astrobases Space Technologies, VyomIC, Suhora, Kepler Aerospace Ltd., Hyspace Technologies, TakeMe2Space, Jarbits Pvt. Ltd. and Dhruva Space, joined the delegation, with multiple partnerships and collaboration announcements emerging during the visit.

Among the key developments, Karnataka-based Astrobases Space Technologies signed a Memorandum of Understanding (MoU) with Impulso Space to support customer ac-

cess and explore launch opportunities through integrated mission management and launch service networks.

Kepler Aerospace signed a framework agreement with Apogeo Space to expand global Ground Station as a Service (GSaaS) infrastructure and strengthen satellite collaboration between India and Europe. The partnership will further explore joint opportunities across CubeSat systems, satellite mission and infrastructure operations.

IN-SPACe said that in alignment with the 2025-2029 India-Italy Joint Strategic Action Plan announced during the G20 Summit 2024.

19M. 9 Indian space start-ups sign strategic partnerships in Italy

9 भारतीय स्पेस स्टार्ट-अप्स ने इटली में रणनीतिक साझेदारियों पर हस्ताक्षर किए

- Nine Indian space-tech companies, which were part of the delegation led by **Indian National Space Promotion and Authorisation Centre (IN-SPACe)**, have signed multiple partnerships and collaborations at the recently held **Space Meetings Veneto 2026 at Venice, Italy**.

इंडियन नेशनल स्पेस प्रमोशन एंड ऑथराइजेशन सेंटर (IN-SPACe) के नेतृत्व वाले प्रतिनिधिमंडल का हिस्सा रही नौ भारतीय स्पेस-टेक कंपनियों ने हाल ही में इटली के वेनिस में आयोजित स्पेस मीटिंग्स वेनेटो 2026 में कई साझेदारियों और सहयोग समझौतों पर हस्ताक्षर किए हैं।

- **IN-SPACe** which is the single-window agency for all space sector activities of private entities said that the nine Indian space-tech companies, including **Astrogate Labs, Astrobases Space Technologies, VyomIC, Suhora, Kepler Aerospace Ltd., Hyspace Technologies, TakeMe2Space, Jarbits Pvt. Ltd. and Dhruva Space**, joined the delegation, with multiple partnerships and collaboration announcements emerging during the visit.

निजी संस्थाओं की सभी अंतरिक्ष गतिविधियों के लिए एकल-विंडो एजेंसी **IN-SPACe** ने कहा कि **Astrogate Labs, Astrobases Space Technologies, VyomIC, Suhora, Kepler Aerospace Ltd., Hyspace Technologies, TakeMe2Space, Jarbits Pvt. Ltd. और Dhruva Space** सहित नौ भारतीय स्पेस-टेक कंपनियाँ प्रतिनिधिमंडल में शामिल हुईं, और यात्रा के दौरान कई साझेदारियों एवं सहयोगों की घोषणाएँ सामने आईं।



India still short on expertise, tools to manage fungal health burden

Over 5 crore Indians suffer from fungal diseases; now researchers are working to identify priority fungal pathogens circulating within its borders; they are also working to map antifungal resistance in pathogens in the environment and develop newer therapeutics such as antimicrobial peptides

SSM SAT
Sondatta Karak

For almost 25 summers, Sunita (name changed) gets a severe 'sweat rash' on her neck in the hot and humid weather of Mumbai. The rash turns black, looks almost burnt, and stays that way until the monsoons arrive. Then, as if miraculously, the dead skin is shed and her neck looks just fine all over again. Doctors have told her she needn't worry too much about it and that she just tries to keep her neck bare and dry. Sunita, however, is embarrassed every time this happens and becomes anxious about hiding the rash or explaining it to puzzled and concerned onlookers.

She has been self-medicating with a popular anti-fungal powder plus time under an air-conditioner to tame the rash on sweaty summer days. So far this year, her neck has been clear.

Sunita's situation may be familiar to the increasing number of people who suffer fungal infections in India. The World Health Organization released a priority list of fungal pathogens in 2022 while also saying data of fungal diseases and their morbidity are lacking.

A 2024 review in *The Lancet Infectious Diseases* estimated 3.8 million people die every year due to fungal diseases, compounded by public fears about antimicrobial resistance and concerns about whether antifungal drugs will work.

For this situation, however, India lacks expertise on the genesis and effects of fungal pathogens as well as a paucity of institutes dedicated to fungal outbreaks, like it does for viral and bacterial infections (such as tuberculosis).

Mindset, investment problem
Fungi grow well in hot and humid conditions, putting tropical countries at higher risk than those in temperate regions.

"In the western world, especially in temperate conditions, ophthalmologists see one to a couple of cases per year," Prashant Garg, executive chair of the L.V. Prasad Eye Institute (LVPEI), Hyderabad, said. "These numbers are way higher in tropical countries. We see three to four cases of fungal eye infections in our hospital daily."

According to one estimate published by scientists from India and the U.K. in the *Open Forum Infectious Diseases* in 2022, more than 5 crore Indians likely suffer from fungal diseases – one of the highest national burdens worldwide.

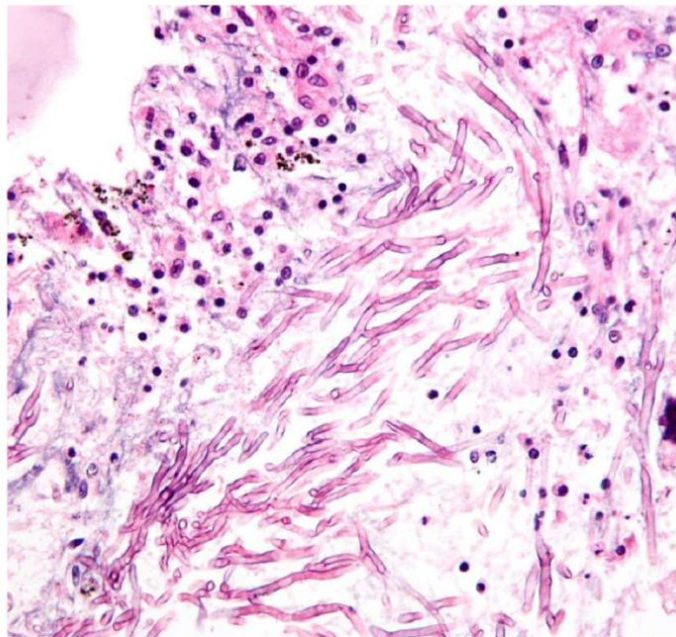
These diseases are generally called mycoses; they affect the eyes, skin, lungs, vagina, and brain and cause blood infections.

During the COVID-19 pandemic, an opportunistic infection called mucormycosis captured the public imagination. Caused by black fungus, its prevalence is about 80-times higher in India than in the economically developed countries.

Despite the burden of fungal diseases in India, clinicians are often not equipped to deal with them. Most clinicians prescribe antibacterial medications first. When those don't work, they try antifungals. This delay allows the fungi to intrude deeper into a patient's body and becomes harder to get rid of.

'A dying art'
Anuradha Chowdhary, director professor at the Vallabhbhai Patel Chest Institute in the University of Delhi, said, "Many cases that test negative for *Mycobacterium tuberculosis* are still called tuberculosis and treated with anti-tuberculosis drugs. Our country's microbiology departments do not test them for common respiratory fungal conditions like aspergilliosis or the rarely identified histoplasmosis."

"Fungal testing must begin at the same time as bacterial testing in a microbiology lab," Dr. Chowdhary added.



A micrograph of pulmonary aspergilliosis. Fungi grow well in hot and humid conditions, putting tropical countries at higher risk than those in temperate regions. NEPHRON/ICC BY SA

is because of contamination." Identifying the actual pathogen can take longer than just confirming a fungus's presence. Here, the details of fungal spore morphology matter.

Fungal spores come in different colours, shapes, and sizes. And microbiologists use fungal handbooks and databases to identify the spores.

"It is a dying art," Dr. Chowdhary said. "Plus, some fungi do not form spores in lab cultures. Or the entire procedure can take up to a month," Dr. Joseph added. "Very few medical setups invest in that kind of investigation. It is expensive for the patient and technically demanding for the healthcare providers."

Treating animals
These challenges aren't confined to human medicine. The chytrid fungus causes an infection called chytridiomycosis, and it has been annihilating frogs and salamanders in many parts of the world. Chytrids grow on the animals' skin – an organ crucial for respiration among these amphibious animals.

To make matters worse, it is very difficult to outwardly distinguish an infected animal from an uninfected one in the earlier stages of infection, when the animal can still be saved.

"Culturing chytrid fungus in the lab is almost a fluke since it is present in low numbers," CSIR-Centre for Cellular and Molecular Biology scientist Karthikeyan Vasudevan said. "Some add hair to their culture, some snake skin since keratin helps in growing this fungus. But details such as how much to add or when are often not shared in research papers."

Of course, more advanced tests are more helpful. They help reduce contamination as well as accelerate the reactions required to identify specific species.

For example, a test called MALDI-TOF – short for matrix-assisted laser desorption/ionisation time-of-flight mass spectrometry – has an automated technique that can identify the proteins on the pathogens' surfaces. It does this by creating a surface protein signature of the sample and compares that with an existing database of pathogens.

While MALDI-TOF can identify fungi in about 30 minutes, it remains in the dark about new pathogens emerging in tropical countries, and which are not reflected in the prevailing fungi databases.

Timely diagnostics
Some work here is underway – such as that of BRIC-Centre for DNA Fingerprinting and Diagnostics, Hyderabad, staff scientist Rupinder Kaur said. However, these lab-level processes have yet to be standardised for clinical settings. One major challenge is the small quantity of pathogenic material when working with patient samples.

"For fungal infection diagnostics to work in clinical settings, lab protocols usually need improvements in specimen handling, volume, transport and storage, standardisation, speed, and proper contamination controls

Limited understanding
Candida infections among a small group of fungal infections that have received sustained research attention.

Most fungus biologists in India use fungi as a model system to understand eukaryotic cell processes such as how genes are expressed in cells and how cells divide. But these experiments are done with baker's yeast (*Saccharomyces cerevisiae*) and the results don't always lead to clinically relevant findings. That said, *Candida* is structurally similar to baker's yeast, and the technical know-how from one species can be translated to the other.

"Fungal cells exist morphologically in two forms – roundish forms called yeast and long filamentous forms called molds," Dr. Garg said. "India has many moldy infections due to pathogens like *Aspergillus* and *Fusarium*."

"We do not have enough people looking into the biology of filamentous fungi," Dr. Kaur added. "Even with *Candida*, basic questions like what turns this fungus, which is often found on human skin, suddenly pathogenic is not well-understood."

"We need to also study the fungus in its native state and understand its relationship with its host," Dr. Vasudevan said. He also highlighted the importance of skilled taxonomists who can painstakingly grow, identify, and maintain fungal cultures.

Just like the medical community, the wildlife biology community will also benefit from fungal expertise within the country because samples can't be out of the country, limiting access to skilled personnel elsewhere.

The good news is that researchers in India are working to identify priority fungal pathogens circulating within its borders, both including and beyond a list of species the World Health Organization released in 2022. They are also working to map antifungal resistance in pathogens in the environment and develop newer therapeutics such as antimicrobial peptides. Better-equipped hospitals are also training others in the medical community to pay attention to the fungal infection crisis.

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19M. India still short on expertise, tools to manage fungal health burden
भारत अभी भी फंगल स्वास्थ्य बोझ के प्रबंधन हेतु विशेषज्ञता और उपकरणों की कमी से जूझ रहा है।

- Over 5 crore Indians suffer from fungal diseases. भारत में 5 करोड़ से अधिक लोग फंगल रोगों से पीड़ित हैं।
- Now researchers are working to identify priority fungal pathogens circulating within its borders. अब शोधकर्ता देश की सीमाओं के भीतर फैल रहे प्राथमिकता वाले फंगल रोगजनकों की पहचान करने पर कार्य कर रहे हैं।
- They are also working to map antifungal resistance in pathogens in the environment and develop newer





therapeutics such as **antimicrobial peptides**.

वे पर्यावरण में उपस्थित रोगजनकों में एंटीफंगल प्रतिरोध का मानचित्रण करने तथा एंटीमाइक्रोबियल पेप्टाइड्स जैसे नए उपचार विकसित करने पर भी कार्य कर रहे हैं।

- For almost 25 summers, **Sunita** (name changed) gets a severe 'sweat rash' on her neck in the hot and humid weather of **Mumbai**.
लगभग 25 ग्रीष्म ऋतुओं से, **सुनीता** (परिवर्तित नाम) को **मुंबई** के गर्म और आर्द्र मौसम में गर्दन पर गंभीर 'पसीने के दाने' हो जाते हैं।
- The rash turns black, looks almost burnt, and stays that way until the monsoons arrive.
यह दाने काले पड़ जाते हैं, लगभग जले हुए प्रतीत होते हैं, और मानसून आने तक उसी स्थिति में बने रहते हैं।
- Then, as if miraculously, the dead skin is shed and her neck looks just like all over again.
फिर, मानो किसी चमत्कार की तरह, मृत त्वचा निकल जाती है और उसकी गर्दन पुनः पूरी तरह सामान्य दिखाई देने लगती है।
- Doctors have told her she needn't worry too much about it and that she just tries to keep her neck bare and dry.
चिकित्सकों ने उसे बताया है कि उसे इसके बारे में अधिक चिंता करने की आवश्यकता नहीं है तथा उसे केवल अपनी गर्दन को खुला और सूखा रखने का प्रयास करना चाहिए।
- **Sunita**, however, is embarrassed every time this happens and becomes anxious about hiding the rash or explaining it to puzzled and concerned onlookers.
किन्तु **सुनीता** हर बार ऐसा होने पर शर्मिंदगी महसूस करती है और दानों को छिपाने अथवा चिंतित एवं आश्चर्यचकित लोगों को इसके बारे में समझाने को लेकर चिंतित हो जाती है।
- She has been self-medicating with a popular **anti-fungal powder** plus time under an air-conditioner to tame the rash on sweaty summer days.
वह पसीने भरे ग्रीष्मकालीन दिनों में दानों को नियंत्रित करने के लिए एक लोकप्रिय एंटी-फंगल पाउडर तथा वातानुकूलित वातावरण का सहारा लेकर स्वयं उपचार कर रही है।
- So far this year, her neck has been clear.
इस वर्ष अब तक उसकी गर्दन साफ रही है।
- **Sunita's** situation may be familiar to the increasing number of people who suffer **fungal infections in India**.
सुनीता की स्थिति **भारत** में **फंगल संक्रमणों** से पीड़ित बढ़ती संख्या वाले लोगों के लिए परिचित हो सकती है।
- The **World Health Organization** released a priority list of **fungal pathogens** in 2022 while also saying data of fungal diseases and their morbidity are lacking.
विश्व स्वास्थ्य संगठन ने वर्ष 2022 में **फंगल रोगजनकों** की प्राथमिकता सूची जारी की थी तथा यह भी कहा था कि फंगल रोगों और उनकी रुग्णता से संबंधित आँकड़ों का अभाव है।
- A 2024 review in **The Lancet Infectious Diseases** estimated 3.8 million people die every year due to fungal diseases, compounded by public fears about **antimicrobial resistance** and concerns about whether antifungal drugs will work.
वर्ष 2024 में **द लैंसेट इन्फेक्शियस डिजीजेस** में प्रकाशित एक समीक्षा के अनुसार, प्रत्येक वर्ष लगभग 38 लाख लोग फंगल रोगों के कारण मृत्यु का शिकार होते हैं, जिसे **प्रतिजैविक प्रतिरोध** को लेकर सार्वजनिक भय तथा एंटी-फंगल दवाओं की प्रभावशीलता संबंधी चिंताओं ने और गंभीर बना दिया है।
- For this situation, however, **India** lacks expertise on the genesis and effects of fungal pathogens as well as a paucity of institutes dedicated to fungal outbreaks, like it does for viral and bacterial infections (such as **tuberculosis**).
हालाँकि, इस स्थिति से निपटने के लिए **भारत** में फंगल रोगजनकों की उत्पत्ति और प्रभावों से संबंधित विशेषज्ञता का अभाव है, साथ ही फंगल प्रकोपों के लिए समर्पित संस्थानों की भी कमी है, जबकि वायरल और बैक्टीरियल संक्रमणों (जैसे **क्षयरोग**) के लिए ऐसे संस्थान उपलब्ध हैं।

Mindset, investment problem

मानसिकता एवं निवेश की समस्या



- **Fungi** grow well in hot and humid conditions, putting tropical countries at higher risk than those in temperate regions.
फफूंद गर्म और आर्द्र परिस्थितियों में अच्छी तरह विकसित होती हैं, जिससे उष्णकटिबंधीय देशों में समशीतोष्ण क्षेत्रों की तुलना में अधिक जोखिम उत्पन्न होता है।
- These diseases are generally called **mycoses**; they affect the eyes, skin, lungs, vagina, and brain and cause blood infections.
इन रोगों को सामान्यतः **माइकोसिस** कहा जाता है; ये आँखों, त्वचा, फेफड़ों, योनि तथा मस्तिष्क को प्रभावित करते हैं और रक्त संक्रमण उत्पन्न करते हैं।
- During the **COVID-19 pandemic**, an opportunistic infection called **mucormycosis** captured the public imagination.
कोविड-19 महामारी के दौरान, **म्यूकरमाइकोसिस** नामक एक अवसरवादी संक्रमण ने जनसामान्य का ध्यान आकर्षित किया।
- Caused by **black fungus**, its prevalence is about 80-times higher in **India** than in the economically developed countries.
ब्लैक फंगस के कारण होने वाला यह संक्रमण आर्थिक रूप से विकसित देशों की तुलना में **भारत** में लगभग 80 गुना अधिक पाया जाता है।
- Most clinicians prescribe **antibacterial medications** first.
अधिकांश चिकित्सक पहले **प्रतिजैविक दवाएँ** लिखते हैं।
- When those don't work, they try antifungals.
जब वे प्रभावी नहीं होतीं, तब वे एंटी-फंगल दवाओं का प्रयोग करते हैं।
- This delay allows the fungi to intrude deeper into a patient's body and becomes harder to get rid of.
यह विलंब फफूंद को रोगी के शरीर में अधिक गहराई तक प्रवेश करने का अवसर देता है और फिर उन्हें समाप्त करना अधिक कठिन हो जाता है।
- Our country's microbiology departments do not test them for common respiratory fungal conditions like **aspergillosis** or the rarely identified **histoplasmosis**.
हमारे देश के सूक्ष्मजीवविज्ञान विभाग सामान्य श्वसन संबंधी फंगल रोगों जैसे **एस्पेरजिलोसिस** अथवा दुर्लभ रूप से पहचाने जाने वाले **हिस्टोप्लास्मोसिस** के लिए उनकी जाँच नहीं करते हैं।
- "Fungal testing must begin at the same time as bacterial testing in a microbiology lab," Dr. Chowdhary added.
"सूक्ष्मजीवविज्ञान प्रयोगशाला में फंगल जाँच की शुरुआत बैक्टीरियल जाँच के साथ ही होनी चाहिए," डॉ. चौधरी ने आगे कहा।
- **Fungi** are present everywhere.
फफूंद हर स्थान पर उपस्थित होती हैं।
- When an individual tests positive for a fungal infection, there is sometimes a doubt as to whether the fungus came from the patient's sample or if it is a contaminant that entered the sample from the testing facility or the tester.
जब किसी व्यक्ति की जाँच फंगल संक्रमण के लिए सकारात्मक आती है, तब कभी-कभी यह संदेह होता है कि फफूंद रोगी के नमूने से आई है अथवा परीक्षण केंद्र या परीक्षक के माध्यम से नमूने में प्रदूषण के रूप में प्रवेश कर गई है।
- The most trusted way to confirm a fungal infection is to have it grow on microbiology culture plates.
फंगल संक्रमण की पुष्टि करने का सबसे विश्वसनीय तरीका उसे सूक्ष्मजीवविज्ञान कल्चर प्लेटों पर विकसित करना है।
- "We lightly scrape a sample from an infected region of the eye, place it on various culture media.
"हम आँख के संक्रमित भाग से हल्के रूप में नमूना खुरचते हैं और उसे विभिन्न कल्चर माध्यमों पर रखते हैं।



- Some allow growth of bacteria and some of fungi,” LVPEI head of microbiology **Joveeta Joseph** explained.
कुछ माध्यम बैक्टीरिया की वृद्धि की अनुमति देते हैं और कुछ फफूंद की,” एलवीपीईआई की सूक्ष्मजीवविज्ञान प्रमुख **जोवेटा जोसेफ** ने समझाया।
- “We sometimes have to wait for days to see if a fungus grows where we placed the patient sample on the culture plate.
“कभी-कभी हमें यह देखने के लिए कई दिनों तक प्रतीक्षा करनी पड़ती है कि जहाँ हमने रोगी का नमूना कल्चर प्लेट पर रखा है, वहाँ फफूंद विकसित होती है या नहीं।
- If a fungus grows elsewhere on the plate, that is because of contamination.”
यदि प्लेट के किसी अन्य भाग में फफूंद विकसित होती है, तो वह प्रदूषण के कारण होती है।”
- Identifying the actual pathogen can take longer than just confirming a fungus’s presence.
वास्तविक रोगजनक की पहचान करने में केवल फफूंद की उपस्थिति की पुष्टि करने की तुलना में अधिक समय लग सकता है।
- Here, the details of fungal spore morphology matter.
यहाँ फंगल बीजाणुओं की संरचना संबंधी विवरण महत्वपूर्ण होते हैं।
- **Fungal spores** come in different colours, shapes, and sizes.
फंगल बीजाणु विभिन्न रंगों, आकारों और आकृतियों में पाए जाते हैं।
- And microbiologists use fungal handbooks and databases to identify the spores.
और सूक्ष्मजीवविज्ञानी बीजाणुओं की पहचान के लिए फंगल पुस्तिकाओं और डेटाबेस का उपयोग करते हैं।
- “It is a dying art,” Dr. Chowdhary said.
“यह एक लुप्त होती कला है,” डॉ. चौधरी ने कहा।
- “Plus, some fungi do not form spores in lab cultures.
“इसके अतिरिक्त, कुछ फफूंद प्रयोगशाला कल्चर में बीजाणु नहीं बनाती हैं।
- Or the entire procedure can take up to a month,” Dr. Joseph added.
या पूरी प्रक्रिया में एक माह तक का समय लग सकता है,” डॉ. जोसेफ ने आगे कहा।
- “Very few medical setups invest in that kind of investigation.
“बहुत कम चिकित्सा संस्थान इस प्रकार की जाँच में निवेश करते हैं।
- It is expensive for the patient and technically demanding for the healthcare providers.”
यह रोगी के लिए महँगा तथा स्वास्थ्य सेवा प्रदाताओं के लिए तकनीकी रूप से चुनौतीपूर्ण होता है।”

Treating animals

पशुओं का उपचार

- These challenges aren’t confined to human medicine.
ये चुनौतियाँ केवल मानव चिकित्सा तक सीमित नहीं हैं।
- The **chytrid fungus** causes an infection called **chytridiomycosis**, and it has been annihilating frogs and salamanders in many parts of the world.
काइट्रिड फंगस काइट्रिडियोमाइकोसिस नामक संक्रमण उत्पन्न करता है, और यह विश्व के अनेक भागों में मेंढकों तथा सलामेंडरों का विनाश कर रहा है।
- Chytrids grow on the animals’ skin — an organ crucial for respiration among these amphibious animals.
काइट्रिड फफूंद इन जीवों की त्वचा पर विकसित होती है — जो इन उभयचर प्राणियों में श्वसन के लिए अत्यंत महत्वपूर्ण अंग है।
- To make matters worse, it is very difficult to outwardly distinguish an infected animal from an uninfected one in the earlier stages of infection, when the animal can still be saved.
स्थिति को और गंभीर बनाते हुए, संक्रमण के प्रारंभिक चरणों में संक्रमित और असंक्रमित पशु के बीच बाहरी रूप से अंतर करना अत्यंत कठिन होता है, जबकि उस समय पशु को अभी भी बचाया जा सकता है।
- “Culturing chytrid fungus in the lab is almost a like since it is present in low numbers,” **CSIR-Centre for Cellular and Molecular Biology** scientist **Karthikeyan Vasudevan** said.



“प्रयोगशाला में काइट्रिड फंगस का संवर्धन लगभग संयोग जैसा होता है क्योंकि यह बहुत कम मात्रा में उपस्थित होती है,” सीएसआईआर-कोशिकीय एवं आणविक जीवविज्ञान केंद्र के वैज्ञानिक कार्तिकेयन वासुदेवन ने कहा।

- “Some add hair to their culture, some snake skin since keratin helps in growing this fungus. “कुछ लोग अपने कल्चर में बाल मिलाते हैं, तो कुछ साँप की त्वचा, क्योंकि केराटिन इस फफूंद की वृद्धि में सहायता करता है।
- But details such as how much to add or when are often not shared in research papers.” किन्तु कितना और कब मिलाना है जैसी जानकारियाँ प्रायः शोध-पत्रों में साझा नहीं की जाती हैं।”
- Of course, more advanced tests are more helpful. निस्संदेह, अधिक उन्नत परीक्षण अधिक सहायक होते हैं।
- They help reduce contamination as well as accelerate the reactions required to identify specific species. वे प्रदूषण को कम करने के साथ-साथ विशिष्ट प्रजातियों की पहचान हेतु आवश्यक अभिक्रियाओं को तीव्र करने में सहायता करते हैं।
- For example, a test called **MALDI-TOF** — short for **matrix-assisted laser desorption/ionisation time-of-flight mass spectrometry** — has an automated technique that can identify the proteins on the pathogens’ surfaces. उदाहरण के लिए, **MALDI-TOF** नामक एक परीक्षण — जिसका पूर्ण रूप **मैट्रिक्स-असिस्टेड लेज़र डीसॉर्शन/आयोजनाइज़ेशन टाइम-ऑफ-फ्लाइट मास स्पेक्ट्रोमेट्री** है — एक स्वचालित तकनीक का उपयोग करता है जो रोगजनकों की सतह पर उपस्थित प्रोटीनों की पहचान कर सकती है।
- It does this by creating a surface protein signature of the sample and compares that with an existing database of pathogens. यह नमूने का सतही प्रोटीन हस्ताक्षर तैयार करके उसे रोगजनकों के उपलब्ध डेटाबेस से तुलना करके कार्य करता है।
- While **MALDI-TOF** can identify fungi in about 30 minutes, it remains in the dark about new pathogens emerging in tropical countries, and which are not reflected in the prevailing fungi databases. यद्यपि **MALDI-TOF** लगभग 30 मिनट में फफूंद की पहचान कर सकता है, फिर भी यह उष्णकटिबंधीय देशों में उभर रहे नए रोगजनकों के बारे में जानकारी देने में असमर्थ रहता है, क्योंकि वे वर्तमान फफूंद डेटाबेस में परिलक्षित नहीं होते हैं।
- **MALDI-TOF** is also very expensive. **MALDI-TOF** अत्यंत महँगा भी है।
- New units can cost upwards of ₹1.5 crore apiece; even refurbished ones can cost ₹10 lakh or more. इसके नए उपकरणों की कीमत प्रति इकाई ₹1.5 करोड़ से अधिक हो सकती है; यहाँ तक कि पुनर्निर्मित उपकरण भी ₹10 लाख या उससे अधिक के हो सकते हैं।
- The **PCR tests** that check for pathogen’s genetic material, and which were widely used during the **COVID-19 pandemic**, are one alternative. रोगजनकों की आनुवंशिक सामग्री की जाँच करने वाले **पीसीआर परीक्षण**, जिनका **कोविड-19 महामारी** के दौरान व्यापक रूप से उपयोग किया गया था, एक वैकल्पिक उपाय हैं।
- But while they worked well for the coronavirus, they’re not well-suited for fungi. किन्तु जहाँ ये कोरोनावायरस के लिए प्रभावी सिद्ध हुए, वहीं ये फफूंद के लिए उतने उपयुक्त नहीं हैं।
- This is because fungal cells have tough cell walls that need to be broken open first to extract the fungal DNA. ऐसा इसलिए है क्योंकि फंगल कोशिकाओं की कोशिका-भित्तियाँ अत्यंत कठोर होती हैं, जिन्हें फंगल डीएनए निकालने से पहले तोड़ना आवश्यक होता है।
- (**PCR** works by creating numerous copies of DNA material, then checking them for species signatures.)



(पीसीआर डीएनए सामग्री की अनेक प्रतियाँ बनाकर तथा उनमें प्रजाति-विशिष्ट संकेतों की जाँच करके कार्य करता है।)

Timely diagnostics

समय पर निदान

- Some work here is underway — such as that of **BRIC-Centre for DNA Fingerprinting and Diagnostics, Hyderabad**, scientist **Rupinder Kaur** said.
इस क्षेत्र में कुछ कार्य प्रगति पर हैं — जैसे कि **बीआरआईसी-डीएनए फिंगरप्रिंटिंग एवं डायग्नोस्टिक्स केंद्र, हैदराबाद** में, ऐसा वैज्ञानिक **रुपिंदर कौर** ने कहा।
- However, these lab-level processes have yet to be standardised for clinical settings.
हालाँकि, इन प्रयोगशाला-स्तरीय प्रक्रियाओं को अभी तक चिकित्सीय परिस्थितियों के लिए मानकीकृत नहीं किया गया है।
- One major challenge is the small quantity of pathogenic material when working with patient samples.
एक प्रमुख चुनौती रोगी के नमूनों के साथ कार्य करते समय रोगजनक सामग्री की अत्यल्प मात्रा है।
- “For fungal infection diagnostics to work in clinical settings, lab protocols usually need improvements in specimen handling, volume, transport and storage, standardisation, speed, and proper contamination controls,” Dr. Kaur said.
“फंगल संक्रमण के निदान को चिकित्सीय परिस्थितियों में प्रभावी बनाने के लिए प्रयोगशाला प्रोटोकॉल में सामान्यतः नमूना प्रबंधन, मात्रा, परिवहन एवं भंडारण, मानकीकरण, गति तथा उचित प्रदूषण नियंत्रण में सुधार की आवश्यकता होती है,” डॉ. कौर ने कहा।
- “It is always helpful if lab protocols utilise at least a small set of complex, varied clinical samples to optimise concentrations of primers, cell wall-digesting enzymes, time duration for mechanical cell lysis using bead-beater etc., for developed procedures.”
“यह सदैव उपयोगी होता है यदि प्रयोगशाला प्रोटोकॉल विकसित प्रक्रियाओं हेतु प्राइमर्स की सांद्रता, कोशिका-भित्ति को पचाने वाले एंजाइमों, बीड-बीटर द्वारा यांत्रिक कोशिका-विघटन की समयावधि आदि को अनुकूलित करने के लिए विविध एवं जटिल चिकित्सीय नमूनों के कम-से-कम एक छोटे समूह का उपयोग करें।”
- She added that more advanced **PCR tests** have not been tested enough for use in fungal contexts.
उन्होंने आगे कहा कि अधिक उन्नत **पीसीआर परीक्षणों** का फंगल संदर्भों में उपयोग हेतु पर्याप्त परीक्षण नहीं किया गया है।
- Timely diagnostics help clinicians decide the appropriate next steps, such as choosing the right antifungal drugs to treat a particular infection.
समय पर किया गया निदान चिकित्सकों को उचित अगला कदम निर्धारित करने में सहायता करता है, जैसे किसी विशेष संक्रमण के उपचार हेतु सही एंटी-फंगल दवाओं का चयन करना।
- This said, the number of antifungal options available is limited.
हालाँकि, उपलब्ध एंटी-फंगल विकल्पों की संख्या सीमित है।
- Fungal cells are **eukaryotic cells**, like our own cells.
फंगल कोशिकाएँ हमारी अपनी कोशिकाओं की तरह **यूकैरियोटिक कोशिकाएँ** होती हैं।
- So molecules that kill fungus can also be harmful to us.
अतः जो अणु फफूंद को नष्ट करते हैं, वे हमारे लिए भी हानिकारक हो सकते हैं।
- To make matters worse, many antifungals have also been rendered less effective thanks to rampant self-medication by patients, over-the-counter sales, and use in plant agriculture.
स्थिति को और गंभीर बनाते हुए, रोगियों द्वारा व्यापक स्व-चिकित्सा, बिना चिकित्सकीय पर्चों के बिक्री तथा कृषि में इनके उपयोग के कारण अनेक एंटी-फंगल दवाएँ कम प्रभावी हो गई हैं।



- When fungi are repeatedly exposed to antifungal compounds in the environment, they develop resistance.
जब फफूंद बार-बार पर्यावरण में एंटी-फंगल यौगिकों के संपर्क में आती हैं, तो वे प्रतिरोध विकसित कर लेती हैं।
- From her own experience at LVPEI, Dr. Joseph recalled how identifying pathogens has allowed her to help her clinician colleagues about when they can rely on an antifungal to work.
एलवीपीईआई में अपने अनुभव को स्मरण करते हुए, डॉ. जोसेफ ने बताया कि रोगजनकों की पहचान ने उन्हें अपने चिकित्सक सहयोगियों की यह समझने में सहायता करने में सक्षम बनाया कि वे कब किसी एंटी-फंगल दवा के प्रभावी होने पर भरोसा कर सकते हैं।

Limited understanding

सीमित समझ

- Candida** infections among a small group of fungal infections that have received sustained research attention.
कैंडिडा संक्रमण उन कुछ फंगल संक्रमणों में शामिल हैं जिन्हें निरंतर शोध संबंधी ध्यान प्राप्त हुआ है।
- Most fungus biologists in **India** use fungi as a model system to understand **eukaryotic cell** processes such as how genes are expressed in cells and how cells divide.
भारत में अधिकांश फफूंद जीवविज्ञानी फफूंद का उपयोग यूकैरियोटिक कोशिका प्रक्रियाओं को समझने हेतु मॉडल प्रणाली के रूप में करते हैं, जैसे कोशिकाओं में जीन किस प्रकार अभिव्यक्त होते हैं और कोशिकाएँ कैसे विभाजित होती हैं।
- But these experiments are done with baker's yeast (**Saccharomyces cerevisiae**) and the results don't always lead to clinically relevant findings.
किन्तु ये प्रयोग बेकर यीस्ट (सैकरोमाइसीज़ सेरेविसिए) पर किए जाते हैं और इनके परिणाम सदैव चिकित्सकीय दृष्टि से प्रासंगिक निष्कर्षों तक नहीं पहुँचते हैं।
- "Fungal cells exist morphologically in two forms — roundish forms called yeast and long filamentous forms called molds," Dr. Garg said.
"फंगल कोशिकाएँ आकारिकी रूप से दो रूपों में पाई जाती हैं — गोलाकार रूप जिन्हें यीस्ट कहा जाता है तथा लंबे तंतु-जैसे रूप जिन्हें मोल्ड कहा जाता है," डॉ. गर्ग ने कहा।
- "India has many moldy infections due to pathogens like **Aspergillus** and **Fusarium**."
"भारत में एस्पेरजिलस और फ्यूज़ेरियम जैसे रोगजनकों के कारण अनेक मोल्ड संक्रमण पाए जाते हैं।"
- "We do not have enough people looking into the biology of filamentous fungi," Dr. Kaur added.
"हमारे पास तंतु-जैसी फफूंदों के जीवविज्ञान का अध्ययन करने वाले पर्याप्त लोग नहीं हैं," डॉ. कौर ने आगे कहा।
- "Even with **Candida**, basic questions like what turns this fungus, which is often found on human skin, suddenly pathogenic is not well-understood."
"यहाँ तक कि कैंडिडा के संबंध में भी, यह मूलभूत प्रश्न कि मानव त्वचा पर सामान्यतः पाए जाने वाला यह फफूंद अचानक रोगजनक कैसे बन जाता है, अभी अच्छी तरह समझा नहीं गया है।"
- "We need to also study the fungus in its native state and understand its relationship with its host," Dr. Vasudevan said.
"हमें फफूंद का उसके प्राकृतिक रूप में भी अध्ययन करना चाहिए तथा उसके मेज़बान के साथ उसके संबंध को समझना चाहिए," डॉ. वासुदेवन ने कहा।
- He also highlighted the importance of skilled taxonomists who can painstakingly grow, identify, and maintain fungal cultures.
उन्होंने कुशल वर्गिकी विशेषज्ञों के महत्व को भी रेखांकित किया, जो अत्यंत सावधानीपूर्वक फंगल कल्चर को विकसित, पहचान तथा संरक्षित कर सकते हैं।
- Just like the medical community, the wildlife biology community will also benefit from fungal expertise within the country because samples can't be out of the country, limiting access to



skilled personnel elsewhere.

चिकित्सा समुदाय की तरह ही, वन्यजीव जीवविज्ञान समुदाय को भी देश के भीतर उपलब्ध फंगल विशेषज्ञता से लाभ होगा, क्योंकि नमूनों को देश से बाहर नहीं भेजा जा सकता, जिससे अन्य स्थानों के कुशल विशेषज्ञों तक पहुँच सीमित हो जाती है।

- The good news is that researchers in **India** are working to identify priority fungal pathogens circulating within its borders, both including and beyond a list of species the **World Health Organization** released in 2022.

सकारात्मक बात यह है कि **भारत** में शोधकर्ता देश की सीमाओं के भीतर फैल रहे प्राथमिक फंगल रोगजनकों की पहचान करने पर कार्य कर रहे हैं, जिनमें **विश्व स्वास्थ्य संगठन** द्वारा वर्ष 2022 में जारी प्रजातियों की सूची में सम्मिलित तथा उससे परे की प्रजातियाँ भी शामिल हैं।

- They are also working to map antifungal resistance in pathogens in the environment and develop newer therapeutics such as **antimicrobial peptides**.

वे पर्यावरण में उपस्थित रोगजनकों में एंटी-फंगल प्रतिरोध का मानचित्रण करने तथा **एंटीमाइक्रोबियल पेप्टाइड्स** जैसे नए उपचार विकसित करने पर भी कार्य कर रहे हैं।

- Better-equipped hospitals are also training others in the medical community to pay attention to the fungal infection crisis.

बेहतर संसाधनों से सुसज्जित अस्पताल चिकित्सा समुदाय के अन्य लोगों को भी फंगल संक्रमण संकट पर ध्यान देने के लिए प्रशिक्षित कर रहे हैं।

Why has the WHO declared a PHEIC over Ebola outbreak?

What is Ebola? How is Ebola transmitted? What measures are being taken to contain the outbreak?

ESTABLISHED

Ranva Kannan

The story so far :

On May 16, the World Health Organization (WHO) declared the Ebola outbreak in the Democratic Republic of the Congo (DRC) and Uganda a 'public health emergency of international concern (PHEIC). Just ahead of that, the Ministry of Public Health, Hygiene and Social Welfare, DRC, and the Uganda Ministry of Health declared an Ebola outbreak.

What is a PHEIC?

A PHEIC is the WHO's highest level of global health alert, formally declared under the International Health Regulations, whenever the health event is 'serious, sudden, unexpected, or unusual, and poses a public health risk to other countries through spread'. The declaration of the PHEIC also calls for a coordinated global response to tackle the current outbreak.

A new Ebola outbreak was notified in eastern DRC and Uganda, reportedly driven by the Bundibugyo ebolavirus strain. According to the WHO report, as of May 16, eight laboratory-confirmed cases, 246 suspected cases, and 80 suspected deaths have been reported in Ituri Province of the DRC. In addition, two laboratory-confirmed cases (including one death) with no apparent link to each other have been reported in Kampala, Uganda, within 24 hours of each other, among two individuals travelling from the DRC.

What is Ebola?

Ebola virus disease is a zoonotic disease that can be severe and often fatal in humans. It is caused by the eponymous Ebola virus, and has spilled over to humans from wild animals, including fruit bats and non-human primates, but is now capable of spreading between humans whenever there is direct contact with blood, secretion, bodily fluids of those

infected, and even contaminated surfaces. According to the WHO, three different viruses are known to cause large Ebola disease outbreaks: Ebola virus, Sudan virus, and Bundibugyo virus. This current epidemic involves the last variant.

Ebola has been known since 1976, with most early outbreaks occurring in remote villages of Central Africa. However, things changed dramatically with the worst Ebola outbreak in history, which occurred in West Africa from 2014 to 2016, sweeping across Guinea, Liberia, and Sierra Leone, resulting in over 28,600 reported cases and 11,325 deaths.

But this outbreak served as a milestone turning point for the way in which the world treated Ebola; it catalysed unprecedented global support for research and development into vaccines for Ebola. As a result, there are two vaccines in the market that have been approved for Ebola, in a single and double dose regimen. Both are being used for targeted "ring vaccination" for all

contacts and frontline workers dealing with the cases, as post-exposure prophylaxis. There are monoclonal-antibody treatments in the market that reportedly improve survival when given early to patients.

What measures are in place now?

The WHO-led response now focuses on several aspects including rapid isolation of a patient and immediate provision of intensive supportive care (rehydration, symptom management) to reduce mortality. But what will be crucial in actually containing this outbreak is to initiate rapid case tracing, contact tracing, ensuring safe burials, and establishing strict infection-control measures in all health facilities where people are being treated. The WHO's plan also includes deploying approved vaccines and monoclonal antibodies to at-risk groups wherever feasible. An essential part of the strategy, according to the global agency, is to launch social mobilisation campaigns to build trust, reduce stigma, and encourage early care-seeking among the people in the affected zones.

According to the WHO, "outbreak control relies on a package of interventions including intensive supportive care of patients, infection prevention and control, disease surveillance and contact tracing, laboratory services, safe and dignified burials, vaccination if relevant, and social mobilisation."

THE GIST

WHO declared the Ebola outbreak in the Democratic Republic of the Congo and Uganda a public health emergency of international concern (PHEIC), its highest level of global health alert.

The outbreak, driven by the Bundibugyo ebolavirus strain, has prompted rapid isolation, contact tracing, safe burials, vaccination, and monoclonal-antibody treatment.

19M. Why has the WHO declared a PHEIC over the Ebola outbreak?

डब्ल्यूएचओ ने इबोला प्रकोप पर पीएचईआईसी क्यों घोषित किया है?

- On May 16, the **World Health Organization (WHO)** declared the **Ebola** outbreak in the **Democratic Republic of the Congo (DRC)** and **Uganda** a 'public health emergency of international concern (PHEIC)'.

16 मई को **विश्व स्वास्थ्य संगठन (डब्ल्यूएचओ)** ने **कांगो लोकतांत्रिक गणराज्य (डीआरसी)** और **युगांडा** में फैले **इबोला** प्रकोप को 'अंतरराष्ट्रीय चिंता की सार्वजनिक स्वास्थ्य आपातस्थिति (पीएचईआईसी)' घोषित किया।

What is a PHEIC?

पीएचईआईसी क्या है?



- A **PHEIC** is the **WHO's** highest level of global health alert, formally declared under the **International Health Regulations**, whenever the health event is 'serious, sudden, unexpected, or unusual, and poses a public health risk to other countries through spread'.
पीएचईआईसी डब्ल्यूएचओ की वैश्विक स्वास्थ्य चेतावनी का सर्वोच्च स्तर है, जिसे **अंतरराष्ट्रीय स्वास्थ्य विनियमों** के अंतर्गत औपचारिक रूप से तब घोषित किया जाता है जब कोई स्वास्थ्य घटना 'गंभीर, अचानक, अप्रत्याशित अथवा असामान्य' हो तथा उसके प्रसार से अन्य देशों के लिए सार्वजनिक स्वास्थ्य जोखिम उत्पन्न हो।
- A new Ebola outbreak was notified in eastern **DRC** and **Uganda**, reportedly driven by the **Bundibugyo ebolavirus strain**.
पूर्वी **डीआरसी** और **युगांडा** में इबोला के एक नए प्रकोप की सूचना दी गई, जो कथित रूप से **बुंडीबुग्यो इबोलावायरस** स्ट्रेन के कारण उत्पन्न हुआ है।
- According to the **WHO** report, as of May 16, eight laboratory-confirmed cases, 246 suspected cases, and 80 suspected deaths have been **reported in Ituri Province of the DRC**.
डब्ल्यूएचओ की रिपोर्ट के अनुसार, 16 मई तक **डीआरसी** के **इटुरी प्रांत** में आठ प्रयोगशाला-पुष्ट मामले, 246 संदिग्ध मामले तथा 80 संदिग्ध मृत्यु दर्ज की गई हैं।
- In addition, two laboratory-confirmed cases (including one death) with no apparent link to each other **have been reported in Kampala, Uganda**, within 24 hours of each other, among two individuals travelling from the **DRC**.
इसके अतिरिक्त, **युगांडा** की राजधानी **कम्पाला** में 24 घंटे के भीतर दो प्रयोगशाला-पुष्ट मामले (जिनमें एक मृत्यु शामिल है) सामने आए हैं, जिनका आपस में कोई स्पष्ट संबंध नहीं पाया गया, और ये दोनों व्यक्ति **डीआरसी** से यात्रा करके आए थे।

What is Ebola?

इबोला क्या है?

- **Ebola virus disease** is a zoonotic disease that can be severe and often fatal in humans.
इबोला वायरस रोग एक जूनोटिक रोग है, जो मनुष्यों में गंभीर तथा प्रायः घातक हो सकता है।
- It is caused by the eponymic **Ebola virus**, and has spilled over to humans from wild animals, including fruit bats and non-human primates, but is now capable of spreading between humans whenever there is direct contact with blood, secretion, bodily fluids of those infected, and even contaminated surfaces.
यह **इबोला वायरस** के कारण होता है और फलाहारी चमगादड़ों तथा गैर-मानव प्राइमेट्स सहित जंगली पशुओं से मनुष्यों में फैला है, किन्तु अब यह संक्रमित व्यक्तियों के रक्त, स्राव, शारीरिक द्रवों तथा दूषित सतहों के सीधे संपर्क से मनुष्यों के बीच भी फैल सकता है।
- According to the **WHO**, three different viruses are known to cause large Ebola disease outbreaks: **Ebola virus, Sudan virus, and Bundibugyo virus**.
डब्ल्यूएचओ के अनुसार, इबोला रोग के बड़े प्रकोप उत्पन्न करने वाले तीन प्रमुख वायरस हैं: **इबोला वायरस, सूडान वायरस, तथा बुंडीबुग्यो वायरस**।
- This current epidemic involves the last variant.
वर्तमान महामारी अंतिम प्रकार के वायरस से संबंधित है।
- Ebola has been known since 1976, with most early outbreaks occurring in remote villages of Central Africa.
इबोला रोग वर्ष 1976 से ज्ञात है, और इसके प्रारंभिक अधिकांश प्रकोप मध्य अफ्रीका के दूरस्थ गाँवों में हुए थे।
- However, things changed dramatically with the worst Ebola outbreak in history, which occurred in **West Africa** from 2014 to 2016, sweeping across **Guinea, Liberia, and Sierra Leone**, resulting in over 28,600 reported cases and 11,325 deaths.
हालाँकि, स्थिति में नाटकीय परिवर्तन इतिहास के सबसे भीषण इबोला प्रकोप के दौरान हुआ, जो वर्ष 2014 से 2016 के बीच **पश्चिम अफ्रीका** में फैला और **गिनी, लाइबेरिया तथा सिएरा लियोन** को प्रभावित करते हुए 28,600 से अधिक मामलों और 11,325 मृत्यु का कारण बना।



- But this outbreak served as a milestone turning point for the way in which the world treated Ebola; it catalysed unprecedented global support for research and development into vaccines for Ebola.
किन्तु यह प्रकोप इबोला के प्रति विश्व की प्रतिक्रिया में एक महत्वपूर्ण मोड़ सिद्ध हुआ; इसने इबोला टीकों के अनुसंधान एवं विकास हेतु अभूतपूर्व वैश्विक समर्थन को प्रेरित किया।
- As a result, **there are two vaccines in the market that have been approved for Ebola, in a single and double dose regimen.**
परिणामस्वरूप, वर्तमान में इबोला के लिए एकल तथा द्वि-खुराक प्रणाली में दो स्वीकृत टीके उपलब्ध हैं।
- **Both are being used for targeted "ring vaccination" for all contacts and frontline workers dealing with the cases, as post-exposure prophylaxis.**
इन दोनों का उपयोग लक्षित "रिंग वैक्सीनेशन" के रूप में, सभी संपर्कों तथा मामलों से जुड़े अग्रिम पंक्ति के कर्मियों के लिए, संक्रमण-उपरांत प्रतिरोधात्मक उपाय के रूप में किया जा रहा है।
- There **are monoclonal-antibody treatments** in the market **that reportedly improve survival when given early to patients.**
बाज़ार में मोनोक्लोनल एंटीबॉडी आधारित उपचार भी उपलब्ध हैं, जो रोगियों को प्रारंभिक अवस्था में दिए जाने पर जीवित रहने की संभावना बढ़ाते हैं।

What measures are in place now?

वर्तमान में कौन-कौन से उपाय लागू हैं?

- The **WHO-led response now focuses on several aspects including rapid isolation of a patient and immediate provision of intensive supportive care (rehydration, symptom management) to reduce mortality.**
डब्ल्यूएचओ के नेतृत्व में वर्तमान प्रतिक्रिया कई पहलुओं पर केंद्रित है, जिनमें रोगियों को शीघ्र अलग करना तथा मृत्यु दर कम करने हेतु तत्काल गहन सहायक उपचार (पुनर्जलीकरण, लक्षण प्रबंधन) प्रदान करना शामिल है।
- But what will be crucial in actually containing this outbreak is to initiate **rapid case tracing, contact tracing, ensuring safe burials, and establishing strict infection-control measures in all health facilities where people are being treated.**
किन्तु इस प्रकोप को वास्तव में नियंत्रित करने के लिए तीव्र रोगी पहचान, संपर्क अनुरेखण, सुरक्षित अंतिम संस्कार सुनिश्चित करना तथा सभी स्वास्थ्य केंद्रों में कठोर संक्रमण-नियंत्रण उपाय स्थापित करना अत्यंत महत्वपूर्ण होगा।
- The **WHO's** plan also includes deploying approved vaccines and monoclonal antibodies to at-risk groups wherever feasible.
डब्ल्यूएचओ की योजना में जहाँ संभव हो, जोखिमग्रस्त समूहों को स्वीकृत टीके तथा मोनोक्लोनल एंटीबॉडी उपलब्ध कराना भी शामिल है।
- An essential part of the strategy, according to the global agency, is **to launch social mobilisation campaigns to build trust, reduce stigma, and encourage early care-seeking among the people in the affected zones.**
वैश्विक एजेंसी के अनुसार, रणनीति का एक महत्वपूर्ण भाग सामाजिक जागरूकता अभियान प्रारंभ करना है, जिससे विश्वास निर्माण, कलंक में कमी तथा प्रभावित क्षेत्रों के लोगों को शीघ्र उपचार प्राप्त करने के लिए प्रोत्साहित किया जा सके।
- According to the **WHO**, "**outbreak control relies on a package of interventions including intensive supportive care of patients, infection prevention and control, disease surveillance and contact tracing, laboratory services, safe and dignified burials, vaccination if relevant, and social mobilisation.**"
डब्ल्यूएचओ के अनुसार, "प्रकोप नियंत्रण रोगियों की गहन सहायक देखभाल, संक्रमण की रोकथाम एवं नियंत्रण, रोग निगरानी एवं संपर्क अनुरेखण, प्रयोगशाला सेवाएँ, सुरक्षित एवं सम्मानजनक अंतिम संस्कार,



आवश्यकता पड़ने पर टीकाकरण तथा सामाजिक जागरूकता जैसे उपायों के समग्र पैकेज पर आधारित होता है।”

GS Paper III: Environment		19 May 2026
TOPICS COVERED		
19M	DRI recovers two Indian Red Sand Boa snakes in Telangana डीआरआई ने तेलंगाना में दो इंडियन रेड सैंड बोआ सांप बरामद किए	
19M	Scientists use DNA maps to find pangolin tracking hubs वैज्ञानिक पैंगोलिन तस्करी केंद्रों का पता लगाने के लिए डीएनए मानचित्रों का उपयोग कर रहे हैं।	
19M	Strengthening domestic energy security through decentralised bioenergy systems विकेन्द्रीकृत जैव-ऊर्जा प्रणालियों के माध्यम से घरेलू ऊर्जा सुरक्षा को सुदृढ़ बनाना	



GS III: Environment

DRI recovers two Indian Red Sand Boa snakes in Telangana

Officials of the Directorate of Revenue Intelligence (DRI), Hyderabad zonal unit, seized two live Indian Red Sand Boa snakes and apprehended a person during an operation in Warangal in Telangana on Sunday. Officials said specific intelligence inputs indicated that a person was attempting to sell live snakes in the grey market. The DRI conducted an undercover decoy operation on May 17 and intercepted the suspect at the identified location.

19M. DRI recovers two Indian Red Sand Boa snakes in Telangana

डीआरआई ने तेलंगाना में दो इंडियन रेड सैंड बोआ सांप बरामद किए

- Officials of the Directorate of Revenue Intelligence (DRI), Hyderabad zonal unit, seized two live Indian Red Sand Boa snakes and apprehended a person during an operation in Warangal in Telangana on Sunday.

राजस्व खुफिया निदेशालय (DRI) की हैदराबाद क्षेत्रीय इकाई के अधिकारियों ने रविवार को तेलंगाना के वारंगल में एक अभियान के दौरान दो जीवित इंडियन रेड सैंड बोआ सांप बरामद किए और एक व्यक्ति को पकड़ा।



Scientists use DNA maps to find pangolin trafficking hubs

GS III: Environment

Vasudevan Mukunth

Pangolins are one of the world's most trafficked mammals even as their existence is threatened by shrinking habitats. So to protect them, conservationists are keen to know where they are being poached.

The problem is that it is notoriously difficult to trace a bag of scales seized from a smuggler in an airport back to a specific location. The DNA in these materials is also often degraded and thus amenable for further analysis.

Now, a study published in *PLoS Biology* on May 7 by an international team of researchers has offered a breakthrough. The team was able to use advanced genetic sequencing to map the trafficking routes of the three most-traded pangolin species: the white-bellied, the Sunda, and the Chinese pangolins.

To overcome the low DNA quality in seized materials, the researchers used a new approach where they targeted just the 671 locations on the pangolin genome that differentiate between different populations. This way, they were able to use 122 museum specimens to plug large gaps in the geography of where wild pangolins are now too rare.

Scientists were able to use advanced genetic sequencing to map the trafficking routes of the three most-traded pangolin species: the white-bellied, the Sunda, and the Chinese pangolins

नया डेटाबेस तैयार किया।

- However, the places that 'supply' pangolins to local markets also often overlap with those 'supplying' international traffickers. हालाँकि, जो स्थान स्थानीय बाज़ारों को पैंगोलिन उपलब्ध कराते हैं, वे प्रायः उन स्थानों से भी मेल खाते हैं जो अंतरराष्ट्रीय तस्करो को आपूर्ति करते हैं।
- The team also identified three international trafficking hotspots: southwestern **Cameroon** for white-bellied pangolins, southwestern **Borneo** for Sunda pangolins, and around **Myanmar** for Chinese pangolins.

Together with hundreds of more recent samples, the researchers put together an unprecedented new database covering the major locations of all eight pangolin species. According to the team, this database is a "genetic map" that state agencies can use to pinpoint the origin of a trafficked pangolin with high accuracy.

The researchers also revealed a complex relationship between local and international markets. Typically, experts have considered pangolin trafficking for local consumption and for 'export' to be independent problems – but the team's data revealed otherwise. According to the paper, in domestic trade, pangolins are moved 454 km on average from the source. However, the places that 'supply' pangolins to local markets also often overlap with those 'supplying' international traffickers.

The team also identified three international trafficking hotspots: southwestern Cameroon for white-bellied pangolins, southwestern Borneo for Sunda pangolins, and around Myanmar for Chinese pangolins.

"To our knowledge, this is the first population genomics study jointly addressing the three most traded species of pangolins," the team wrote in its paper. "Additionally, the geo-referenced DNA database presented in this study is unprecedented in sampling density and geographic scale, leading to detailed population genomic insights and informative domestic and international trade tracing estimates at a range-wide scale for each species."

Per the data, traffickers also collect the scales of various nearby populations before shipping them worldwide, primarily to China and Vietnam.

"International seizures in China seem to have originated both from outside and within the country, with evidence of a network from northeastern India around Arunachal Pradesh and Assam (and possibly Bhutan)," the researchers wrote.

The illegal wildlife trade is a multibillion-dollar transnational crime. Authorities, however, lacked the evidence required to nip the trade at the source. The new "genetic map" may change that.

19M. Scientists use DNA maps to find pangolin tracking hubs

वैज्ञानिक पैंगोलिन तस्करी

केंद्रों का पता लगाने के लिए

डीएनए मानचित्रों का उपयोग

कर रहे हैं।

- **Pangolins** are one of the world's most trafficked mammals even as their existence is threatened by shrinking habitats.

पैंगोलिन विश्व के सबसे अधिक तस्करी किए जाने वाले स्तनधारियों में से एक हैं, जबकि उनका अस्तित्व सिकुड़ते आवासों के कारण संकट में है।

- The team was able to use advanced genetic sequencing to map the trafficking routes of the three most-traded pangolin species: the white-bellied, the Sunda, and the Chinese pangolins.

इस दल ने उन्नत आनुवंशिक अनुक्रमण तकनीक का उपयोग करके सबसे अधिक व्यापार की जाने वाली तीन पैंगोलिन प्रजातियों — श्वेत-उदरीय, सुंडा तथा चीनी पैंगोलिन — के तस्करी मार्गों का मानचित्रण किया।

- Together with hundreds of more recent samples, the researchers put together an unprecedented new database covering the major locations of all eight pangolin species. सैकड़ों नवीन नमूनों के साथ मिलकर, शोधकर्ताओं ने सभी आठ पैंगोलिन प्रजातियों के प्रमुख स्थानों को समाहित करने वाला एक अभूतपूर्व



दल ने तीन अंतरराष्ट्रीय तस्करी हॉटस्पॉट की भी पहचान की: श्वेत-उदरीय पेंगोलिनों के लिए दक्षिण-पश्चिमी कैमरून, सुंडा पेंगोलिनों के लिए दक्षिण-पश्चिमी बोर्नियो, तथा चीनी पेंगोलिनों के लिए म्यांमार के आसपास का क्षेत्र।

- “To our knowledge, this is the **first population genomics study jointly addressing the three most traded species of pangolins**,” the team wrote in its paper.
“हमारी जानकारी के अनुसार, यह पहली जनसंख्या जीनोमिक्स अध्ययन है जो संयुक्त रूप से पेंगोलिन की तीन सबसे अधिक व्यापारित प्रजातियों को संबोधित करता है,” दल ने अपने शोध-पत्र में लिखा।
- Per the data, **traffickers also collect the scales of various nearby populations before shipping them worldwide, primarily to China and Vietnam**.
आँकड़ों के अनुसार, तस्कर विश्वभर में भेजने से पहले विभिन्न निकटवर्ती आबादियों से शल्क एकत्र करते हैं, मुख्यतः **चीन और वियतनाम** के लिए।
- “**International seizures in China seem to have originated both from outside and within the country, with evidence of a network from northeastern India around Arunachal Pradesh and Assam (and possibly Bhutan)**,” the researchers wrote.
“**चीन** में अंतरराष्ट्रीय जब्ती की घटनाएँ देश के भीतर और बाहर दोनों स्रोतों से उत्पन्न होती प्रतीत होती हैं, तथा उत्तर-पूर्वी भारत के **अरुणाचल प्रदेश और असम** (और संभवतः **भूटान**) के आसपास एक नेटवर्क के प्रमाण प्राप्त हुए हैं,” शोधकर्ताओं ने लिखा।

PATRIOTIC IAS



Strengthening domestic energy security through decentralised bioenergy systems

India's energy security concerns are increasing focus on converting agricultural residue, food waste, sewage sludge, and organic municipal waste into reliable and commercially viable energy solutions; technologies such as gasification and anaerobic digestion are emerging as critical pathways

SS III Environment
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Global energy supply chains continue to face uncertainty and fuel prices remain vulnerable to international disruptions. The importance of strengthening domestic energy security has become more urgent for countries like India.

Interestingly, while the country continues to search for scalable and sustainable energy alternatives, one of its largest untapped resources already exists within its own waste streams. Every year, enormous volumes of agricultural residue, food waste, sewage sludge, and organic municipal waste are generated, much of which remains underutilised or poorly managed.

This creates an important intersection between two major national challenges: energy security and waste management. What is often treated purely as a disposal problem can also become a valuable energy resource when supported by the right technology and infrastructure ecosystem. The real question, therefore, is not whether India has the resource base. It is whether the country can build efficient systems capable of converting waste into reliable and commercially viable energy solutions at scale.

Between waste and energy
India produces nearly 750 million tonnes of agricultural biomass a year, of which around 230 million metric tonnes is estimated to be surplus biomass. If collected and processed efficiently, this mass alone has the potential to offset a meaningful share of India's fossil fuel dependence, with some estimates suggesting it could replace nearly one-third of fuel imports. However, converting biomass into usable energy is complex.

Unlike conventional fuels, biomass is highly inconsistent in nature. Moisture levels vary, density differs across feedstocks, and ash content can fluctuate significantly. This affects combustion efficiency, transport economics, and industrial reliability. Most energy systems require stable and predictable fuel inputs, which raw biomass often can't provide on its own.

As a result, the focus is increasingly on technologies that can convert waste into cleaner, more manageable, and energy-efficient forms. This is where solutions like gasification and anaerobic digestion are becoming important.

In many ways, these technologies are the bridge between raw waste and usable energy infrastructure. Instead of treating waste as a low-value byproduct, they help convert it into commercially viable fuels and energy carriers that can integrate into existing industrial and energy systems.

Versatile syngas

Gasification is particularly effective for dry biomass such as crop residue, husk, woody waste, and other solid organic materials.

Inside a gasifier, the feedstock is dried, pyrolysed (broken down by heat), partially oxidised, and then reduced. In this process, biomass breaks down into gases, biochar, and tars. A limited amount of oxygen is introduced – not enough for



Gasification is particularly effective for dry biomass such as crop residue, husk, woody waste, and other solid organic materials. GETTY IMAGES

complete combustion but enough to sustain reactions between carbon, steam, and carbon dioxide at 800-1,000 °C. The outcome is syngas, which is made of carbon monoxide, hydrogen, carbon dioxide, and smaller amounts of methane and other gases.

Syngas is valuable because it is versatile. It can be used directly to generate heat or power or can be upgraded into renewable methane, methanol, ethanol, and even hydrogen depending on downstream applications. This flexibility makes gasification one of the more promising pathways within advanced bioenergy systems and explains why it is increasingly becoming central to future-ready clean fuel ecosystems.

Beyond generating energy, the process also produces biochar, a carbon-rich material that can improve soil quality and help sequester carbon. It also creates opportunities within emerging carbon credit markets.

As a result, the value created extends beyond energy alone, contributing to broader environmental and agricultural sustainability outcomes.

Anaerobic digestion

While gasification is more suitable for dry biomass, wet organic waste requires a different treatment pathway. This is where anaerobic digestion is highly relevant. The technology is particularly suited for sewage, food waste, animal manure, and industrial organic waste streams.

In this process, microorganisms break down waste in the absence of oxygen to produce biogas, which consists mainly of methane and carbon dioxide. The process also produces nutrient-rich digestate that can be used as a soil amendment if

managed effectively.

This is why anaerobic digestion is relevant across urban waste systems, sewage networks, dairy clusters, food processing units, industrial campuses, and even large-scale canteens, where wet waste is generated consistently. At smaller scales, it can support rural and semi-urban communities.

However, unlike thermal systems, anaerobic digestion depends on a continuous biological process. This means feedstock should be available in sufficient quantities to ensure long-term operational efficiency and reliable round-the-clock output.

Decentralised energy

This is also why the larger opportunity for India may not lie in choosing one technology over another but in integrating them intelligently. Gasifiers are designed for dry waste while anaerobic digestion works best with wet waste. Together, they create a more complete solution aligned with the diversity of India's waste landscape.

Matching the right feedstock with the right technology and right outcome is also essential because forcing wet waste into gasifiers or dry biomass into digesters reduces efficiency and increases operational challenges.

Such an approach also strengthens the case for decentralised energy systems. India does not only need large centralised plants. It also requires smaller distributed systems that can support rural industries, agro-processing clusters, MSMEs, and waste-heavy regions where transporting biomass over long distances is economically inefficient. Localised energy systems can convert local waste into local energy, lowering fuel costs while

improving energy access and waste management outcomes.

For this ecosystem to scale effectively, policy support is crucial. Segregating waste at source, decentralised infrastructure development, stronger carbon markets, and long-term regulatory clarity will all influence the pace of adoption. Without proper segregation, neither gasification nor anaerobic digestion can achieve their full potential. Similarly, without policy certainty, investors and operators often hesitate to commit capital at scale.

Not a single technology

Initiatives such as the Government of India's Sustainable Alternative Towards Affordable Transportation (SATAT) scheme have already demonstrated how biomass can be converted into biogas and upgraded into compressed biogas, a renewable methane alternative increasingly replacing natural gas across applications. At the same time, where the objective is to produce ethanol, methanol or hydrogen, syngas is emerging as a critical pathway.

In many ways, bioenergy is not a single technology trying to solve every challenge. It is a broader umbrella of technologies, each serving different end uses based on feedstock type and energy needs.

Ultimately, India's energy future cannot rely only on imported fuels and conventional energy systems. The country already possesses a large and underutilised resource base in the form of waste. The challenge now lies in building the right technologies, infrastructure, and policy ecosystems.

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19M. Strengthening domestic energy security through decentralised bioenergy systems

विकेन्द्रीकृत जैव-ऊर्जा प्रणालियों के माध्यम से घरेलू ऊर्जा सुरक्षा को सुदृढ़ बनाना

- India's energy security concerns are increasing focus on converting agricultural residue, food waste, sewage sludge, and organic municipal waste into reliable and commercially viable energy solutions.



भारत की ऊर्जा सुरक्षा संबंधी चिंताओं के कारण कृषि अवशेष, खाद्य अपशिष्ट, सीवेज स्लज तथा जैविक नगर अपशिष्ट को विश्वसनीय और व्यावसायिक रूप से व्यवहार्य ऊर्जा समाधानों में परिवर्तित करने पर अधिक ध्यान दिया जा रहा है।

- Technologies such as **gasification** and **anaerobic digestion** are emerging as critical pathways.
गैसीफिकेशन तथा एनेरोबिक डाइजेशन जैसी प्रौद्योगिकियाँ महत्वपूर्ण मार्गों के रूप में उभर रही हैं।
- Global energy supply chains continue to face uncertainty and fuel prices remain vulnerable to international disruptions.
वैश्विक ऊर्जा आपूर्ति श्रृंखलाएँ निरंतर अनिश्चितता का सामना कर रही हैं और ईंधन की कीमतें अंतरराष्ट्रीय व्यवधानों के प्रति संवेदनशील बनी हुई हैं।
- The importance of strengthening domestic energy security has become more urgent for countries like **India**.
भारत जैसे देशों के लिए घरेलू ऊर्जा सुरक्षा को सुदृढ़ करने का महत्व और अधिक तात्कालिक हो गया है।
- Interestingly, while the country continues to search for scalable and sustainable energy alternatives, one of its largest untapped resources already exists within its own waste streams.
रोचक तथ्य यह है कि जहाँ देश विस्तार योग्य और टिकाऊ ऊर्जा विकल्पों की खोज जारी रखे हुए है, वहीं उसके सबसे बड़े अप्रयुक्त संसाधनों में से एक पहले से ही उसके स्वयं के अपशिष्ट स्रोतों में मौजूद है।
- Every year, enormous volumes of agricultural residue, food waste, sewage sludge, and organic municipal waste are generated, much of which remains underutilised or poorly managed.
प्रत्येक वर्ष कृषि अवशेष, खाद्य अपशिष्ट, सीवेज कीचड़ तथा जैविक नगरपालिका अपशिष्ट की विशाल मात्रा उत्पन्न होती है, जिनका बड़ा भाग या तो अपर्याप्त रूप से उपयोग होता है अथवा खराब ढंग से प्रबंधित किया जाता है।
- This creates an important intersection between two major national challenges: energy security and waste management.
यह दो प्रमुख राष्ट्रीय चुनौतियों — ऊर्जा सुरक्षा तथा अपशिष्ट प्रबंधन — के बीच एक महत्वपूर्ण संबंध स्थापित करता है।
- What is often treated purely as a disposal problem can also become a valuable energy resource when supported by the right technology and infrastructure ecosystem.
जिसे सामान्यतः केवल निपटान की समस्या माना जाता है, वही उचित प्रौद्योगिकी एवं अवसंरचना तंत्र के सहयोग से एक मूल्यवान ऊर्जा संसाधन भी बन सकता है।
- The real question, therefore, is not whether **India** has the resource base.
अतः वास्तविक प्रश्न यह नहीं है कि **भारत** के पास संसाधन आधार उपलब्ध है या नहीं।
- It is whether the country can build efficient systems capable of converting waste into reliable and commercially viable energy solutions at scale.
वास्तविक प्रश्न यह है कि क्या देश ऐसे दक्ष तंत्र विकसित कर सकता है जो अपशिष्ट को बड़े पैमाने पर विश्वसनीय एवं व्यावसायिक रूप से व्यवहार्य ऊर्जा समाधानों में परिवर्तित कर सकें।

Between waste and energy अपशिष्ट और ऊर्जा के बीच

- India** produces nearly 750 million tonnes of agricultural biomass a year, of which around 230 million metric tonnes is estimated to be surplus biomass.
भारत प्रतिवर्ष लगभग 750 मिलियन टन कृषि बायोमास उत्पन्न करता है, जिसमें से लगभग 230 मिलियन मीट्रिक टन अधिशेष बायोमास माना जाता है।
- If collected and processed efficiently, this mass alone has the potential to offset a meaningful share of **India's** fossil fuel dependence, with some estimates suggesting it could replace nearly one-third of fuel imports.



यदि इसे दक्षतापूर्वक एकत्रित एवं संसाधित किया जाए, तो यह मात्रा अकेले ही भारत की जीवाश्म ईंधन निर्भरता के एक महत्वपूर्ण हिस्से की भरपाई कर सकती है, और कुछ अनुमानों के अनुसार यह लगभग एक-तिहाई ईंधन आयात का स्थान ले सकती है।

- However, converting biomass into usable energy is complex. हालाँकि, बायोमास को उपयोगी ऊर्जा में परिवर्तित करना एक जटिल प्रक्रिया है।
- Unlike conventional fuels, biomass is highly inconsistent in nature. पारंपरिक ईंधनों के विपरीत, बायोमास अपनी प्रकृति में अत्यधिक असंगत होता है।
- Moisture levels vary, density differs across feedstocks, and ash content can significantly. इसमें नमी का स्तर भिन्न होता है, विभिन्न फीडस्टॉक्स की घनता अलग-अलग होती है, तथा राख की मात्रा भी महत्वपूर्ण उतार-चढ़ाव हो सकता है।
- This affects combustion efficiency, transport economics, emissions performance, and industrial reliability. इसका प्रभाव दहन दक्षता, परिवहन अर्थशास्त्र, उत्सर्जन प्रदर्शन तथा औद्योगिक विश्वसनीयता पर पड़ता है।
- Most energy systems require stable and predictable fuel inputs, which raw biomass often can't provide on its own. अधिकांश ऊर्जा प्रणालियों को स्थिर एवं पूर्वानुमेय ईंधन आपूर्ति की आवश्यकता होती है, जिसे कच्चा बायोमास प्रायः स्वयं उपलब्ध नहीं करा पाता।
- As a result, the focus is increasingly on technologies that can convert waste into cleaner, more manageable, and energy-efficient forms. परिणामस्वरूप, अब ध्यान उन प्रौद्योगिकियों पर केंद्रित हो रहा है जो अपशिष्ट को अधिक स्वच्छ, प्रबंधनीय तथा ऊर्जा-दक्ष रूपों में परिवर्तित कर सकें।
- This is where solutions like gasification and anaerobic digestion are becoming important. यहीं पर गैसीकरण तथा अवायवीय अपघटन जैसी प्रौद्योगिकियाँ महत्वपूर्ण बन रही हैं।
- In many ways, these technologies are the bridge between raw waste and usable energy infrastructure. कई दृष्टियों से, ये प्रौद्योगिकियाँ कच्चे अपशिष्ट और उपयोगी ऊर्जा अवसंरचना के बीच सेतु का कार्य करती हैं।
- Instead of treating waste as a low-value byproduct, they help convert it into commercially viable fuels and energy carriers that can integrate into existing industrial and energy systems. अपशिष्ट को कम मूल्य वाले उप-उत्पाद के रूप में देखने के बजाय, ये उसे व्यावसायिक रूप से व्यवहार्य ईंधनों तथा ऊर्जा वाहकों में परिवर्तित करने में सहायता करती हैं, जिन्हें वर्तमान औद्योगिक एवं ऊर्जा प्रणालियों में एकीकृत किया जा सकता है।

Versatile syngas

बहुउपयोगी सिंगैस

- Gasification is particularly effective for dry biomass such as crop residue, husk, woody waste, and other solid organic materials. गैसीकरण विशेष रूप से शुष्क बायोमास जैसे फसल अवशेष, भूसी, लकड़ी आधारित अपशिष्ट तथा अन्य ठोस जैविक पदार्थों के लिए प्रभावी है।
- Inside a gasifier, the feedstock is dried, pyrolysed (broken down by heat), partially oxidised, and then reduced. गैसीफायर के भीतर फीडस्टॉक को सुखाया जाता है, पायरोलाइज किया जाता है (ऊष्मा द्वारा विघटित किया जाता है), आंशिक रूप से ऑक्सीकरण किया जाता है तथा तत्पश्चात अपचयित किया जाता है।
- In this process, biomass breaks down into gases, biochar, and tars. इस प्रक्रिया में बायोमास गैसों, बायोचार तथा तार में विभाजित हो जाता है।



- A limited amount of oxygen is introduced — not enough for complete combustion but enough to sustain reactions between carbon, steam, and carbon dioxide at **800-1,000 °C**.
इसमें सीमित मात्रा में ऑक्सीजन प्रविष्ट कराई जाती है — इतनी नहीं कि पूर्ण दहन हो सके, किन्तु इतनी अवश्य कि कार्बन, भाप तथा कार्बन डाइऑक्साइड के बीच **800-1,000 डिग्री सेल्सियस** पर अभिक्रियाएँ जारी रह सकें।
- The outcome is syngas, which is made of carbon monoxide, hydrogen, carbon dioxide, and smaller amounts of methane and other gases.
इस प्रक्रिया का परिणाम सिंगैस होता है, जिसमें कार्बन मोनोऑक्साइड, हाइड्रोजन, कार्बन डाइऑक्साइड तथा कम मात्रा में मीथेन एवं अन्य गैसों शामिल होती हैं।
- Syngas is valuable because it is versatile.
सिंगैस मूल्यवान है क्योंकि यह बहुउपयोगी है।
- It can be used directly to generate heat or power or can be upgraded into renewable methane, methanol, ethanol, and even hydrogen depending on downstream applications.
इसे प्रत्यक्ष रूप से ऊष्मा अथवा ऊर्जा उत्पादन के लिए उपयोग किया जा सकता है अथवा इसे आगे की आवश्यकताओं के अनुसार नवीकरणीय मीथेन, मेथनॉल, एथेनॉल तथा यहाँ तक कि हाइड्रोजन में भी परिवर्तित किया जा सकता है।
- This exibility makes gasification one of the more promising pathways within advanced bioenergy systems and explains why it is increasingly becoming central to future-ready clean fuel ecosystems.
यह लचीलापन गैसीकरण को उन्नत जैव-ऊर्जा प्रणालियों के अंतर्गत एक अत्यंत आशाजनक मार्ग बनाता है तथा यही कारण है कि यह भविष्य-उन्मुख स्वच्छ ईंधन पारिस्थितिकी तंत्रों का केंद्रीय घटक बनता जा रहा है।
- Beyond generating energy, the process also produces biochar, a carbon-rich material that can improve soil quality and help sequester carbon.
ऊर्जा उत्पादन के अतिरिक्त, यह प्रक्रिया बायोचार भी उत्पन्न करती है, जो कार्बन-समृद्ध पदार्थ है और मृदा गुणवत्ता में सुधार तथा कार्बन अवशोषण में सहायता कर सकता है।
- It also creates opportunities within emerging carbon credit markets.
यह उभरते हुए कार्बन क्रेडिट बाजारों में अवसर भी उत्पन्न करता है।
- As a result, the value created extends beyond energy alone, contributing to broader environmental and agricultural sustainability outcomes.
परिणामस्वरूप, इससे उत्पन्न मूल्य केवल ऊर्जा तक सीमित नहीं रहता, बल्कि व्यापक पर्यावरणीय एवं कृषि स्थिरता लक्ष्यों में भी योगदान देता है।

Anaerobic digestion

अवायवीय अपघटन

- While gasification is more suitable for dry biomass, wet organic waste requires a different treatment pathway.
जहाँ गैसीकरण शुष्क बायोमास के लिए अधिक उपयुक्त है, वहीं गीले जैविक अपशिष्ट के लिए एक भिन्न उपचार पद्धति की आवश्यकता होती है।
- This is where **anaerobic digestion** is highly relevant.
यहीं पर **अवायवीय अपघटन** अत्यंत महत्वपूर्ण सिद्ध होता है।
- The technology is particularly suited for sewage, food waste, animal manure, and industrial organic waste streams.
यह प्रौद्योगिकी विशेष रूप से सीवेज, खाद्य अपशिष्ट, पशु मल तथा औद्योगिक जैविक अपशिष्ट धाराओं के लिए उपयुक्त है।
- In this process, microorganisms break down waste in the absence of oxygen to produce biogas, which consists mainly of methane and carbon dioxide.



इस प्रक्रिया में सूक्ष्मजीव ऑक्सीजन की अनुपस्थिति में अपशिष्ट का अपघटन करते हैं और बायोगैस उत्पन्न करते हैं, जिसमें मुख्यतः मीथेन तथा कार्बन डाइऑक्साइड होती है।

- The process also produces nutrient-rich digestate that can be used as a soil amendment if managed effectively.
यह प्रक्रिया पोषक तत्वों से समृद्ध डाइजेस्टेट भी उत्पन्न करती है, जिसका प्रभावी प्रबंधन होने पर मृदा सुधारक के रूप में उपयोग किया जा सकता है।
- This is why anaerobic digestion is relevant across urban waste systems, sewage networks, dairy clusters, food processing units, industrial campuses, and even large-scale canteens, where wet waste is generated consistently.
इसी कारण अवायवीय अपघटन शहरी अपशिष्ट प्रणालियों, सीवेज नेटवर्क, डेयरी समूहों, खाद्य प्रसंस्करण इकाइयों, औद्योगिक परिसरों तथा बड़े पैमाने के कैंटीनों में अत्यंत उपयोगी है, जहाँ निरंतर गीला अपशिष्ट उत्पन्न होता है।
- At smaller scales, it can support rural and semi-urban communities.
छोटे स्तर पर यह ग्रामीण एवं अर्ध-शहरी समुदायों को भी सहायता प्रदान कर सकता है।
- However, unlike thermal systems, anaerobic digestion depends on a continuous biological process.
हालाँकि, तापीय प्रणालियों के विपरीत, अवायवीय अपघटन एक सतत जैविक प्रक्रिया पर निर्भर करता है।
- This means feedstock should be available in sufficient quantities to ensure long-term operational efficiency and reliable round-the-clock output.
इसका अर्थ है कि दीर्घकालिक परिचालन दक्षता तथा चौबीसों घंटे विश्वसनीय उत्पादन सुनिश्चित करने के लिए पर्याप्त मात्रा में फीडस्टॉक उपलब्ध होना चाहिए।

Decentralised energy

विकेन्द्रीकृत ऊर्जा

- This is also why the larger opportunity for **India** may not lie in choosing one technology over another but in integrating them intelligently.
इसी कारण **भारत** के लिए बड़ी संभावना किसी एक प्रौद्योगिकी को चुनने में नहीं, बल्कि विभिन्न प्रौद्योगिकियों के बुद्धिमत्तापूर्ण एकीकरण में निहित हो सकती है।
- Gasifiers are designed for dry waste while anaerobic digestion works best with wet waste.
गैसीफायर शुष्क अपशिष्ट के लिए निर्मित होते हैं, जबकि अवायवीय अपघटन गीले अपशिष्ट के साथ सर्वोत्तम कार्य करता है।
- Together, they create a more complete solution aligned with the diversity of **India's** waste landscape.
सामूहिक रूप से, वे **भारत** के विविध अपशिष्ट परिदृश्य के अनुरूप एक अधिक समग्र समाधान प्रस्तुत करते हैं।
- Matching the right feedstock with the right technology and right outcome is also essential because forcing wet waste into gasifiers or dry biomass into digesters reduces efficiency and increases operational challenges.
उचित फीडस्टॉक को उचित प्रौद्योगिकी एवं उचित परिणाम के साथ जोड़ना भी आवश्यक है, क्योंकि गीले अपशिष्ट को गैसीफायर में अथवा शुष्क बायोमास को डाइजेस्टर में डालने से दक्षता घटती है तथा परिचालन संबंधी चुनौतियाँ बढ़ती हैं।
- Such an approach also strengthens the case for decentralised energy systems.
ऐसा दृष्टिकोण विकेन्द्रीकृत ऊर्जा प्रणालियों की आवश्यकता को भी सुदृढ़ करता है।
- **India** does not only need large centralised plants.
भारत को केवल बड़े केंद्रीकृत संयंत्रों की ही आवश्यकता नहीं है।
- It also requires smaller distributed systems that can support rural industries, agro-processing clusters, MSMEs, and waste-heavy regions where transporting biomass over long distances is economically inefficient.



उसे छोटे वितरित तंत्रों की भी आवश्यकता है, जो ग्रामीण उद्योगों, कृषि-प्रसंस्करण समूहों, एमएसएमई तथा उन क्षेत्रों को समर्थन दे सकें जहाँ लंबी दूरी तक बायोमास का परिवहन आर्थिक दृष्टि से अलाभकारी है।

- Localised energy systems can convert local waste into local energy, lowering fuel costs while improving energy access and waste management outcomes.
स्थानीयकृत ऊर्जा प्रणालियाँ स्थानीय अपशिष्ट को स्थानीय ऊर्जा में परिवर्तित कर सकती हैं, जिससे ईंधन लागत कम होती है तथा ऊर्जा उपलब्धता और अपशिष्ट प्रबंधन परिणामों में सुधार होता है।
- For this ecosystem to scale effectively, policy support is crucial.
इस पारिस्थितिकी तंत्र को प्रभावी रूप से विस्तार देने के लिए नीतिगत समर्थन अत्यंत आवश्यक है।
- Segregating waste at source, decentralised infrastructure development, stronger carbon markets, and long-term regulatory clarity will all influence the pace of adoption.
स्रोत स्तर पर अपशिष्ट पृथक्करण, विकेन्द्रीकृत अवसंरचना विकास, सशक्त कार्बन बाजार तथा दीर्घकालिक नियामकीय स्पष्टता — ये सभी अपनाने की गति को प्रभावित करेंगे।
- Without proper segregation, neither gasification nor anaerobic digestion can achieve their full potential.
उचित पृथक्करण के अभाव में न तो गैसीकरण और न ही अवायवीय अपघटन अपनी पूर्ण क्षमता प्राप्त कर सकते हैं।
- Similarly, without policy certainty, investors and operators often hesitate to commit capital at scale.
इसी प्रकार, नीतिगत निश्चितता के अभाव में निवेशक एवं संचालक बड़े पैमाने पर पूँजी निवेश करने में संकोच करते हैं।

Not a single technology

केवल एक प्रौद्योगिकी नहीं

- Initiatives such as the **Government of India's Sustainable Alternative Towards Affordable Transportation (SATAT) scheme** have already demonstrated how biomass can be converted into biogas and upgraded into compressed biogas, a renewable methane alternative increasingly replacing natural gas across applications.
भारत सरकार की सस्टेनेबल अल्टरनेटिव टुवर्ड्स अफोर्डेबल ट्रांसपोर्टेशन (SATAT) योजना जैसी पहलों ने पहले ही यह प्रदर्शित कर दिया है कि किस प्रकार बायोमास को बायोगैस में तथा आगे संपीड़ित बायोगैस में परिवर्तित किया जा सकता है, जो एक नवीकरणीय मीथेन विकल्प है और विभिन्न उपयोगों में प्राकृतिक गैस का स्थान ले रहा है।
- At the same time, where the objective is to produce ethanol, methanol or hydrogen, syngas is emerging as a critical pathway.
साथ ही, जहाँ उद्देश्य एथेनॉल, मेथनॉल अथवा हाइड्रोजन का उत्पादन करना है, वहाँ सिंगैस एक महत्वपूर्ण मार्ग के रूप में उभर रहा है।
- In many ways, bioenergy is not a single technology trying to solve every challenge.
अनेक दृष्टियों से, जैव-ऊर्जा प्रत्येक चुनौती का समाधान करने वाली एकल प्रौद्योगिकी नहीं है।
- It is a broader umbrella of technologies, each serving different end uses based on feedstock type and energy needs.
यह विभिन्न प्रौद्योगिकियों का एक व्यापक समूह है, जिनमें से प्रत्येक फीडस्टॉक के प्रकार तथा ऊर्जा आवश्यकताओं के आधार पर भिन्न-भिन्न उपयोगों की पूर्ति करती है।
- Ultimately, **India's** energy future cannot rely only on imported fuels and conventional energy systems.
अंततः, **भारत** का ऊर्जा भविष्य केवल आयातित ईंधनों तथा पारंपरिक ऊर्जा प्रणालियों पर निर्भर नहीं रह सकता।
- The country already possesses a large and underutilised resource base in the form of waste.
देश के पास पहले से ही अपशिष्ट के रूप में एक विशाल एवं अल्प-उपयोगित संसाधन आधार उपलब्ध है।



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- The challenge now lies in building the right technologies, infrastructure, and policy ecosystems.
अब चुनौती उचित प्रौद्योगिकियों, अवसंरचना तथा नीतिगत पारिस्थितिकी तंत्रों के निर्माण में निहित है।

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