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The silken voice of Hindi cinema that touched hearts falls silent

OBITUARY

PCS
Anuj Kumar

Suman Kalyanpur, who touched the deepest corners of our hearts with her silken voice, passed away in Mumbai on Sunday night after a brief illness. Like a gentle wind bearing the fragrance of first rain, Kalyanpur's voice possessed a luminous clarity that spoke directly to the listener. It never knocked on the door of the heart – it felt like it was already nestled within, like a long-lost memory waiting to be remembered. Her understated and intimate expressions made her songs feel like quiet confessions.

In Hindi cinema's golden age, when competition was not always fair, and musical giants carried huge egos, Kalyanpur



SUMAN KALYANPUR (1937-2026)

viewed singing not as a vehicle for fame but as a pure, spiritual extension of her early love for the fine arts. Underappreciated even after delivering massive chartbusters, she remained remarkably soft-spoken, media-shy, and genuinely embarrassed by extravagant praise.

Born on January 28, 1937, in Dhaka to Shankar Rao Hemmady, a noted banker, she relocated to Bombay with her family in 1943. Music was not her first choice. As a teenager, she was passionate about the visual arts. After completing her schooling at Mumbai's St. Columba

High School, she enrolled at the prestigious Sir J.J. School of Art to pursue painting.

Her musical quest began when family members noticed her natural talent while she sang Noor Jehan songs at home, prompting her to pursue formal vocal training under family friend and composer Pandit Keshav Rao Bhole.

Later, maestro Khan Abdul Rehman Khan of Kirana gharana gave her a grounding in Hindustani classical music, followed by a stint with Master Navrang.

Finds a footing

Meanwhile, in 1953, when Kalyanpur sang at a college function, she impressed the legendary Talat Mahmood with her rendition of Noor Jehan classics. Mahmood recommended her name to the recording la-

bel HMV, and Kalayanpur found a footing in an extremely competitive industry led by the Mangeshkar sisters.

In a career spanning three decades, the Padma Bhushan sang in around 100 films in different languages. Her definitive masterpieces include *Na Tum Hamain Jano (Baat Ek Raat Ki)*, a masterclass in romantic yearning with Hemant Kumar, where her voice floats like moonlight over a minimalist arrangement by S.D. Burman. In Shankar Jaikishen's pulsating *Aaj Kal Tere Mere Pyar Ke Charche (Brahmachari)* and Kalyanji Anandji's teasing love song *Na Na Karte Pyar Tumhin Se Karte (Jab Jab Phool Khile, 1965)* with Rafi, Kalyanpur exudes her playful energy and mischievous tone without losing vocal control, while Naushad's ten-

der *Mera Pyar Bhi Tu Hai (Saathi, 1968)* with Mukesh is a perfect example of Kalyanpur's soft, romantic, caressing vocal style.

Comparison with Lata

Though a section of the industry saw Kalyanpur as an alternative to Lata Mangeshkar, and radio announcers inadvertently credited her songs to Mangeshkar, a close look reveals the difference in their sonic signatures. The discerning always appreciated Suman's softer, slightly rounder texture, which lent itself beautifully to intimate settings.

One of the abiding links with the golden era of Hindi film music, Kalyanpur will live on through melodies that continue to resonate across generations, a soothing voice that made ordinary love stories feel poetic and eternal.

02J6. The silken voice of Hindi cinema that touched hearts falls silent

दिलों को छू लेने वाली हिंदी सिनेमा की रेशमी आवाज़ खामोश हो गई

- **Suman Kalyanpur**, who touched the deepest corners of our hearts with her silken voice, passed away in **Mumbai** on Sunday night after a brief illness.

सुमन कल्याणपुर, जिन्होंने अपनी रेशमी आवाज़ से हमारे दिलों के सबसे गहरे कोनों को छुआ, उनका रविवार रात मुंबई में संक्षिप्त बीमारी के बाद निधन हो गया।

- Born on January 28, 1937, in **Dhaka to Shankar Rao Hemmady**, a noted banker, she relocated to **Bombay** with her family in 1943.

28 जनवरी 1937 को ढाका में प्रसिद्ध बैंकर शंकर राव हेम्माडी के घर जन्मी सुमन कल्याणपुर 1943 में अपने परिवार के साथ बॉम्बे आ गईं।

- Later, maestro **Khan Abdul Rehman Khan of Kirana gharana** gave her a grounding in Hindustani classical music, followed by a stint with **Master Navrang**. बाद में किराना घराना के उस्ताद **खान अब्दुल रहमान खान** ने उन्हें हिंदुस्तानी शास्त्रीय संगीत की शिक्षा दी, जिसके बाद उन्होंने **मास्टर नवरंग** के साथ भी काम किया।

- In a career spanning three decades, the **Padma Bhushan** sang in around 100 films in different languages. तीन दशकों के करियर में **पद्म भूषण** से सम्मानित सुमन कल्याणपुर ने विभिन्न भाषाओं की लगभग 100 फिल्मों में गीत गाए।

02J6. Divyanshi is youngest Indian to win WTT Feeder women's title

दिव्यांशी WTT फीडर महिला खिताब जीतने वाली सबसे युवा भारतीय बर्नी

- Fifteen-year-old **Divyanshi Bhowmick** produced a dream performance at **Prishtina in Kosovo** as she became the youngest Indian to win a **WTT Feeder women's singles**

Divyanshi is youngest Indian to win WTT Feeder women's title

PCS
Sports Bureau

Fifteen-year-old Divyanshi Bhowmick produced a dream performance at Prishtina in Kosovo as she became the youngest Indian to win a WTT Feeder women's singles title.

The World No. 211 Divyanshi stunned Chinese Taipei's Yeh Yi-Tian, placed 38 in the chart, with a 8-11, 11-8, 11-5, 7-11, 11-7 victory. According to the Table Tennis Federation of India, she is the second-youngest player in the world to capture a WTT Feeder women's crown. Divyanshi also clinched the women's doubles top prize



Divyanshi... the champion.

alongside fellow Indian teenager Syndrela Das. The pair defeated Japan's Sachi Aoki and Cocona Muramatsu 7-11, 14-12, 12-14, 11-8, 11-7.

In WTT Youth Contender Sandefjord, M. Ananya bagged the girls' u-17 singles trophy, beating Tushti Sood 14-12, 11-3, 12-10.



title.

15 वर्षीय दिव्यांशी भौमिक ने कोसोवो के प्रिस्टिना में शानदार प्रदर्शन करते हुए WTT फीडर महिला एकल खिताब जीतने वाली सबसे युवा भारतीय बनने का गौरव हासिल किया।

- The World No. 211 Divyanshi stunned Chinese Taipei's Yeh Yi-Tian, placed 38 in the chart, with a 8-11, 11-8, 11-5, 7-11, 11-7 victory.

A tribute to Satwik and Chirag's resilience



Celebration time: Satwik and Chirag are delighted after ending their drought. BADMINTON PHOTO

PCS

Devyanshi Bihani

For nearly two years, Satwiksairaj Rankireddy and Chirag Shetty were forced to watch title opportunities slip away amid injuries, setbacks and frustrating near-misses.

On Sunday, however, India's premier men's doubles pair ended the drought by becoming the first Indian duo to win the Singapore Open after defeating Indonesia's Fajar Alfian and Muhammad Shohibul Fikri 18-21, 21-17, 21-16 in the Super 750 final.

The triumph marked Satwik and Chirag's first BWF World Tour title since 2024 and capped a week in which they also snapped the 34-match winning streak of World champions Kim Won-ho and Seo Seung-jae in the semifinals.

"I think the last week has been really, really good. It's been almost two years since we had won a title, so that makes it even more special. Especially in a tournament like the Singapore Open, where historically we haven't done as well," Chirag said during a virtual press conference on Monday.

The title run was built on resilience, with four of the Indians' five matches going the distance. They were tested again in the final as the Indonesians edged a tight opening game after drawing level at 18. But Satwik and Chirag stayed composed.

"We'll accept if we lose, but we'll give everything and lose. The attitude was pretty calm. Even when we were down, we wanted to fight back," Satwik said.

The second game saw the Indians increase the pace of the exchanges and force errors from their opponents to force the decision.

The Indians entered the third game determined to seize control. Satwik's attacking game began to click while Chirag dominated the forecourt, helping the pair build a crucial cushion. Although Fajar and Fikri briefly narrowed the gap, the Indians remained in command and closed out the contest in 72 minutes.

With a long-awaited title finally secured, Satwik and Chirag head into this week's Indonesia Open with renewed confidence and momentum ahead of the World Championships and Asian Games later this year.

विश्व रैंकिंग में 211वें स्थान पर मौजूद दिव्यांशी ने रैंकिंग में 38वें स्थान पर काबिज चीनी ताइपे की येह यी-तियान को 8-11, 11-8, 11-5, 7-11, 11-7 से हराकर चौका दिया।

- According to the **Table Tennis Federation of India**, she is the second-youngest player in the world to capture a **WTT Feeder women's crown**.

टेबल टेनिस फेडरेशन ऑफ इंडिया के अनुसार, वह WTT फीडर महिला खिताब जीतने वाली दुनिया की दूसरी सबसे युवा खिलाड़ी हैं।

02J6. A tribute to Satwik and Chirag's resilience

सात्विक और चिराग के संघर्ष व जड़बे को सलाम

- For nearly two years, **Satwiksairaj Rankireddy and Chirag Shetty** were forced to watch title opportunities slip away amid injuries, setbacks and frustrating near-misses.

लगभग दो वर्षों तक **सात्विकसाईराज रंकीरेड्डी** और **चिराग शेट्टी** को चोटों,

असफलताओं और निराशाजनक करीबी हारों के बीच खिताब जीतने के मौके हाथ से निकलते हुए देखने पड़े।

- On Sunday, however, India's premier men's doubles pair ended the drought by becoming the first Indian duo to win the **Singapore Open** after defeating Indonesia's **Fajar Alfian and Muhammad Shohibul Fikri** 18-21, 21-17, 21-16 in the **Super 750 final**.

हालाँकि रविवार को भारत की शीर्ष पुरुष युगल जोड़ी ने इस सूखे को समाप्त करते हुए

सिंगापुर ओपन जीतने वाली पहली भारतीय जोड़ी बनने का गौरव हासिल किया। उन्होंने इंडोनेशिया के **फजार अल्फियान** और **मुहम्मद सोहिबुल फिक्री** को सुपर 750 फाइनल में 18-21, 21-17, 21-16 से हराया।

GS Paper 1: History	02 June 2026
TOPICS COVERED	
02J6	How red moved through empires, trade networks, and industrial factories



	लाल रंग किस प्रकार साम्राज्यों, व्यापारिक नेटवर्कों और औद्योगिक कारखानों के माध्यम से आगे बढ़ा।
02J6	QUIZ

How red moved through empires, trade networks, and industrial factories

Red emerges from a vast global system of dyes made from insects raised in the Americas, plants cultivated in Asia, and shellfish harvested along Mediterranean coasts; it moves through empires, trade networks, and factories, shifting from living organisms to laboratory production

SS I: History

Satwik Gade

In 1799, during the storming of the fortress of Seringapatam, British troops broke through the defences of Srirangapatna and killed Tipu Sultan, the ruler of Mysore. The palace inventories compiled in the aftermath record jewels, weapons, manuscripts and textiles of startling colour. Officers wrote with particular fascination about the intensity of the dyed fabrics stored in the royal workshops.

At the same moment, the soldiers themselves wore uniforms dyed in equally vivid scarlet. The British redcoat marching through the palace and the Mysorean textile he admired were both products of a vast global system of dyes – insects raised in the Americas, plants cultivated in Asia, shellfish harvested along Mediterranean coasts.

Global red trade

In the Mediterranean world, the most famous red-purple dye was extracted from marine snails harvested along Levantine shores. Classical writers such as Pliny the Elder describe vats of crushed shells fermenting under the sun, releasing a colour so rare that Roman law eventually reserved it for imperial robes. The value of the dye lay not merely in its hue but in the difficulty of its production: thousands of mollusks sacrificed to colour a single garment. In the Americas,

As pigments entered circuits of factories and markets, meanings attached to red began to shift: from sacrifice to revolution, warning, and mass politics

Indigenous farmers raised the cochineal insect on cactus paddles, harvesting the tiny bodies and drying them into a powder that produced a red of extraordinary intensity. A pound of red from these insects could produce enough red colour to run an entire factory. When Spanish ships began exporting cochineal to Europe in the sixteenth century, the dye rapidly became one of the most valuable commodities of the Atlantic world, rivaling silver in price and strategic importance.

Elsewhere, especially across Eurasia, dyers cultivated the roots of the madder plant, whose alizarin compounds could produce deep crimson lakes. These biological reds travelled astonishing distances. A single crimson cloak worn in London or Istanbul might contain colour drawn from insects cultivated in Oaxaca, plants grown in Central Asia, or mollusks harvested from Mediterranean shores. Colour, therefore, linked distant ecologies into networks of exchange long before industrial globalisation. Each red carried with it a geography.

Military power depended on these

networks. By the eighteenth century, the scarlet coats of European regiments required reliable supplies of imported dyes. On battlefields clouded with gunpowder smoke, vivid uniforms helped commanders identify their troops and maintain order. The siege of Seringapatam unfolded within this global colour economy. Mysore's textile workshops produced fabrics dyed through Indian Ocean trade networks that connected Persian, Southeast Asian and South Asian markets. British officers entering the palace encountered not simply decorative cloth but the material traces of a rival commercial system. Empires fought not only for territory but also for control of the commodities that coloured the world.

Imperial cloth

Yet even as imperial armies marched in crimson, the foundations of the dye trade were beginning to shift. For centuries, every brilliant red had depended on living organisms, whether it was roots pulled from soil, or insects harvested from cacti, or shellfish gathered along rocky coasts. In 1856, the English chemist William Henry Perkin inadvertently altered this relationship. While attempting to synthesise quinine in an experiment, he produced a purple residue that dyed silk with remarkable intensity. The compound, later marketed as mauveine, inaugurated the modern synthetic dye

industry. Within a few decades, chemists learned to reproduce the molecular structures responsible for many natural colours. In 1869, industrial chemists succeeded in synthesising alizarin, which is the key red component of madder, making centuries of agricultural cultivation suddenly unnecessary.

The implications were profound. Madder fields across Europe collapsed almost overnight. Cochineal plantations faced competition from cheaper laboratory pigments. What had once required soil, insects, seasons and skilled cultivation could now be produced in factories wherever coal, glassware and chemical knowledge were available.

Red was becoming abstract. Red moved from earth, to organism, to laboratory – from ritual substance to industrial commodity. And as pigments entered the circuits of factories, markets and empires, the meanings attached to red also began to shift: from sacrifice and sovereignty to revolution, warning, and mass politics.

Synthetic shift

The colour remained the same to the eye, but the world that produced it, and the world that would perceive red as a phenomenon, had both fundamentally changed.

(Satwik Gade is a Chennai-based writer and illustrator. This article is part of a series on the history and development of colours)

02J6. How red moved through empires, trade networks, and industrial factories

लाल रंग किस प्रकार साम्राज्यों, व्यापारिक नेटवर्कों और औद्योगिक कारखानों के माध्यम से आगे बढ़ा।

- In 1799, during the storming of the fortress of **Seringapatam**, British troops broke through the defences of **Srirangapatna** and killed **Tipu Sultan**, the ruler of **Mysore**. वर्ष 1799 में, **सेरिंगपट्टम** के किले पर आक्रमण के दौरान ब्रिटिश सैनिकों ने **श्रीरंगपट्टन** की रक्षा पंक्तियों को भेद दिया और **मैसूर** के शासक **टीपू सुल्तान** की हत्या कर दी।
- Officers wrote with particular fascination about the **intensity of the dyed fabrics stored in the royal workshops**. अधिकारियों ने विशेष आकर्षण के साथ राजकीय कार्यशालाओं में संग्रहित रंगे हुए वस्त्रों की गहन रंगत का वर्णन किया।

Global red trade

वैश्विक लाल रंग व्यापार

- In the Mediterranean world, the **most famous red-purple dye was extracted from marine snails harvested along Levantine shores**.



भूमध्यसागरीय विश्व में सबसे प्रसिद्ध लाल-बेंगनी रंग लेवांत के तटों से एकत्रित समुद्री घोंघों से प्राप्त किया जाता था।

- In the Americas, Indigenous farmers raised the **cochineal insect on cactus paddles**, harvesting the tiny bodies and drying them into a powder that produced a red of extraordinary intensity.
अमेरिका में स्थानीय कृषक कैक्टस पर **कोचिनियल** नामक कीटों का पालन करते थे, उनके छोटे शरीरों को एकत्र कर सुखाकर ऐसा चूर्ण बनाते थे जो अत्यंत गहरे लाल रंग का उत्पादन करता था।
- When Spanish ships began exporting cochineal to Europe in the sixteenth century, the dye rapidly became one of the most valuable commodities of the Atlantic world, rivaling silver in price and strategic importance.
जब सोलहवीं शताब्दी में स्पेनी जहाजों ने कोचिनियल को यूरोप निर्यात करना प्रारंभ किया, तब यह रंग शीघ्र ही अटलांटिक विश्व की सबसे मूल्यवान वस्तुओं में से एक बन गया और मूल्य तथा रणनीतिक महत्व में चाँदी की बराबरी करने लगा।
- Elsewhere, especially across **Eurasia, dyers cultivated the roots of the madder plant, whose alizarin compounds could produce deep crimson lakes.**
अन्य स्थानों पर, विशेषकर यूरेशिया में, रंगरेज़ मैडर पौधे की जड़ों की खेती करते थे, जिनके अलिज़ारिन यौगिक गहरे लाल रंग उत्पन्न कर सकते थे।
- A single crimson cloak worn in **London** or **Istanbul** might contain colour drawn from insects cultivated in **Oaxaca**, plants grown in **Central Asia**, or mollusks harvested from **Mediterranean shores.**
लंदन या इस्तांबुल में पहना गया एक लाल चोगा संभवतः ओआहाका में पाले गए कीटों, मध्य एशिया में उगाए गए पौधों या भूमध्यसागरीय तटों से प्राप्त मोलस्क जीवों के रंग से निर्मित होता था।
- The **siege of Seringapatam** unfolded within this global colour economy.
सेरिंगपट्टम की घेराबंदी इसी वैश्विक रंग अर्थव्यवस्था के भीतर हुई।
- For centuries, every brilliant red had depended on living organisms, whether it was roots pulled from soil, or insects harvested from cacti, or shellfish gathered along rocky coasts.
सदियों तक प्रत्येक चमकीला लाल रंग जीवित जीवों पर निर्भर था, चाहे वे मिट्टी से निकाली गई जड़ें हों, कैक्टस से प्राप्त कीट हों या पथरीले तटों से एकत्रित शंख-जीव।
- In 1856, the English chemist **William Henry Perkin** inadvertently altered this relationship.
वर्ष 1856 में अंग्रेज रसायनशास्त्री **विलियम हेनरी पर्किन** ने अनजाने में इस संबंध को बदल दिया।
- While attempting to synthesise quinine in an experiment, he produced a purple residue that dyed silk with remarkable intensity.
क्विनीन संश्लेषित करने के एक प्रयोग के दौरान उन्होंने एक बैंगनी अवशेष उत्पन्न किया जिसने रेशम को अत्यंत गहरे रंग में रंग दिया।
- The compound, later marketed as **mauveine**, inaugurated the modern synthetic dye industry.
यह यौगिक, जिसे बाद में **मॉवीन** के नाम से बाज़ार में प्रस्तुत किया गया, आधुनिक कृत्रिम रंग उद्योग की शुरुआत बना।
- In 1869, industrial chemists succeeded in synthesising **alizarin**, which is the key red component of **madder**, making centuries of agricultural cultivation suddenly unnecessary.
वर्ष 1869 में औद्योगिक रसायनज्ञों ने **अलिज़ारिन** का संश्लेषण करने में सफलता प्राप्त की, जो मैडर का मुख्य लाल घटक है, और इससे सदियों पुरानी कृषि आधारित खेती अचानक अनावश्यक हो गई।
- **Madder fields across Europe collapsed almost overnight.**
यूरोप भर में मैडर के खेत लगभग रातोंरात समाप्त हो गए।
- **Cochineal plantations faced competition from cheaper laboratory pigments.**
कोचिनियल बागानों को सस्ते प्रयोगशाला-निर्मित रंगों से प्रतिस्पर्धा का सामना करना पड़ा।
- What had once required soil, insects, seasons and skilled cultivation could now be produced in factories wherever coal, glassware and chemical knowledge were available.



जो कार्य पहले मिट्टी, कीट, मौसम और कुशल खेती पर निर्भर था, अब वह कोयला, काँच उपकरण और रासायनिक ज्ञान उपलब्ध होने पर कारखानों में उत्पादित किया जा सकता था।

- Red moved from earth, to organism, to laboratory — from ritual substance to industrial commodity.
लाल रंग पृथ्वी से जीवों तक और फिर प्रयोगशाला तक पहुँच गया — एक अनुष्ठानिक पदार्थ से औद्योगिक वस्तु में परिवर्तित हो गया।

Questions and Answers to the previous

day's daily quiz: 1. In which year did Goa attain statehood, and from which State was it separated? **Ans: 1987 and Daman and Diu**

2. On what date does Goa celebrate its

Liberation Day? **Ans: December 19, 1961**

3. Goa attained statehood on May 30, and it became the State of India. Fill in the blanks.

Ans: 25

4. Who owned Goa before India, and when was it annexed to India? **Ans: Portugal and 1961**

5. "Little Russia" in Goa refers to which place?

Ans: Morjim Beach

6. What was the name of Goa before it was changed to the present name? **Ans:**

Gomantak, Govapuri, Gopakapattanna and Aparanta

Visual: This place is famous for its "Blue Lagoon" — a stunning, emerald-green freshwater lagoon situated in South Goa. What is this place? **Ans: Cola Beach**

Early Birds: K.N. Viswanathan | Tom Alan Faith | Tito Shiladitya | Tamanjit Bisla | Sumana Dutta

- Portuguese rule in Goa had continued for nearly **451 years**.

3. Goa became the 25th State of India

- The inclusion of **Konkani in the Eighth Schedule** of the Constitution in 1992 further strengthened Goa's linguistic recognition at the national level.

4. Goa was owned by Portugal and annexed to India in 1961

- Before joining India, Goa was under the control of **Portugal**, which had established colonial rule there in **1510** under Afonso de Albuquerque.

5. "Little Russia" in Goa refers to Morjim Beach

- The term "**Little Russia**" is popularly associated with **Morjim Beach** in North Goa.
- The area gained this nickname because of the **large number of Russian tourists and expatriates who began visiting and residing there from the late 1990s onward**.
- Russian restaurants, signboards, cultural influence, and businesses became common in the locality.
- **Morjim** is also ecologically significant because it serves as a nesting site for the protected **Olive Ridley turtles**, attracting both tourists and conservationists.

6. Goa was earlier known by names such as Gomantak and Govapuri

- Historically, Goa was known by several ancient names including **Gomantak, Govapuri, Gopakapattana, and Aparanta**.



- These names are found in ancient Indian texts, Puranas, and historical records. "Gomantak" is often interpreted as "fertile land" or "land of cows."
- During different historical periods, Goa was ruled by the Kadambas, Bahmani Sultanate, Vijayanagara Empire, and the Portuguese.

GS Paper 1: Geography		02 June 2026
TOPICS COVERED		
02J6	Fearsome dinosaur-era reptile was T. rex of the sea भयावह डायनासोर-युग का सरीसृप समुद्र का टी. रेक्स था।	

Fearsome dinosaur-era reptile was T. rex of the sea

GS 1: Geography
Readers

Tyrannosaurus rex was a huge land predator during the twilight of the age of dinosaurs. But it was not the only T. rex that terrorised the Cretaceous Period. There also was a marine reptile named *Tylosaurus rex* – the T. rex of the sea – that rivalled its land counterpart in size and ferocity.

Scientists say they have identified *Tylosaurus rex* as a distinct species after a wide-ranging examination of previously discovered fossils. They made the judgment based on its enormous size, fine serrations along the edges of its teeth to cut flesh more efficiently, heavy-duty musculature of the jaws and neck for subduing large prey, and certain other anatomical nuances. Roughly 66 million years ago, *Tyrannosaurus rex* roamed the land in Western North America.

The seagoing T. rex with a streamlined body, elongated snout with large teeth, four large paddle-like flippers, and a powerful tail, rivalling its land counterpart in size and ferocity

Approximately 80 million years ago, *Tylosaurus rex* prowled an inland sea that at the time split North America in two. The seagoing T. rex had a streamlined body, elongated snout with large teeth, four large paddle-like flippers, and a powerful tail. The genus 'Tylosaurus' has been known since fossils were first unearthed during the 19th century. A handful of species are recognised, including *Tylosaurus proriger*. A genus is a grouping of closely related species sharing similar characteristics. For example, lions and tigers are from the same genus but represent different species.

The largest *Tyrannosaurus rex* specimen, nicknamed Sue and held at the Field Museum in Chicago, is about 12.2 m long. The largest *Tylosaurus rex* specimen, nicknamed Bunker and held at the University of Kansas Biodiversity Institute and Natural History Museum, is about 13.2 m long. Bunker previously had been identified as *Tylosaurus proriger*, but possessed the suite of traits that assigned it to *Tylosaurus rex*, the researchers said. "The skull alone is as long as I am tall – 5-foot-7 inches (1.7 m)," said palaeontologist Amelia Zietlow of the History Museum at the Castle in Appleton, Wisconsin, lead author of the study published in the *Bulletin of the American Museum of Natural History*.

Tylosaurus rex is a member of a group of marine reptiles with a global distribution called mosasaurs that evolved from land-living lizards to become apex marine predators during the final roughly 30 million years of the age of dinosaurs. Today's monitor lizards, including the Komodo dragon – the largest present-day lizard at up to 3 m long – are perhaps among the closest living relatives of *Tylosaurus rex*. Most of the fossils identified as *Tylosaurus rex* come from north and central Texas, though Bunker came from Kansas. The holotype specimen – the fossil used to formally name a species – is at the Perot Museum.

The new species name, meaning "king of the tylosaurs," was a nod to *Tyrannosaurus rex* – "an incredible animal itself, obviously," Ms. Zietlow said. The two T. rexes were not contemporaries, though forerunners of the giant dinosaur lived at the same time as the giant mosasaur. *Tylosaurus rex* was among the largest of the mosasaurs, alongside the likes of *Mosasaurus hoffmanni*.

02J6. Fearsome dinosaur-era reptile was T. rex of the sea

भयावह डायनासोर-युग का सरीसृप समुद्र का टी. रेक्स था।

- **Tyrannosaurus rex** was a huge land predator during the twilight of the age of dinosaurs.

टायरैनोसॉरस रेक्स डायनासोरों के युग के अंतिम चरण में एक विशाल स्थलीय शिकारी था।

- But it was not the only T. rex that terrorised the **Cretaceous Period**.

किन्तु क्रेटेशियस काल में आतंक फैलाने वाला वह एकमात्र टी. रेक्स नहीं था।

- There also was a marine reptile named **Tylosaurus rex** — the T. rex of the sea — that rivalled its land counterpart in size and ferocity.

एक समुद्री सरीसृप टायलोसॉरस रेक्स भी था — समुद्र का टी. रेक्स — जो आकार और उग्रता में अपने स्थलीय समकक्ष की बराबरी करता था।

- Roughly 66 million years ago, **Tyrannosaurus rex** roamed the land in **Western North America**.

लगभग 6.6 करोड़ वर्ष पूर्व टायरैनोसॉरस रेक्स पश्चिमी उत्तरी अमेरिका की भूमि पर विचरण करता था।

- The largest **Tylosaurus rex** specimen, nicknamed **Bunker** and held at the **University of Kansas Biodiversity Institute and Natural History Museum**, is about 13.2 m long.

टायलोसॉरस रेक्स का सबसे बड़ा नमूना, जिसे बंकर

नाम दिया गया है और जो यूनिवर्सिटी ऑफ कंसास बायोडायवर्सिटी इंस्टिट्यूट एंड नेचुरल हिस्ट्री म्यूज़ियम में रखा गया है, लगभग 13.2 मीटर लंबा है।

- **Tylosaurus rex** is a member of a group of marine reptiles with a global distribution called **mosasaurs** that evolved from land-living lizards to become apex marine predators during the nal roughly 30 million years of the age of dinosaurs.



टायलोसॉरस रेक्स समुद्री सरीसृपों के एक वैश्विक समूह मोसासॉर्स का सदस्य है, जो स्थलीय छिपकलियों से विकसित होकर डायनासोरों के युग के अंतिम लगभग 3 करोड़ वर्षों के दौरान समुद्र के शीर्ष शिकारी बन गए।

- Today's monitor lizards, including the **Komodo dragon** — the largest present-day lizard at up to 3 m long — are perhaps among the closest living relatives of **Tylosaurus rex**.

वर्तमान समय की मॉनिटर छिपकलियाँ, जिनमें **कोमोडो ड्रैगन** भी शामिल है — जो लगभग 3 मीटर लंबाई वाली आज की सबसे बड़ी छिपकली है — संभवतः टायलोसॉरस रेक्स के सबसे निकट जीवित संबंधियों में से हैं।

- The two **T. rexes** were not contemporaries, though forerunners of the giant dinosaur lived at the same time as the giant mosasaur.

दोनों टी. रेक्स एक ही समय के जीव नहीं थे, यद्यपि विशाल डायनासोर के पूर्वज उसी काल में जीवित थे जब विशाल मोसासॉर मौजूद था।

- **Tylosaurus rex** was among the largest of the mosasaurs, alongside the likes of **Mosasaurus hoffmanni**.

टायलोसॉरस रेक्स, मोसासॉरस हॉफमानी जैसे मोसासॉर्स के साथ, सबसे बड़े मोसासॉर्स में से एक था।

GS Paper II: Polity		02 June 2026
TOPICS COVERED		
02J6	Centre clears five new judges for SC; strength rises to 37 केंद्र ने सुप्रीम कोर्ट के लिए पाँच नए न्यायाधीशों को मंजूरी दी; संख्या बढ़कर 37 हुई	
02J6	Delhi HC recognises 'right to be forgotten', lays down rules for de-indexing judicial records दिल्ली हाई कोर्ट ने 'भूल जाने के अधिकार' को मान्यता दी, न्यायिक अभिलेखों को डी-इंडेक्स करने के नियम तय किए	

Centre clears five new judges for SC; strength rises to 37

GS II: Polity

The Hindu Bureau
NEW DELHI

The Centre on Monday cleared the appointment of five judges to the Supreme Court, taking the court's strength to 37, close to its revised sanctioned strength of 38.

In a post on X, Minister of State for Law and Justice Arjun Ram Meghwal said the President had approved the appointments under Article 124(2) of the Constitution.

Those appointed are Justice Sheel Nagu, Chief Justice of the Punjab and Haryana High Court; Justice Shree Chandrashekar, Chief Justice of the Bombay High Court; Justice Sanjeev Sachdeva, Chief Justice of the Madhya Pradesh High Court; Justice Arun Palli, Chief Justice of the High Court of Jammu and Kashmir and Ladakh; and senior advocate V. Mohana.

Ms. Mohana was one of the leading counsels in a series of cases highlighting structural career inequali-



V. Mohana

ties for women officers in the armed forces. Currently, the Supreme Court has only one woman judge, Justice B.V. Nagarathna, who is also part of the Supreme Court Collegium. Justice Nagarathna was appointed to the Supreme Court in August 2021.

The appointments follow the Collegium's recommendation on May 27, 2026.

The development comes weeks after the Centre, on May 5, increased the sanctioned strength of the Supreme Court from 34 to 38 judges through the Supreme Court (Number of Judges) Amendment Ordinance, 2026.

02J6. Centre clears five new judges for SC; strength rises to 37

केंद्र ने सुप्रीम कोर्ट के लिए पाँच नए न्यायाधीशों को मंजूरी दी; संख्या बढ़कर 37 हुई

- The Centre on Monday cleared the appointment of five judges to the **Supreme Court**, taking the court's strength to 37, close to its revised sanctioned strength of 38.

केंद्र ने सोमवार को सुप्रीम कोर्ट में पाँच न्यायाधीशों की नियुक्ति को मंजूरी दी, जिससे अदालत की संख्या बढ़कर 37 हो गई, जो संशोधित स्वीकृत संख्या 38 के करीब है।

- In a post on X, Minister of State for Law and Justice Arjun Ram Meghwal said the President had approved the appointments under **Article 124(2) of the Constitution**.

X पर एक पोस्ट में विधि एवं न्याय राज्य मंत्री अर्जुन राम मेघवाल ने कहा कि राष्ट्रपति ने संविधान के अनुच्छेद 124(2) के तहत इन नियुक्तियों को मंजूरी दी है।

- Those appointed are Justice **Sheel Nagu**, Chief Justice of the **Punjab and Haryana High Court**.

नियुक्त किए गए न्यायाधीशों में पंजाब एवं हरियाणा हाई कोर्ट के मुख्य न्यायाधीश जस्टिस शील नागू शामिल हैं।



- Justice **Shree Chandrashekhar**, Chief Justice of the **Bombay High Court**.
बॉम्बे हाई कोर्ट के मुख्य न्यायाधीश जस्टिस श्री चंद्रशेखर शामिल हैं।
- Justice **Sanjeev Sachdeva**, Chief Justice of the **Madhya Pradesh High Court**.
मध्य प्रदेश हाई कोर्ट के मुख्य न्यायाधीश जस्टिस संजीव सचदेवा शामिल हैं।
- Justice **Arun Palli**, Chief Justice of the **High Court of Jammu and Kashmir and Ladakh**.
जम्मू-कश्मीर और लद्दाख हाई कोर्ट के मुख्य न्यायाधीश जस्टिस अरुण पल्ली शामिल हैं।
- **And senior advocate V. Mohana**.
तथा वरिष्ठ अधिवक्ता वी. मोहना शामिल हैं।
- **Ms. Mohana was one of the leading counsels in a series of cases highlighting structural career inequalities for women officers in the armed forces.**
सुश्री मोहना सशस्त्र बलों में महिला अधिकारियों के लिए संरचनात्मक करियर असमानताओं को उजागर करने वाले कई मामलों में प्रमुख वकीलों में से एक थीं।
- **Currently, the Supreme Court has only one woman judge, Justice B.V. Nagarathna, who is also part of the Supreme Court Collegium.**
वर्तमान में सुप्रीम कोर्ट में केवल एक महिला न्यायाधीश जस्टिस बी.वी. नागरत्ना हैं, जो सुप्रीम कोर्ट कॉलेजियम का भी हिस्सा हैं।
- **Justice Nagarathna was appointed to the Supreme Court in August 2021.**
जस्टिस नागरत्ना की नियुक्ति अगस्त 2021 में सुप्रीम कोर्ट में हुई थी।
- **The development comes weeks after the Centre, on May 5, increased the sanctioned strength of the Supreme Court from 34 to 38 judges through the Supreme Court (Number of Judges) Amendment Ordinance, 2026.**
यह घटनाक्रम केंद्र द्वारा 5 मई को सुप्रीम कोर्ट (न्यायाधीशों की संख्या) संशोधन अध्यादेश, 2026 के माध्यम से सुप्रीम कोर्ट की स्वीकृत संख्या 34 से बढ़ाकर 38 करने के कुछ सप्ताह बाद आया है।

Delhi HC recognises 'right to be forgotten', lays down rules for de-indexing judicial records

GS II: Polity
The Hindu Bureau
NEW DELHI

The Delhi High Court has held that the "right to be forgotten" flows from the constitutional right to privacy under Article 21 and enables individuals to seek removal of personal information from public digital accessibility when it no longer serves a legitimate public purpose.

Justice Sachin Datta, in a 144-page judgment delivered on Friday, laid down a framework governing de-indexing of judicial records from search engines and masking of personal identifiers from publicly accessible court records.

"India presently lacks a comprehensive statutory

Petitioners sought removal of personal information from digital public domain

framework explicitly governing the right to be forgotten. However, the absence of specific legislation does not preclude constitutional courts from recognising and enforcing this right," the High Court remarked.

The court's decision came while hearing over 30 petitions filed by a diverse group of individuals, including persons who had been acquitted of criminal charges, parties to matrimonial disputes, persons whose proceedings had

been quashed or settled, and individuals whose names appeared incidentally in judicial records.

'Harm to reputation'

The petitioners shared a common grievance that the continued availability and name-based searchability of judicial records bearing their names in the digital public domain causes "disproportionate and continuing harm to their reputations, dignity, and life prospects".

Giving them relief, the court directed search engines, legal database platforms and other intermediaries to de-index specified judgments, orders and related reportage from name-based search results.

02J6. Delhi HC recognises 'right to be forgotten', lays down rules for de-indexing judicial records

दिल्ली हाई कोर्ट ने 'भूल जाने के अधिकार' को मान्यता दी, न्यायिक अभिलेखों को डी-इंडेक्स करने के नियम तय किए

• The **Delhi High Court** has held that the "right to be forgotten" flows from the constitutional right to privacy under **Article 21** and enables individuals to seek removal of personal information from public digital accessibility when it no longer serves a legitimate public purpose.

दिल्ली हाई कोर्ट ने कहा है कि "भूल जाने का अधिकार" संविधान के अनुच्छेद 21 के तहत निजता के अधिकार से उत्पन्न होता है और यह



व्यक्तियों को सार्वजनिक डिजिटल पहुंच से अपनी व्यक्तिगत जानकारी हटाने का अधिकार देता है, जब उसका कोई वैध सार्वजनिक उद्देश्य नहीं रह जाता।

- Justice **Sachin Datta**, in a 144-page judgment delivered on Friday, laid down a framework governing **de-indexing of judicial records from search engines and masking of personal identifiers from publicly accessible court records.**
न्यायमूर्ति **सचिन दत्ता** ने शुक्रवार को दिए गए 144 पृष्ठों के फैसले में सर्च इंजनों से न्यायिक रिकॉर्ड को डी-इंडेक्स करने और सार्वजनिक रूप से उपलब्ध अदालत रिकॉर्ड से व्यक्तिगत पहचान संबंधी जानकारी छिपाने के लिए एक रूपरेखा तय की।
- “India presently lacks a **comprehensive statutory framework explicitly governing the right to be forgotten.** However, the absence of specific legislation does not preclude constitutional courts from recognising and enforcing this right,” the High Court remarked.
हाई कोर्ट ने कहा, “भारत में वर्तमान में ‘भूल जाने के अधिकार’ को स्पष्ट रूप से नियंत्रित करने वाला कोई व्यापक वैधानिक ढांचा नहीं है। हालांकि, विशेष कानून की अनुपस्थिति संवैधानिक अदालतों को इस अधिकार को मान्यता देने और लागू करने से नहीं रोकती।”
- The court’s decision came while hearing over 30 petitions filed by a diverse group of individuals, including persons who had been acquitted of criminal charges, parties to matrimonial disputes, persons whose proceedings had been quashed or settled, and individuals whose names appeared incidentally in judicial records.
अदालत का यह फैसला 30 से अधिक याचिकाओं की सुनवाई के दौरान आया, जिन्हें विभिन्न लोगों ने दायर किया था, जिनमें आपराधिक मामलों से बरी हुए लोग, वैवाहिक विवादों के पक्षकार, जिनके मामले रद्द या सुलझा दिए गए थे, और वे लोग शामिल थे जिनके नाम न्यायिक रिकॉर्ड में संयोगवश दर्ज हो गए थे।

‘Harm to reputation’

‘प्रतिष्ठा को नुकसान’

- The petitioners shared a common grievance that the continued availability and name-based searchability of judicial records bearing their names in the digital public domain causes “disproportionate and continuing harm to their reputations, dignity, and life prospects”.
याचिकाकर्ताओं की साझा शिकायत थी कि डिजिटल सार्वजनिक क्षेत्र में उनके नाम वाले न्यायिक रिकॉर्ड की निरंतर उपलब्धता और नाम के आधार पर खोजे जाने की सुविधा उनकी “प्रतिष्ठा, गरिमा और जीवन की संभावनाओं को असंगत और निरंतर नुकसान” पहुंचाती है।
- Giving them relief, the court directed search engines, legal database platforms and other intermediaries to de-index specified judgments, orders and related reportage from name-based search results.
उन्हें राहत देते हुए अदालत ने सर्च इंजनों, कानूनी डेटाबेस प्लेटफॉर्मों और अन्य मध्यस्थों को निर्देश दिया कि वे निर्दिष्ट फैसलों, आदेशों और संबंधित रिपोर्टों को नाम-आधारित खोज परिणामों से डी-इंडेक्स करें।

GS Paper II: Governance		02 June 2026
TOPICS COVERED		
02J6	Joy and pain खुशी और पीड़ा	



GS II: Governance-Health Sector

Joy and pain

Health gains from NFHS-6 are significant, but unaddressed needs exist

When triumph and disaster arrive at the same time, it is important to celebrate, but also, to take stock, assess, and pivot to address the lacuna. The recently released National Family Health Survey (NFHS)-6 data offer such an opportunity. The data for 2023-24 revealed some remarkable gains for India, but also exposed some unguarded pathways that will become disastrous if not attended to. The greatest of the gains came in the sector of child health – stunting is down by 17%; severe wasting is down 32%; institutional deliveries are at over 90%; and full immunisation coverage for children aged 12-23 months rose to over 87%. Additionally, the figures show that India's Total Fertility Rate (TFR) had stabilised at 2.0, below the replacement level of 2.1. Unequivocally, these are gains; ones that India has been working on for decades. It is an encouraging sign that the needle has finally moved, in these crucial sectors. These gains will have to be built upon, without any drop in service delivery, while remaining uncompromising on access or quality of services in the public sector. However, health managers need to heed the other side of the paradigm as well. NFHS-6 indicates a 'dual public health burden' – obesity (in three years, it had grown from 22.9% to 27.3% among men, while among women, from 24% to 30.7%) remains problematic while some level of malnutrition continues, besides the onslaught of lifestyle diseases. The survey also showed a decline in exclusive breastfeeding among children under six months, from 63.7% in NFHS-5 to 55.8% in NFHS-6. Breast feeding is essential to prevent infant malnutrition.

The NFHS, one of the largest cross-sectional household surveys in the world, could easily be considered the primary tool to define public policy, and evidence-based governance, besides tracking development indicators. The data it generates are crucial. Other India-level data from similar periods indicate similar trends; the SRS and the National Health Accounts Survey reveal the lack of focus or funds for lifestyle diseases, and metabolic disorders. The danger of letting this continue will be known sooner rather than later, as India progresses through a demographic transition to a greayer nation. At this stage, transformations are still possible. Setting up comprehensive screening programmes for NCDs, stressing on nation-wide behaviour change communication on diet and exercise, and ensuring higher taxes on sugared beverages and packaged foods are all techniques that will help reduce, and limit the burden, of NCDs. Bolstering health systems to tackle these NCDs, once they set in, at every level – village, town and city – is also critical.

शासन का प्रमुख उपकरण माना जा सकता है।

- The data it generates are crucial. इसके द्वारा उत्पन्न आँकड़े अत्यंत महत्वपूर्ण हैं।
- Setting up comprehensive screening programmes for NCDs, stressing on nation-wide behaviour change communication on diet and exercise, and ensuring higher taxes on sugared beverages and packaged foods are all techniques that will help reduce, and limit the burden, of NCDs.

गैर-संचारी रोगों (NCDs) के लिए व्यापक स्क्रीनिंग कार्यक्रम स्थापित करना, आहार और व्यायाम के संबंध में राष्ट्रव्यापी व्यवहार परिवर्तन संचार पर बल देना, तथा मीठे पेय पदार्थों और पैकेज्ड खाद्य पदार्थों पर अधिक कर सुनिश्चित करना — ये सभी उपाय NCDs के बोझ को कम और सीमित करने में सहायक होंगे।

02J6. Joy and pain

खुशी और पीड़ा

- The greatest of the gains came in the sector of child health — stunting is down by 17%; severe wasting is down 32%; institutional deliveries are at over 90%; and full immunisation coverage for children aged 12-23 months rose to over 87%.

सबसे बड़ी उपलब्धियाँ बाल स्वास्थ्य के क्षेत्र में प्राप्त हुईं — अवरुद्ध वृद्धि में 17% की कमी आई; गंभीर क्षीणता में 32% की कमी हुई; संस्थागत प्रसव 90% से अधिक हो गए; तथा 12-23 माह आयु के बच्चों के लिए पूर्ण टीकाकरण कवरेज 87% से अधिक हो गया।

- Additionally, the figures show that India's **Total Fertility Rate (TFR)** had stabilised at 2.0, below the replacement level of 2.1.

इसके अतिरिक्त, आँकड़े दर्शाते हैं कि भारत की कुल प्रजनन दर (TFR) 2.0 पर स्थिर हो गई है, जो प्रतिस्थापन स्तर 2.1 से नीचे है।

- **NFHS-6** indicates a 'dual public health burden' — obesity (in three years, it had grown from 22.9% to 27.3% among men, while among women, from 24% to 30.7%) remains problematic while some level of malnutrition continues, besides the onslaught of lifestyle diseases.

NFHS-6 एक 'द्वैध सार्वजनिक स्वास्थ्य बोझ' को इंगित करता है — मोटापा (तीन वर्षों में पुरुषों में 22.9% से बढ़कर 27.3% तथा महिलाओं में 24% से बढ़कर 30.7%) अभी भी गंभीर समस्या बना हुआ है, जबकि जीवनशैली संबंधी रोगों के बढ़ते प्रभाव के साथ कुछ स्तर का कुपोषण भी जारी है।

- The survey also showed a decline in exclusive breastfeeding among children under six months, from 63.7% in **NFHS-5** to 55.8% in **NFHS-6**.

सर्वेक्षण में यह भी पाया गया कि छह माह से कम आयु के बच्चों में केवल स्तनपान की दर **NFHS-5** में 63.7% से घटकर **NFHS-6** में 55.8% रह गई।

- **Breast feeding is essential to prevent infant malnutrition.**

शिशु कुपोषण को रोकने के लिए स्तनपान अत्यंत आवश्यक है।

- The **NFHS**, one of the largest cross-sectional household surveys in the world, could easily be considered the primary tool to define public policy, and evidence-based governance, besides tracking development indicators.

NFHS, जो विश्व के सबसे बड़े क्रॉस-सेक्शनल घरेलू सर्वेक्षणों में से एक है, विकास संकेतकों की निगरानी के साथ-साथ सार्वजनिक नीति निर्धारण और साक्ष्य-आधारित



02J6	No room for anti-India elements in Myanmar, says visiting President म्यांमार में भारत-विरोधी तत्वों के लिए कोई जगह नहीं, दौरे पर आए राष्ट्रपति ने कहा
02J6	Ethical use of AI in cultural space to be a key focus area at BRICS culture meetings ब्रिक्स संस्कृति बैठकों में सांस्कृतिक क्षेत्र में AI के नैतिक उपयोग पर रहेगा विशेष फोकस
02J6	IMEC is caught between commerce and geopolitics IMEC वाणिज्य और भूराजनीति के बीच फँस गया है।
02J6	EU's engagement with West Balkan countries is real: Costa पश्चिम बाल्कन देशों के साथ EU की भागीदारी वास्तविक है: कोस्टा
02J6	Court rejects Rwanda's £100 mn claim against U.K. over migrant deal प्रवासी समझौते पर अदालत ने ब्रिटेन के खिलाफ रवांडा के £100 मिलियन दावे को खारिज किया

No room for anti-India elements in Myanmar, says visiting President

GS II: IR
Kallol Bhattacharjee
NEW DELHI

Visiting Myanmar President Min Aung Hlaing has assured India that he will not allow use of his country's territory by groups that pose a security threat to Indian interests. The concern was raised by Prime Minister Narendra Modi, who held broad-spectrum conversations with Mr. Hlaing on Monday, including calls for dialogue between the junta-backed government and the pro-democracy opposition in Myanmar. Foreign Secretary Vikram Misri said the discussion included the issue of detention of former leader and Nobel laureate Aung San Suu Kyi.

"The President reiterated Myanmar's assurance that its territory would not be permitted to be used against India's security interests. The Prime Minister affirmed that India... remained committed to deepening security cooperation between the two countries," a joint statement issued at the end of the discussion mentioned.

Mr. Misri later said that the issue of presence of insurgents from India's Northeast in Myanmar territory was raised by Mr. Modi during the talks.



Promising talks: PM Narendra Modi with Myanmar President Min Aung Hlaing in New Delhi on Monday. SHY KUMAR PUSHPAKAR

Defence cooperation
Mr. Misri further said that the two sides discussed defence cooperation that will cover training of Myanmar troops for United Nations peacekeeping. "This is something that has been in focus for several years now. Defence cooperation with Myanmar focuses on training, capacity building, institution building and a very important part of the training is also UN peacekeeping." Mr. Misri also said that the defence cooperation also included concerns related to security and safety of the India-Myanmar border spanning 1,643 km.

He also informed that the discussion covered critical minerals as Myanmar has major deposits in the Kachin State that borders both India and China. The discussion also included the issue of existence of cyber scam centres in southeast Myanmar bordering Thailand. Mr. Misri recollected that India has airlifted at least 2,411 workers from cyber scam compounds in Myanmar so far.

Mr. Hlaing's visit has also drawn criticism from Myanmar's exiled Opposition and especially the exiled National Unity Government (NUG), which has urged India not to grant legitimacy to his junta-backed government.

'Pragmatic step'
The visit of Mr. Hlaing is being viewed as a pragmatic engagement of Myanmar by India despite the conflict situation that prevails in that country since the February 2021 coup that deposed the National League for Democracy (NLD) government of Ms. Suu Kyi. Speaking to the media after the discussion, Mr. Misri mentioned that a detailed discussion was held during the talks to "find a way" out of the civil conflict, saying that India believes in "sustained dia-

02J6. No room for anti-India elements in Myanmar, says visiting President

म्यांमार में भारत-विरोधी तत्वों के लिए कोई जगह नहीं, दौरे पर आए राष्ट्रपति ने कहा

• Visiting Myanmar President **Min Aung Hlaing** has assured India that he will not allow use of his country's territory by groups that pose a security threat to Indian interests. दौरे पर आए म्यांमार के राष्ट्रपति **मिन आंग हलाइंग** ने भारत को आश्वासन दिया है कि वह अपने देश की भूमि का उपयोग उन समूहों द्वारा नहीं होने देंगे जो भारत के हितों के लिए सुरक्षा खतरा पैदा करते हैं।

• Foreign Secretary **Vikram Misri** said the discussion included the issue of detention of former leader and **Nobel laureate Aung San Suu Kyi**. विदेश सचिव **विक्रम मिस्री** ने कहा कि चर्चा में पूर्व नेता और नोबेल पुरस्कार विजेता **आंग सान सू ची** की हिरासत का मुद्दा भी शामिल था।

• The visit of Mr. Hlaing is being viewed as a pragmatic engagement of Myanmar by India despite the conflict situation that prevails in that country since the **February 2021 coup that deposed the National League for Democracy (NLD) government of Ms. Suu Kyi**.

श्री हलाइंग की यात्रा को भारत द्वारा म्यांमार के साथ एक व्यावहारिक जुड़ाव के रूप में देखा जा रहा है, जबकि फरवरी 2021 के तख्तापलट के बाद से वहां संघर्ष की स्थिति बनी हुई है, जिसने सुश्री सू ची की नेशनल लीग फॉर डेमोक्रेसी (NLD) सरकार को हटा दिया था।

• He further informed that the two sides discussed infrastructure projects like the **Kaladan Multimodal Transit Transport Project** and the trilateral **Moreh-Mae Sot highway** that was to connect India's northeast with Myanmar via Thailand – both of which have been "delayed" by the conflict in Myanmar.

उन्होंने आगे बताया कि दोनों पक्षों ने **कलादान मल्टीमॉडल ट्रांजिट ट्रांसपोर्ट प्रोजेक्ट** और त्रिपक्षीय **मोरेह-माए सॉट राजमार्ग** जैसे अवसंरचना परियोजनाओं पर चर्चा की, जो भारत के पूर्वोत्तर को थाईलैंड के माध्यम से म्यांमार से जोड़ने वाली थीं — और दोनों ही परियोजनाएं म्यांमार के संघर्ष के कारण "विलंबित" हो गई हैं।

- "Right now, the obstacle that faces both of these projects is the security situation in Myanmar," said Mr. Misri, adding that there are "active hostilities" currently under way in the **Kaladan highway between the Myanmar Army and the ethnic armed organisations in the Rakhine State**.



“इस समय इन दोनों परियोजनाओं के सामने सबसे बड़ी बाधा म्यांमार की सुरक्षा स्थिति है,” श्री मिस्री ने कहा। उन्होंने बताया कि **राखाइन राज्य** में कलादान राजमार्ग पर म्यांमार सेना और जातीय सशस्त्र संगठनों के बीच वर्तमान में “सक्रिय संघर्ष” चल रहा है।

Defence cooperation

रक्षा सहयोग

- Mr. Misri further said that the two sides discussed defence cooperation that will **cover training of Myanmar troops for United Nations peacekeeping**.
श्री मिस्री ने आगे कहा कि दोनों पक्षों ने रक्षा सहयोग पर चर्चा की जिसमें **संयुक्त राष्ट्र शांति स्थापना** के लिए म्यांमार के सैनिकों का प्रशिक्षण शामिल होगा।
- Mr. Misri also said that the defence cooperation also included concerns related to security and safety of the **India-Myanmar border spanning 1,643 km**.
श्री मिस्री ने यह भी कहा कि रक्षा सहयोग में **भारत-म्यांमार सीमा** की सुरक्षा और संरक्षा से जुड़ी चिंताएं भी शामिल थीं, जिसकी लंबाई **1,643 किमी** है।
- He also informed that the discussion covered **critical minerals** as Myanmar has major deposits in the **Kachin State** that borders both India and China.
उन्होंने यह भी बताया कि चर्चा में **महत्वपूर्ण खनिजों** का मुद्दा भी शामिल था क्योंकि म्यांमार के **काचिन राज्य** में बड़े भंडार हैं, जिसकी सीमा भारत और चीन दोनों से लगती है।
- The discussion also included the issue of the existence of **cyber scam centres** in southeast Myanmar bordering Thailand.
चर्चा में थाईलैंड से लगते दक्षिण-पूर्वी म्यांमार में मौजूद **साइबर धोखाधड़ी केंद्रों** का मुद्दा भी शामिल था।
- Mr. Misri recollected that **India has airlifted at least 2,411 workers from cyber scam compounds in Myanmar so far**.
श्री मिस्री ने बताया कि भारत अब तक म्यांमार के साइबर धोखाधड़ी परिसरों से कम से कम **2,411 श्रमिकों** को

एयरलिफ्ट कर चुका है।

Ethical use of AI in cultural space to be a key focus area at BRICS culture meetings

CGS II: IR
NEW DELHI

The ethical use of artificial intelligence in the cultural space will be one of the focus areas for discussion during the BRICS culture working group meetings beginning from Thursday, the Union Culture Ministry said on Monday.

Creative economy, culture climate and sustainable development and cultural and creative industries are some of the other areas of deliberation, Union Culture Secretary Vivek Agrawal said at a press conference in which he unveiled the comprehensive road map and calendar for the 2026 BRICS Culture Track.

He said that there was a line-up of major cultural events around the BRICS summit scheduled across

Varanasi is set to host 2nd Culture Working Group Meeting after the 1st CWG, which was held virtually

the country over the coming months. Varanasi is set to host second Culture Working Group Meeting, following the successful completion of the 1st Culture Working Group (CWG) meeting held virtually on April 29-30.

“As one of the world’s oldest living cities, Varanasi will serve as the backdrop for five critical thematic panel discussions aimed at shaping the final outcome document,” Mr. Agrawal said.

The five themes are: creative economy and people-to-people cooperation,

copyright and ethical AI in the creative economy, cultural heritage protection and return of cultural property, collaborative approaches to safeguarding shared heritage and culture as a driver of sustainable development.

The culture track will feature a total of four official meetings alongside major public festivals, bringing together the 11 member nations (Brazil, Russia, India, China, South Africa, Egypt, Ethiopia, Iran, Saudi Arabia, the UAE, and Indonesia) along with 10 newly joined partner countries. After Varanasi, the third BRICS CWG meeting would be held in Bhopal followed by the BRICS Culture Festival and the BRICS Culture Minister’s meeting. A BRICS theatre festival would be held in Delhi in October.

02J6. Ethical use of AI in cultural space to be a key focus area at BRICS culture meetings
ब्रिक्स संस्कृति बैठकों में सांस्कृतिक क्षेत्र में AI के नैतिक उपयोग पर रहेगा विशेष फोकस

• The **ethical use of artificial intelligence** in the cultural space will be one of the focus areas for discussion during the **BRICS culture working group meetings** beginning from Thursday, the Union Culture Ministry said on Monday.

केंद्रीय संस्कृति मंत्रालय ने सोमवार को कहा कि गुरुवार से शुरू होने वाली **ब्रिक्स संस्कृति कार्य समूह बैठकों** में सांस्कृतिक क्षेत्र में **कृत्रिम बुद्धिमत्ता (AI)** के नैतिक उपयोग पर विशेष चर्चा की जाएगी।

• **Creative economy, culture climate and sustainable development and**



cultural and creative industries are some of the other areas of deliberation, Union Culture Secretary **Vivek Agrawal** said at a press conference in which he unveiled the comprehensive road map and calendar for the **2026 BRICS Culture Track**.

केंद्रीय संस्कृति सचिव **विवेक अग्रवाल** ने एक प्रेस कॉन्फ्रेंस में कहा कि **रचनात्मक अर्थव्यवस्था**, संस्कृति, जलवायु एवं सतत विकास तथा सांस्कृतिक और रचनात्मक उद्योग भी चर्चा के अन्य प्रमुख विषय होंगे। इस दौरान उन्होंने **2026 ब्रिक्स कल्चर ट्रैक** का व्यापक रोडमैप और कैलेंडर जारी किया।

- **Varanasi is set to host second Culture Working Group Meeting**, following the successful completion of the 1st Culture Working Group (CWG) meeting held virtually on April 29–30. 29–30 अप्रैल को वर्चुअल माध्यम से आयोजित पहली **कल्चर वर्किंग ग्रुप (CWG)** बैठक की सफलता के बाद अब दूसरी **कल्चर वर्किंग ग्रुप बैठक** की मेजबानी **वाराणसी** करेगा।
- “As one of the world’s oldest living cities, Varanasi will serve as the backdrop for five critical thematic panel discussions aimed at shaping the final outcome document,” Mr. Agrawal said. श्री अग्रवाल ने कहा, “दुनिया के सबसे प्राचीन जीवित शहरों में से एक **वाराणसी** पाँच महत्वपूर्ण विषयगत पैनल चर्चाओं की पृष्ठभूमि बनेगा, जिनका उद्देश्य अंतिम परिणाम दस्तावेज़ को तैयार करना है।”
- **The five themes are: creative economy and people-to-people cooperation.** पाँच विषयों में पहला है: रचनात्मक अर्थव्यवस्था और लोगों के बीच सहयोग।
- **Copyright and ethical AI in the creative economy.** रचनात्मक अर्थव्यवस्था में कॉपीराइट और नैतिक AI।
- **Cultural heritage protection and return of cultural property.** सांस्कृतिक विरासत की सुरक्षा और सांस्कृतिक संपत्तियों की वापसी।
- **Collaborative approaches to safeguarding shared heritage.** साझा विरासत की सुरक्षा के लिए सहयोगात्मक दृष्टिकोण।
- **And culture as a driver of sustainable development.** और सतत विकास को बढ़ावा देने में संस्कृति की भूमिका।
- The culture track will feature a total of four official meetings alongside major public festivals, bringing together the **11 member nations (Brazil, Russia, India, China, South Africa, Egypt, Ethiopia, Iran, Saudi Arabia, the UAE, and Indonesia)** along with 10 newly joined partner countries. कल्चर ट्रैक के अंतर्गत चार आधिकारिक बैठकों के साथ प्रमुख सार्वजनिक उत्सव भी आयोजित होंगे, जिनमें 11 सदस्य देश (**ब्राज़ील, रूस, भारत, चीन, दक्षिण अफ्रीका, मिस्र, इथियोपिया, ईरान, सऊदी अरब, यूएई और इंडोनेशिया**) तथा 10 नए साझेदार देश भाग लेंगे।
- **After Varanasi, the third BRICS CWG meeting would be held in Bhopal followed by the BRICS Culture Festival and the BRICS Culture Minister’s meeting.** वाराणसी के बाद तीसरी ब्रिक्स CWG बैठक **भोपाल** में आयोजित होगी, जिसके बाद **ब्रिक्स कल्चर फेस्टिवल** और **ब्रिक्स संस्कृति मंत्रियों की बैठक** होगी।
- **A BRICS theatre festival would be held in Delhi in October.** अक्टूबर में **दिल्ली** में एक **ब्रिक्स थिएटर फेस्टिवल** आयोजित किया जाएगा।



IMEC is caught between commerce and geopolitics

CS II, IR

The ongoing war in Iran has shattered many myths and brought to light realities that expose the structural vulnerabilities of the existing world order. Iran, which was no match for the combined military might and technological superiority of Israel and the United States, has not only withstood the military onslaught but has also retaliated in ways that were neither expected nor planned for. Nearly three months into the conflict, although a fragile ceasefire is holding, there appears to be no immediate solution to end the war or achieve the politico-military objectives that Israel and the U.S. set at its outset. While Iran has suffered major losses to its leadership, infrastructure and military assets, the American military has also incurred unprecedented losses.

Lessons from the Iran conflict

A recent U.S. Congressional Research Service report has noted that 42 U.S. aircraft have been lost or damaged so far during "Operation Epic Fury" – the war with Iran – which includes fifth generation stealth fighters such as the F-35. Plus, the ability to intercept Iranian missiles and drones has been severely degraded as more than half the total inventory of Patriot, Tomahawk and Terminal High Altitude Area Defense (THAAD) missiles have been expended. With more than 240 American targets reportedly hit by Iran, the conflict has shattered the myth that military superiority alone will guarantee an outright victory. Several of the asymmetric tactics employed by Iran have caught the U.S. and Israel on the back foot.

Another reality check underscored by this war is the critical importance of global choke points and how their blockade can severely disrupt the global economy. Iran, by imposing a blockade on the Strait of Hormuz early in the conflict, has virtually brought the global economy to its knees. Nearly 20 million barrels of crude oil, accounting for about a third of global oil supplies, pass through this narrow sea passage every day. India is among the countries most affected, as it imports nearly 88% of its crude oil requirements, amounting to about 1.8 billion barrels annually. While the world grapples with the blockade and works to diversify its energy sources, one thing is clear: there is an urgent need to explore and develop alternative connectivity options beyond existing trade routes, particularly maritime routes. New routes and corridors must be developed that avoid the two 'C's' – conflict zones and choke points.

However, this realisation is neither new nor have countries been idle in pursuing solutions. Transnational connectivity projects such as the International North-South Transport Corridor (INSTC) and the Belt and Road Initiative (BRI) were conceived precisely for this purpose. The INSTC was designed to bypass the Suez Canal



Rajeev Agarwal

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choke point, while the overland component of the BRI across Asia and Europe seeks to reduce dependence on both the Malacca Strait and the Suez Canal. Another major connectivity project is the India-Middle East-Europe Economic Corridor (IMEC). Unlike the other initiatives, IMEC traverses parts of West Asia, a region that has been significantly affected by the current conflict.

The IMEC framework

What is IMEC? The IMEC is a transformative and ambitious connectivity initiative that was officially announced at the G-20 Summit in New Delhi in September 2023. It seeks to connect India with Europe across the Arabian Peninsula, bypassing the traditional choke point of the Suez Canal. The project envisions a multimodal economic corridor integrating railways, ports, highways, energy networks and digital infrastructure to enhance trade, investment and connectivity. Unlike conventional transport corridors, IMEC is conceived as a holistic and multidimensional infrastructure project encompassing sea routes, rail networks, pipelines, undersea high-speed data links, green hydrogen corridors and transnational energy transmission grids.

The proposed structure has three distinct sections. The eastern section links India with West Asia through searoutes to the United Arab Emirates (UAE). The central section consists of an overland route across West Asia, traversing the UAE, Saudi Arabia, Jordan and Israel, and culminating at the port of Haifa on Israel's Mediterranean coast. The western leg of the corridor is sea-based, connecting Haifa to various European ports, beyond which the continent's extensive transportation network takes over.

What has happened due to the war? Soon after IMEC was announced, the war in Gaza broke out on October 7, 2023, placing the project on the back burner. Major areas of the originally envisioned corridor, particularly those involving Israel and the port of Haifa, were directly affected by the conflict.

Soon after the Iran-Israel '12-Day War' in June 2025, there was a concerted effort to move the project forward. However, the ongoing conflict involving Iran has once again thrown a spanner into its execution. Key ports in the UAE, particularly Jebel Ali and Fujairah, have been repeatedly targeted by Iran, while disruptions in the Strait of Hormuz have exposed the geographical vulnerabilities of these ports.

Another critical fault line exposed by the war is the deep faultlines and divergence in the positions adopted by Saudi Arabia and the UAE in the war. Both countries are key partners in IMEC, and any adversarial posture between them could prove to be a major setback for the corridor, whose success depends on smooth coordination and seamless connectivity across the region. The UAE's April 2026 announcement that it was

opting out of the global oil grouping, the Organization of the Petroleum Exporting Countries (OPEC) and reports of its growing strategic coordination with Israel, including the deployment of Israeli defence systems such as the Iron Beam, risk widening differences between Riyadh and Abu Dhabi. Such developments are unlikely to augur well for either regional stability or the future of IMEC.

Navigating the challenges

The war in Iran has highlighted two important issues for both West Asia and IMEC. First, there is an urgent need for projects such as IMEC that can bypass conflict zones and choke points. However, for such initiatives to succeed, they must also navigate the region's geopolitical complexities, including the rapidly evolving dynamics among key partners such as Saudi Arabia and the UAE.

To address the first challenge, IMEC must evolve into a broader and more flexible framework while keeping open the possibility of reverting to the originally envisioned alignment once the conflict subsides. To this end, the option of developing key ports in Oman – such as Salalah, Duqm and Muscat – as eastern entry points could be explored, as they are located well away from the conflict-prone Strait of Hormuz. Similarly, on the western end, until the port of Haifa becomes a secure transit hub, a western spur passing through Egypt and terminating at one of its major Mediterranean ports could offer a viable alternative. Egypt already possesses the logistics ecosystem required to support IMEC, including the Suez Canal Economic Zone, six operational ports and four industrial zones specialising in green hydrogen, liquefied natural gas, shipbuilding and other future-oriented sectors.

To address the second challenge, countries such as India, which enjoy close relations and the trust of both Saudi Arabia and the UAE, will have to navigate a delicate but critical diplomatic terrain. European countries such as Italy and France, which are positioning themselves as key champions of IMEC in Europe, will also need to play an active role. The growing recognition of IMEC's strategic importance was evident during Prime Minister Narendra Modi's visit to Europe in May 2026. While elevating their bilateral ties to a Special Strategic Partnership, India and Italy reaffirmed their commitment to cooperate on IMEC, recognising its transformative potential to reshape and promote global trade, connectivity and prosperity.

The bottom line is clear. The war in Iran has underscored the need for transnational connectivity projects such as IMEC that can bypass conflict zones and strategic choke points. However, for such initiatives to succeed, they must overcome the geopolitical complexities in West Asia.

The Iran conflict strengthens the case for the India-Middle East-Europe Economic Corridor (IMEC) while simultaneously complicating its execution

02J6. IMEC is caught between commerce and geopolitics

IMEC वाणिज्य और भूराजनीति के बीच फँस गया है।

- A recent **U.S. Congressional Research Service** report has noted that 42 U.S. aircraft have been lost or damaged so far during "**Operation Epic Fury**" — the war with Iran — which includes fifth generation stealth fighters such as the **F-35**.
हाल ही में जारी अमेरिकी कांग्रेसनल रिसर्च सर्विस की एक रिपोर्ट में उल्लेख किया गया है कि ईरान के साथ युद्ध, जिसे "ऑपरेशन एपिक फ्यूरी" कहा गया, के दौरान अब तक 42 अमेरिकी विमान नष्ट या क्षतिग्रस्त हो चुके हैं, जिनमें **F-35** जैसे पाँचवीं पीढ़ी के स्टील्थ लड़ाकू विमान भी शामिल हैं।
- Plus, the ability to intercept Iranian missiles and drones has been severely degraded as more than half the total inventory of **Patriot, Tomahawk and Terminal High Altitude Area Defense (THAAD) missiles** have been expended.



इसके अतिरिक्त, ईरानी मिसाइलों और ड्रोन को रोकने की क्षमता भी गंभीर रूप से कमजोर हो गई है, क्योंकि पैट्रियट, टॉमहॉक और टर्मिनल हाई एल्टीट्यूड एरिया डिफेंस (THAAD) मिसाइलों के कुल भंडार का आधे से अधिक हिस्सा खर्च हो चुका है।

- **New routes and corridors must be developed that avoid the two 'C's — conflict zones and choke points.**

ऐसे नए मार्ग और गलियारे विकसित किए जाने चाहिए जो दो 'C' — संघर्ष क्षेत्र और चोक प्वाइंट्स — से बच सकें।

- However, this realisation is neither new nor have countries been idle in pursuing solutions. हालाँकि, यह समझ नई नहीं है और न ही देश इसके समाधान खोजने में निष्क्रिय रहे हैं।
- **Transnational connectivity projects such as the International North-South Transport Corridor (INSTC) and the Belt and Road Initiative (BRI) were conceived precisely for this purpose.**

अंतरराष्ट्रीय उत्तर-दक्षिण परिवहन गलियारा (INSTC) और बेल्ट एंड रोड इनिशिएटिव (BRI) जैसी अंतरराष्ट्रीय संपर्क परियोजनाएँ इसी उद्देश्य से परिकल्पित की गई थीं।

- **The INSTC was designed to bypass the Suez Canal choke point, while the overland component of the BRI across Asia and Europe seeks to reduce dependence on both the Malacca Strait and the Suez Canal.**

INSTC को स्वेज नहर के चोक प्वाइंट को दरकिनार करने के लिए तैयार किया गया था, जबकि एशिया और यूरोप में फैला BRI का स्थलीय घटक मलक्का जलडमरूमध्य और स्वेज नहर दोनों पर निर्भरता कम करने का प्रयास करता है।

- Another major connectivity project is the **India-Middle East-Europe Economic Corridor (IMEC).**

एक अन्य प्रमुख संपर्क परियोजना भारत-मध्य पूर्व-यूरोप आर्थिक गलियारा (IMEC) है।

- What is IMEC?

आईएमईसी क्या है?

- The **IMEC is a transformative and ambitious connectivity initiative that was officially announced at the G-20 Summit in New Delhi in September 2023.**

आईएमईसी एक परिवर्तनकारी और महत्वाकांक्षी संपर्क पहल है जिसकी आधिकारिक घोषणा सितंबर 2023 में नई दिल्ली में आयोजित जी-20 शिखर सम्मेलन में की गई थी।

- **It seeks to connect India with Europe across the Arabian Peninsula, bypassing the traditional choke point of the Suez Canal.**

इसका उद्देश्य भारत को अरब प्रायद्वीप के माध्यम से यूरोप से जोड़ना है, जबकि पारंपरिक चोक प्वाइंट स्वेज नहर को दरकिनार करना है।

- **The project envisions a multimodal economic corridor integrating railways, ports, highways, energy networks and digital infrastructure to enhance trade, investment and connectivity.**

यह परियोजना व्यापार, निवेश और संपर्क को बढ़ावा देने हेतु रेलमार्गों, बंदरगाहों, राजमार्गों, ऊर्जा नेटवर्क और डिजिटल अवसंरचना को एकीकृत करने वाले बहु-माध्यमीय आर्थिक गलियारे की परिकल्पना करती है।

- **Unlike conventional transport corridors, IMEC is conceived as a holistic and multidimensional infrastructure project encompassing sea routes, rail networks, pipelines, undersea high-speed data links, green hydrogen corridors and transnational energy transmission grids.**

पारंपरिक परिवहन गलियारों के विपरीत, IMEC को एक समग्र और बहुआयामी अवसंरचना परियोजना के रूप में परिकल्पित किया गया है, जिसमें समुद्री मार्ग, रेल नेटवर्क, पाइपलाइनें, समुद्र के नीचे उच्च गति डेटा लिंक, हरित हाइड्रोजन गलियारे और अंतरराष्ट्रीय ऊर्जा संचरण ग्रिड शामिल हैं।

- The central section consists of an overland route across **West Asia, traversing the UAE, Saudi Arabia, Jordan and Israel**, and culminating at the port of **Haifa** on Israel's Mediterranean coast.



केंद्रीय भाग पश्चिम एशिया में एक स्थलीय मार्ग से बना है, जो UAE, सऊदी अरब, जॉर्डन और इज़राइल से होकर गुजरता है तथा इज़राइल के भूमध्यसागरीय तट पर स्थित हाइफ़ा बंदरगाह पर समाप्त होता है।

- The western leg of the corridor is sea-based, connecting Haifa to various European ports, beyond which the continent's extensive transportation network takes over.
गलियारे का पश्चिमी भाग समुद्र आधारित है, जो हाइफ़ा को विभिन्न यूरोपीय बंदरगाहों से जोड़ता है, जिसके बाद यूरोप का विस्तृत परिवहन नेटवर्क आगे की संपर्क व्यवस्था संभालता है।

- What has happened due to the war?

युद्ध के कारण क्या हुआ है?

- Major areas of the originally envisioned corridor, particularly those involving Israel and the port of Haifa, were directly affected by the conflict.

मूल रूप से परिकल्पित गलियारे के प्रमुख क्षेत्र, विशेषकर इज़राइल और हाइफ़ा बंदरगाह से जुड़े भाग, सीधे संघर्ष से प्रभावित हुए।

- Key ports in the UAE, particularly Jebel Ali and Fujairah, have been repeatedly targeted by Iran, while disruptions in the Strait of Hormuz have exposed the geographical vulnerabilities of these ports.

UAE के प्रमुख बंदरगाह, विशेषकर जेबेल अली और फुजैराह, बार-बार ईरान के निशाने पर रहे हैं, जबकि हॉर्मुज़ जलडमरूमध्य में व्यवधानों ने इन बंदरगाहों की भौगोलिक कमजोरियों को उजागर कर दिया है।

- Saudi Arabia and the UAE in the war both countries are key partners in IMEC, and any adversarial posture between them could prove to be a major setback for the corridor, whose success depends on smooth coordination and seamless connectivity across the region. दोनों देश IMEC के प्रमुख साझेदार हैं, और उनके बीच किसी भी प्रकार की विरोधात्मक स्थिति गलियारे के लिए बड़ा झटका सिद्ध हो सकती है, जिसकी सफलता क्षेत्रीय समन्वय और निर्बाध संपर्क पर निर्भर करती है।

- The UAE's April 2026 announcement that it was opting out of the global oil grouping, the Organization of the Petroleum Exporting Countries (OPEC), and reports of its growing strategic coordination with Israel, including the deployment of Israeli defence systems such as the Iron Beam, risk widening differences between Riyadh and Abu Dhabi.

अप्रैल 2026 में UAE द्वारा वैश्विक तेल संगठन पेट्रोलियम निर्यातक देशों के संगठन (OPEC) से बाहर होने की घोषणा, तथा इज़राइल के साथ उसकी बढ़ती रणनीतिक साझेदारी — जिसमें Iron Beam जैसे इज़राइली रक्षा प्रणालियों की तैनाती भी शामिल है — ने रियाद और अबू धाबी के बीच मतभेदों को और बढ़ाने का जोखिम उत्पन्न कर दिया है।

- However, for such initiatives to succeed, they must also navigate the region's geopolitical complexities, including the rapidly evolving dynamics among key partners such as Saudi Arabia and the UAE.

किन्तु ऐसी पहलों की सफलता के लिए उन्हें क्षेत्र की भू-राजनीतिक जटिलताओं का भी सामना करना होगा, जिनमें सऊदी अरब और UAE जैसे प्रमुख साझेदारों के बीच तेजी से बदलते संबंध शामिल हैं।

- To this end, the option of developing key ports in Oman — such as Salalah, Duqm and Muscat — as eastern entry points could be explored, as they are located well away from the conflict-prone Strait of Hormuz.

इस उद्देश्य से ओमान के प्रमुख बंदरगाहों — जैसे सलालाह, दुक्म और मस्कट — को पूर्वी प्रवेश बिंदुओं के रूप में विकसित करने के विकल्प पर विचार किया जा सकता है, क्योंकि वे संघर्ष-प्रवण हॉर्मुज़ जलडमरूमध्य से काफी दूर स्थित हैं।

- Similarly, on the western end, until the port of Haifa becomes a secure transit hub, a western spur passing through Egypt and terminating at one of its major Mediterranean ports could offer a viable alternative.

इसी प्रकार, पश्चिमी छोर पर जब तक हाइफ़ा बंदरगाह एक सुरक्षित पारगमन केंद्र नहीं बन जाता, तब तक मिस्र से होकर गुजरने वाला और उसके किसी प्रमुख भूमध्यसागरीय बंदरगाह पर समाप्त होने वाला पश्चिमी मार्ग एक व्यावहारिक विकल्प प्रदान कर सकता है।

- Egypt already possesses the logistics ecosystem required to support IMEC, including the Suez Canal Economic Zone, six operational ports and four industrial zones specialising in



green hydrogen, liquefied natural gas, shipbuilding and other future-oriented sectors.

मिस्र के पास पहले से ही IMEC को समर्थन देने हेतु आवश्यक लॉजिस्टिक तंत्र मौजूद है, जिसमें स्वेज नहर आर्थिक क्षेत्र, छह संचालित बंदरगाह और चार औद्योगिक क्षेत्र शामिल हैं, जो हरित हाइड्रोजन, द्रवीकृत प्राकृतिक गैस, जहाज निर्माण तथा अन्य भविष्य उन्मुख क्षेत्रों में विशेषज्ञता रखते हैं।

- European countries such as Italy and France, which are positioning themselves as key champions of IMEC in Europe, will also need to play an active role.

इटली और फ्रांस जैसे यूरोपीय देशों को, जो स्वयं को यूरोप में IMEC के प्रमुख समर्थकों के रूप में स्थापित कर रहे हैं, भी सक्रिय भूमिका निभानी होगी।

- While elevating their bilateral ties to a Special Strategic Partnership, India and Italy reaffirmed their commitment to cooperate on IMEC, recognising its transformative potential to reshape and promote global trade, connectivity and prosperity.

अपने द्विपक्षीय संबंधों को विशेष रणनीतिक साझेदारी के स्तर तक बढ़ाते हुए, भारत और इटली ने IMEC पर सहयोग की अपनी प्रतिबद्धता को पुनः पुष्टि की तथा वैश्विक व्यापार, संपर्क और समृद्धि को पुनर्परिभाषित

और प्रोत्साहित करने की इसकी परिवर्तनकारी क्षमता को स्वीकार किया।

EU's engagement with West Balkan countries is real: Costa

GS II: IR

Associated Press
SARAJEVO

European Council President António Costa said on Monday that this week's European Union summit with Western Balkan candidate nations aims to show that the opportunity for enlargement is real.

Speaking in Bosnia at the start of a pre-summit tour of the Western Balkans, Mr. Costa said that amid global geopolitical uncertainty and economic instability, "enlargement is a geostrategic interest for Europe."

"It (enlargement) is an investment in the peace, stability and security of our continent," Mr. Costa added. "This tour is a clear sign that the commitment of the European Union to the Western Balkans is real. As real as the oppor-

EU has sought to encourage reform in the candidate nations fearing growing influence of Russia and China

tunity for enlargement." Mr. Costa will co-chair the summit in Montenegro on Friday that will gather EU leaders and top officials from Albania, Bosnia-Herzegovina, North Macedonia, Kosovo, Serbia and Montenegro.

The six nations are each at a different stage of the accession process with Montenegro and Albania leading the way. The EU has recently sought to encourage reform in the candidate nations fearing growing influence of Russia and China.

Ukraine and Moldova

are also among about ten countries aspiring to join the bloc.

Candidate countries must bring their laws into line in 35 policy areas, or "chapters," ranging from justice standards to farm and fishing rules. All 27 EU members must agree before each chapter can be opened, and then again for it to be closed.

Friday's event in the Adriatic Sea resort of Tivat will be "a clear demonstration of our determination to bring forward our cooperation and build on the momentum of the European Union's enlargement," Mr. Costa said.

Bosnia has lagged behind, still deeply divided along ethnic lines long after the 1992-95 war that killed more than 100,000 people and displaced millions.

02J6. EU's engagement with West Balkan countries is real: Costa

पश्चिम बाल्कन देशों के साथ EU की भागीदारी वास्तविक है: कोस्टा

- European Council President António Costa said on Monday that this week's European Union summit with Western Balkan candidate nations aims to show that the opportunity for enlargement is real.

यूरोपीय परिषद के अध्यक्ष एंटोनियो कोस्टा ने सोमवार को कहा कि इस सप्ताह यूरोपीय संघ शिखर सम्मेलन का उद्देश्य पश्चिम बाल्कन उम्मीदवार देशों को यह दिखाना है कि विस्तार का अवसर वास्तविक है।

- "This tour is a clear sign that the commitment of the European Union to the Western Balkans is real."

"यह दौरा इस बात का स्पष्ट संकेत है कि यूरोपीय

संघ की पश्चिम बाल्कन के प्रति प्रतिबद्धता वास्तविक है।"

- "As real as the opportunity for enlargement."
"उतनी ही वास्तविक जितना विस्तार का अवसर।"
- Mr. Costa will co-chair the summit in Montenegro on Friday that will gather EU leaders and top officials from Albania, Bosnia-Herzegovina, North Macedonia, Kosovo, Serbia and Montenegro.

श्री कोस्टा शक्रवार को मॉन्टेनेग्रो में आयोजित शिखर सम्मेलन की सह-अध्यक्षता करेंगे, जिसमें EU नेताओं और अल्बानिया, बोस्निया-हर्जेगोविना, उत्तर मैसेडोनिया, कोसोवो, सर्बिया और मॉन्टेनेग्रो के शीर्ष अधिकारी शामिल होंगे।

- The six nations are each at a different stage of the accession process with Montenegro and Albania leading the way.

ये छह देश सदस्यता प्रक्रिया के अलग-अलग चरणों में हैं, जिनमें मॉन्टेनेग्रो और अल्बानिया सबसे आगे हैं।



- The EU has recently sought to encourage reform in the candidate nations fearing growing influence of **Russia** and **China**.
EU ने हाल ही में उम्मीदवार देशों में सुधारों को प्रोत्साहित करने का प्रयास किया है, क्योंकि उसे रूस और चीन के बढ़ते प्रभाव की चिंता है।
- **Ukraine and Moldova** are also among about ten countries aspiring to join the bloc.
यूक्रेन और मोल्दोवा भी उन लगभग दस देशों में शामिल हैं जो इस समूह में शामिल होना चाहते हैं।
- **Candidate countries must bring their laws into line in 35 policy areas**, or “chapters,” ranging from justice standards to farm and fishing rules.
उम्मीदवार देशों को न्यायिक मानकों से लेकर कृषि और मत्स्य पालन नियमों तक **35 नीतिगत क्षेत्रों** या “अध्यायों” में अपने कानूनों को EU मानकों के अनुरूप बनाना होगा।
- **All 27 EU members must agree before each chapter can be opened**, and then again for it to be closed.
प्रत्येक अध्याय को खोलने और बाद में बंद करने से पहले सभी **27 EU सदस्य देशों** की सहमति आवश्यक होती है।
- Friday's event in the **Adriatic Sea** resort of **Tivat** will be “a clear demonstration of our determination to bring forward our cooperation and build on the momentum of the European Union's enlargement,” Mr. Costa said.
श्री कोस्टा ने कहा कि शुक्रवार को **एड्रियाटिक सागर** के रिसॉर्ट शहर **टिवाट** में होने वाला कार्यक्रम “हमारे सहयोग को आगे बढ़ाने और यूरोपीय संघ के विस्तार की गति को मजबूत करने के हमारे संकल्प का स्पष्ट प्रदर्शन” होगा।
- **Bosnia has lagged behind, still deeply divided along ethnic lines long after the 1992-95 war that killed more than 100,000 people and displaced millions.**
बोस्निया अभी भी पीछे है और **1992-95 के युद्ध** के लंबे समय बाद भी जातीय आधार पर गहराई से विभाजित है, जिसमें **1 लाख से अधिक लोग** मारे गए थे और लाखों विस्थापित हुए थे।

Court rejects Rwanda's £100 mn claim against U.K. over migrant deal

GS II: IR

Agence France-Presse
THE HAGUE

An international court on Monday rejected a claim by Rwanda for Britain to pay more than £100 million it said London still owed from a scrapped deal to deport migrants.

Judges from the Permanent Court of Arbitration (PCA) in The Hague ruled that Britain was not liable for two years of outstanding costs from the scheme that was shelved in 2024.

In 2022, former U.K. Prime Minister Boris Johnson sealed a deal with Kigali to send to Rwanda migrants arriving in Britain via “dangerous or illegal journeys” in small boats or lorries.



A file photo of a protest against the British government's plans to deport asylum seekers to Rwanda in London. REUTERS

But the scheme hit legal and political obstacles from the start, with the U.K. Supreme Court eventually ruling it illegal.

When Keir Starmer became British Prime Minister in July 2024, he declared the plan “dead and

buried” on his first full day in office, dismissing it as a “gimmick”.

“Waste of tax money”

Then Interior Minister Yvette Cooper called it “the most shocking waste of taxpayers' money I have

ever seen”.

During the two years before the scheme was scrapped, only four people actually went to Rwanda, all voluntarily, according to the current U.K. government.

According to the U.K. government website, about £290 million has already been paid to Rwanda, but Kigali argued in its pre-hearing submissions to the PCA that two annual payments of £50m were still outstanding.

But the PCA, set up in 1899 to settle contractual disputes between nations, rejected by majority a £50m claim for one year and unanimously rejected the same amount for the second.

02J6. Court rejects Rwanda's £100 mn claim against U.K. over migrant deal

प्रवासी समझौते पर अदालत ने ब्रिटेन के खिलाफ रवांडा के £100 मिलियन दावे को खारिज किया

• An international court on Monday rejected a claim by Rwanda for Britain to pay more than £100 million it said London still

owed from a scrapped deal to deport migrants.

एक अंतरराष्ट्रीय अदालत ने सोमवार को रवांडा के उस दावे को खारिज कर दिया, जिसमें उसने कहा था कि



प्रवासियों को निर्वासित करने के रद्द किए गए समझौते के तहत ब्रिटेन पर अभी भी £100 मिलियन से अधिक बकाया है।

- Judges from the **Permanent Court of Arbitration (PCA) in The Hague** ruled that Britain was not liable for two years of outstanding costs from the scheme that was shelved in 2024.
द हेग स्थित स्थायी मध्यस्थता न्यायालय (PCA) के न्यायाधीशों ने फैसला दिया कि 2024 में बंद की गई इस योजना के दो वर्षों के बकाया खर्च के लिए ब्रिटेन जिम्मेदार नहीं है।
- In 2022, former U.K. Prime Minister **Boris Johnson** sealed a deal with **Kigali** to send to Rwanda migrants arriving in Britain via “dangerous or illegal journeys” in small boats or lorries.
2022 में ब्रिटेन के पूर्व प्रधानमंत्री **बोरिस जॉनसन** ने **किगाली** के साथ एक समझौता किया था, जिसके तहत छोटी नावों या ट्रकों से “खतरनाक या अवैध यात्राओं” के जरिए ब्रिटेन पहुंचने वाले प्रवासियों को रवांडा भेजा जाना था।
- But Kigali argued in its pre-hearing submissions to the PCA that two annual payments of **£50 million** were still outstanding.
लेकिन किगाली ने PCA में सुनवाई से पहले अपने प्रस्तुतिकरण में कहा कि **£50 मिलियन** की दो वार्षिक किस्तें अभी भी बकाया हैं।
- But the **PCA**, set up in 1899 to settle contractual disputes between nations, rejected by majority a **£50 million** claim for one year and unanimously rejected the same amount for the second.
लेकिन देशों के बीच संविदात्मक विवादों को सुलझाने के लिए 1899 में स्थापित **PCA** ने बहुमत से एक वर्ष के लिए किए गए **£50 मिलियन** के दावे को खारिज कर दिया और दूसरे वर्ष के लिए समान राशि के दावे को सर्वसम्मति से अस्वीकार कर दिया।

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TOPICS COVERED		
02J6	Vizag data centre is a major challenge विजाग डेटा सेंटर एक बड़ी चुनौती है।	
02J6	Remittances anchor the rupee, India's external balances प्रेषण राशि रुपये तथा भारत के बाह्य संतुलनों को स्थिरता प्रदान करती है।	
02J6	Value of loans sanctioned to MSMEs under ECLGS ECLGS के तहत MSMEs को स्वीकृत ऋण का मूल्य	
02J6	AI debt sales reshape global corporate bond markets AI ऋण बिक्री वैश्विक कॉर्पोरेट बॉन्ड बाजारों को नया रूप दे रही है	
02J6	As rare earths become strategic assets, China trains youth with specialised courses दुर्लभ मृदा तत्व रणनीतिक संपत्ति बनते जा रहे हैं, चीन विशेष पाठ्यक्रमों से युवाओं को प्रशिक्षित कर रहा है	



Vizag data centre is a major challenge

If India needs Google's hyperscale hub, it is not yet ready for the facility

GS III: Economy: Infrastructure

STATE OF PLAY

Vasudevan Mukunth

The Google Cloud India AI Hub, for which the technology giant and Andhra Pradesh recently broke ground in Visakhapatnam, is a sign that India is finally moving from providing information technology services and coding to owning infrastructure. While the facility is part of a larger digital infrastructure push in Visakhapatnam, expected to involve investments running to ₹1.25 lakh crore, there are also numerous second-order gains in the offing. The facility could strengthen downstream demand for high-end computing hardware, augmenting India's efforts to build semiconductor capacity under Production Linked Incentive (PLI) schemes, even if manufacturing viability will still depend on broader ecosystem factors.

The project has been integrated into the America-India Connect initiative, as part of which multiple international subsea cables will land in Visakhapatnam, creating India's second major gateway on the eastern seaboard. As a result, Indian data will have a direct connection from the east coast to South Africa and thence to the U.S. without first being backhauled to Cochin, that too on Google's high-capacity cables. Likewise, in the east, data from Visakhapatnam can reach the U.S. via Singapore and Australia, no longer restricted to the Chennai-Singapore connection and thereafter to the U.S. on third-party cables. As a result, India's dependence on geopolitical stability in the Red Sea – through which cables from Mumbai pass before reaching Europe – will re-



duce. Similarly, within India, the Hub's location could move high-value technological activity away from expensive metropolitan cities, potentially redistributing growth.

Infrastructure problem

The Hub is an integrated complex with computational infrastructure and high-capacity data connectivity, and large power requirements. Its expected power demand of 1 GW makes it a so-called hyperscale hub, with the ability to run powerful artificial intelligence (AI) models.

But that is also a gateway to consider the not-inconsiderable challenges the project poses. For example, the Hub could attract firms handling sensitive data, especially in sectors where legal or regulatory preferences favour keeping data in India. However, while Google will thus lower costs for Indian firms, it will increase dependence on a single foreign provider's proprietary stack. As a result, India could become a site for "sovereign AI" – as Google Cloud CEO Thomas Kurian said – only in name.

Second, even though AI GPU workloads are among the world's most power-guzzling uses of computing infrastructure, the Hub suggests AI is now an infrastructure problem: power, land, and water are the bottlenecks. The power demand may strain the local grid and result in knock-on

effects for local residents and industries. While Google has pledged 100% use of renewable energy, the Hub will still feature a fleet of backup diesel generators, which will affect local air quality and microclimate.

If Google aspires to maintain its global average power usage effectiveness of 1.1 in Visakhapatnam's humid weather, it may need evaporative cooling, which is water-intensive. The district is periodically vulnerable to water stress, especially in summer. It depends heavily on inter-basin water transfers to meet its needs. In fact, it has the lowest groundwater levels for domestic, agricultural or industrial use in the State, as per the Water Resources and Information Management System. Facilities worldwide similar to the Hub are known to consume over 2 million litres per day per 100 MW. At 1 GW, the indicated demand is an eye-watering 20 million litres per day.

Rights groups have alleged that the State government assigned the project to a category that allowed it to sidestep a full environmental impact assessment and public hearings – measures that have forced Google, et al. in other countries to redesign data centres to be more sustainable. India still struggles to harmonise State-level incentives. Andhra Pradesh offers aggressive tax holidays and power subsidies yet they have not come with environmental benchmarks or 'green' capacity targets. A Central single-window could standardise public hearings and resource accounting. If India does not codify these safeguards, its climb up the digital stack will come at the cost of its environmental and democratic foundations.

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under Production Linked Incentive (PLI) schemes, even if manufacturing viability will still depend on broader ecosystem factors.

यह सुविधा उच्च स्तरीय कंप्यूटिंग हार्डवेयर की मांग को बढ़ा सकती है, जिससे उत्पादन आधारित प्रोत्साहन (PLI) योजनाओं के अंतर्गत भारत के सेमीकंडक्टर क्षमता निर्माण प्रयासों को बल मिलेगा, यद्यपि विनिर्माण की व्यवहार्यता अब भी व्यापक पारिस्थितिक तंत्र पर निर्भर करेगी।

- The project has been integrated into the America-India Connect initiative, as part of which multiple international subsea cables will land in Visakhapatnam, creating India's second major gateway on the eastern seaboard.

इस परियोजना को अमेरिका-इंडिया कनेक्ट पहल में सम्मिलित किया गया है, जिसके अंतर्गत अनेक अंतरराष्ट्रीय समुद्रतलीय केबल विशाखापट्टनम में उतरेंगी, जिससे भारत के पूर्वी तट पर दूसरा प्रमुख प्रवेश द्वार विकसित होगा।

02J6. Vizag data centre is a major challenge

विजाग डेटा सेंटर एक बड़ी चुनौती है।

- If India needs Google's hyperscale hub, it is not yet ready for the facility

यदि भारत को Google का हाइपरस्केल हब चाहिए, तो वह अभी इस सुविधा के लिए तैयार नहीं है।

- The Google Cloud India AI Hub, for which the technology giant and Andhra Pradesh recently broke ground in Visakhapatnam, is a sign that India is finally moving from providing information technology services and coding to owning infrastructure.

गूगल क्लाउड इंडिया एआई हब, जिसके लिए प्रौद्योगिकी कंपनी और आंध्र प्रदेश ने हाल ही में विशाखापट्टनम में आधारशिला रखी, इस बात का संकेत है कि भारत अब केवल सूचना प्रौद्योगिकी सेवाएँ और कोडिंग प्रदान करने से आगे बढ़कर अवसंरचना का स्वामित्व प्राप्त करने की दिशा में अग्रसर है।

- While the facility is part of a larger digital infrastructure push in Visakhapatnam, expected to involve investments running to ₹1.25 lakh crore. यद्यपि यह सुविधा विशाखापट्टनम में व्यापक डिजिटल अवसंरचना विस्तार का हिस्सा है, जिसमें ₹1.25 लाख करोड़ तक के निवेश की संभावना है, इसके अतिरिक्त भी अनेक अप्रत्यक्ष लाभ सामने आने की संभावना है।

- The facility could strengthen downstream demand for high-end computing hardware, augmenting India's efforts to build semiconductor capacity



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

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

CONTACT: 9971932488



- As a result, Indian data will have a direct connection from the east coast to **South Africa** and thereon to the **U.S.** without first being backhauled to **Cochin**, that too on **Google's** high-capacity cables.

इसके परिणामस्वरूप भारतीय डेटा को पूर्वी तट से सीधे **दक्षिण अफ्रीका** और वहाँ से **अमेरिका** तक सीधा संपर्क प्राप्त होगा, बिना पहले **कोच्चि** तक वापस भेजे, और वह भी **गूगल** की उच्च क्षमता वाली केबलों के माध्यम से।

- Likewise, in the east, data from **Visakhapatnam** can reach the **U.S.** via **Singapore** and **Australia**, no longer restricted to the **Chennai-Singapore** connection and thereafter to the **U.S.** on third-party cables.

इसी प्रकार, पूर्वी दिशा में **विशाखापट्टनम** से डेटा **सिंगापुर** और **ऑस्ट्रेलिया** के माध्यम से सीधे **अमेरिका** पहुँच सकेगा, और अब वह केवल **चेन्नई-सिंगापुर** संपर्क तथा उसके बाद तीसरे पक्ष की केबलों तक सीमित नहीं रहेगा।

- As a result, India's dependence on geopolitical stability in the **Red Sea** — through which cables from **Mumbai** pass before reaching **Europe** — will reduce.

इसके परिणामस्वरूप **भारत** की **लाल सागर** क्षेत्र की भू-राजनीतिक स्थिरता पर निर्भरता कम होगी, जहाँ से होकर **मुंबई** से जाने वाली केबलें **यूरोप** तक पहुँचती हैं।

- Its expected power demand of **1 GW** makes it a so-called hyperscale hub, with the ability to run powerful artificial intelligence (**AI**) models.

इसकी अनुमानित **1 गीगावाट** विद्युत मांग इसे तथाकथित हाइपरस्केल हब बनाती है, जिसमें शक्तिशाली कृत्रिम बुद्धिमत्ता (**AI**) मॉडल संचालित करने की क्षमता होगी।

PATRIOTIC IAS



Remittances anchor the rupee, India's external balances

Despite doing the heavy lifting in tackling the pressure on the rupee, remittances are ignored in discussions due to overemphasis on FDI and FPI flows

GS III: Economy

DATA POINT

Puneet Bhasin

The Indian rupee has lost nearly 12% of its value against the U.S. dollar since May 2023. Several analysts have noted the consistent decline in net Foreign Direct Investment (FDI) and net Foreign Portfolio Investment (FPI) flows as a cause.

The ebbing of net FDI and FPI flows notably began much before the current energy crisis due to the war in West Asia. A declining trend in net FDI began in the second quarter (Q2) of 2021-2022. As of Q3 of 2025-26, net FDI was negative (Chart 1). The declining trend in net FPI, which is also a negative, started in Q4 of 2023-24 (Chart 2).

It is commonly understood that a downward (depreciation) pressure is structurally inherent upon the rupee because of India's persistent Current Account (CA) deficit, which in turn stems from India's persistent trade deficit. Consequently, buoyant net positive FDI and FPI flows, recorded in the Financial Account (FA), are considered crucial to not only finance the CA Deficit (CAD), but to counteract the downward pressure on the rupee. However, there is an overemphasis on these two, at the cost of the other important flow for India, namely, remittances, recorded in the CA, which does the heavy lifting for both the financing of the CAD and in tackling the pressure on the rupee. Not accounting for remittances risks non-mitigation of a major external vulnerability: the ebbing of remittance flows that is also likely.

The CA primarily consists of three component flows: the trade deficit, the Net Primary Income (NPI) deficit and the Net Secondary Income (NSI) surplus (Chart 3). The NPI mainly reflects the net negative balance of investment income earned by Indian residents on foreign assets and paid on India's external liabilities held by fo-

reign counterparts. The NSI essentially accounts for its huge net positive remittance flows. India attracts the highest remittances (in \$) by a wide margin. In 2024, India saw \$138 billion in remittances.

They matter significantly for India's CAD and the rupee. Firstly, since mid-2013, remittances have on an average financed more than the entirety of India's trade deficit (Chart 4). As a result, the CAD financed by the FA flows of FDI and FPI is a residual of the two persistent deficits in the CA, leftover after the remittances have financed their bulk. If not for India's huge net remittances, its CAD would be much larger and the financing demands on the FA also higher.

Secondly, net remittances, averaging about 3% of the Gross Domestic Product (GDP), are much higher than the net FDI and FPI flows. Thirdly, unlike, say FPI, remittances are not given to sudden halts, for they are largely driven by the income and savings decisions of the Indian diaspora and their respective familial needs back home. Fourthly, unlike FDI and FPI, remittances are transfers and not claims. Hence, they do not generate future liability outflows. Lastly, remittances have low transaction costs.

A lot rides on remittances now because the more the rupee slips, the more diaspora remitters are likely to wait till it bottoms out. Concomitantly, with the trade deficit likely to increase due to costlier energy imports, a wide gap can emerge in the remittances' ability to cover this deficit. This will in turn increase the CAD and its financing demands on the FA, at a time when net FDI and FPI flows are negative. Yet, despite their importance, analyses of remittances pale in comparison to those of FDI and FPI flows. It is perhaps because remittances are largely the result of small financial decisions by thousands of working-class Indians abroad, who do not animate globalised elites in the same way as talks of FDI and FPI do.

Merits of remittances

The data for the charts were sourced from the Reserve bank of India's Database on Indian Economy. The author is with the Center for the Study of the Indian Economy (CSIE) at Azim Premji University in Bengaluru. With inputs from Anshuman Singh, also at CSIE



CHART 1: Quarterly net Foreign Direct Investment in \$ million (■) and as a % share of GDP (●)

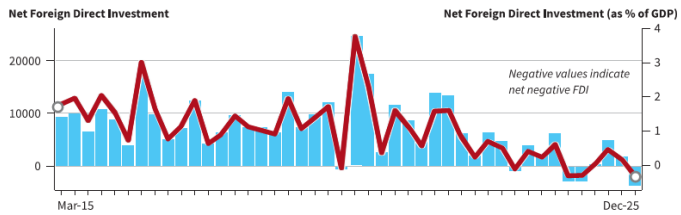


CHART 2: Quarterly net Foreign Portfolio Investment (as % of GDP). Negative values indicate net negative FPI

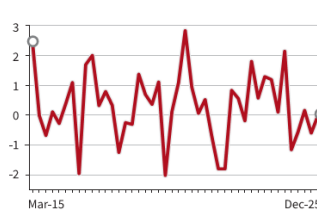


CHART 4: Quarterly net remittances as % of trade deficit. The two blue bars in June and September 2020 indicate trade surplus. All other quarters saw trade deficits

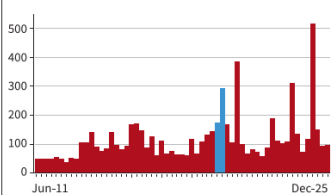
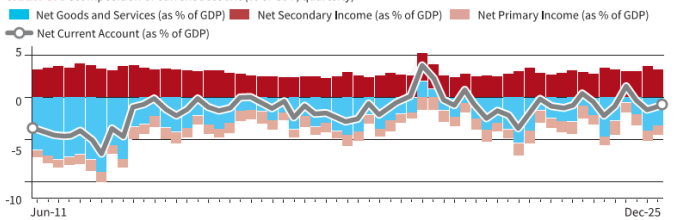


CHART 3: Decomposition of current account (% of GDP, quarterly)



02J6. Remittances anchor the rupee, India's external balances

प्रेषण राशि रुपये तथा भारत के बाह्य संतुलनों को स्थिरता प्रदान करती है।

- The CA primarily consists of three component flows: the trade deficit, the Net Primary Income (NPI) deficit and the Net Secondary Income (NSI) surplus.
चालू खाते में मुख्यतः तीन घटक प्रवाह शामिल होते हैं: व्यापार घाटा, शुद्ध प्राथमिक आय (NPI) घाटा और शुद्ध द्वितीयक आय (NSI) अधिशेष।
- The NPI mainly reflects the net negative balance of investment income earned by Indian residents on foreign assets and paid on India's external liabilities held by foreign counterparts. NPI मुख्यतः विदेशी परिसंपत्तियों पर भारतीय निवासियों द्वारा अर्जित निवेश आय और विदेशी पक्षों के पास मौजूद भारत की बाह्य देनदारियों पर भुगतान की गई आय के शुद्ध नकारात्मक संतुलन को दर्शाता है।
- The NSI essentially accounts for its huge net positive remittance flows. NSI मुख्यतः भारत के विशाल सकारात्मक शुद्ध रेमिटेंस प्रवाह को दर्शाता है।
- Secondly, net remittances, averaging about 3% of the Gross Domestic Product (GDP), are much higher than the net FDI and FPI flows.



दूसरा, शुद्ध रेमिटेंस, जो सकल घरेलू उत्पाद (GDP) का लगभग 3% है, शुद्ध FDI और FPI प्रवाह की तुलना में कहीं अधिक है।

- Thirdly, unlike, say FPI, remittances are not given to sudden halts, for they are largely driven by the income and savings decisions of the Indian diaspora and their respective familial needs back home.

तीसरा, FPI के विपरीत रेमिटेंस अचानक रुकने की प्रवृत्ति नहीं रखती, क्योंकि यह मुख्यतः भारतीय प्रवासी समुदाय की आय, बचत और उनके परिवारों की आवश्यकताओं पर आधारित होती है।

- Fourthly, unlike FDI and FPI, remittances are transfers and not claims.

चौथा, FDI और FPI के विपरीत, रेमिटेंस हस्तांतरण होते हैं, दावे नहीं।

- Hence, they do not generate future liability outflows.

अतः वे भविष्य में देनदारी आधारित बाह्य भुगतान उत्पन्न नहीं करते।

- Lastly, remittances have low transaction costs.

अंततः, रेमिटेंस की लेनदेन लागत भी कम होती है।

Value of loans sanctioned to MSMEs under ECLGS

GS III: Economy

35,000 in ₹ crore. Banks

have sanctioned ₹35,000 crore loans under the **Emergency Credit Line Guarantee Scheme (ECLGS)** to MSMEs and industries impacted by the West Asia conflict. The scheme aimed at providing additional credit flow of ₹2.55 lakh crore for airlines hit by the ongoing geopolitical crisis.

02J6. Value of loans sanctioned to MSMEs under ECLGS

ECLGS के तहत MSMEs को स्वीकृत ऋण का मूल्य

- Banks have sanctioned **₹35,000 crore** loans under the **Emergency Credit Line Guarantee Scheme (ECLGS)** to MSMEs and industries impacted by the **West Asia conflict**.

बैंकों ने पश्चिम एशिया संघर्ष से प्रभावित MSMEs और उद्योगों को इमरजेंसी क्रेडिट लाइन गारंटी योजना (ECLGS) के तहत ₹35,000 करोड़ के ऋण स्वीकृत किए हैं।

- The scheme aimed at providing additional credit flow of **₹2.55 lakh crore** for airlines hit by the ongoing geopolitical crisis.

इस योजना का उद्देश्य जारी भू-राजनीतिक संकट से प्रभावित एयरलाइनों को ₹2.55 लाख करोड़ की अतिरिक्त ऋण सहायता प्रदान करना था।

02J6. AI debt sales reshape global corporate bond markets

AI ऋण बिक्री वैश्विक कॉर्पोरेट बॉन्ड बाजारों को नया रूप दे रही है

- **Google-parent Alphabet** is already one of the biggest outstanding borrowers in the sterling and Swiss franc corporate bond markets.

गूगल की मूल कंपनी अल्फाबेट पहले से ही स्टर्लिंग और स्विस फ्रैंक कॉर्पोरेट बॉन्ड बाजारों में सबसे बड़े उधारकर्ताओं में से एक है।

- Debt issues by so-called "**hyperscalers**" or Big Tech companies outside the **United States** are part of a push to diversify their funding early on, bankers said.

बैंकों के अनुसार, संयुक्त राज्य अमेरिका के बाहर तथाकथित "हाइपरस्केलर्स" या बड़ी टेक कंपनियों द्वारा ऋण जारी करना उनके वित्तपोषण स्रोतों में शुरुआती स्तर पर विविधता लाने की रणनीति का हिस्सा है।



As rare earths become strategic assets, China trains youth with specialised courses

BS III: Economy
Reuters
BEIJING

Every year, several hundred young adults head to the steppes of northern China to learn about rare earths at schools like the Inner Mongolia University of Science and Technology. After completing undergraduate study, they may venture a few kilometres up the six-lane Rare Earths Street in Baotou, where they can work for state-owned refiners that convert the critical minerals into magnets that power jet engines, electric vehicles and wind turbines. Or, the graduates may pursue further studies at the nearby Baotou Rare Earth Research Institute - roughly 150 km from the world's largest rare earths mine.

U.S. President Donald Trump and other Western leaders have pledged billions of dollars in investments to break China's chokehold on rare earths refining - a powerful lever Beijing has wielded in its trade war with the U.S. But China still holds a significant advantage in the pipeline of talent that it has developed over decades in places like Baotou.

40 specialist labs

China has created an ecosystem of more than 40 specialist rare-earth laboratories that produce cutting-edge research, supplemented by at least 11 universities and technical colleges that collectively enrol more than 500 students annually in rare earths degree programmes, a Reuters exami-

nation has found. That accumulated expertise sustains Beijing's grip on global supplies of refined rare earths.

Several U.S. institutions have begun incorporating more of a focus on rare earths in their curriculum, though Reuters could not identify a school outside China that offers a specific undergraduate degree. U.S. institutions awarded just over 200 generalist undergraduate mining and metallurgical engineering degrees in 2023, the latest year with nationwide figures available, according to data compiled by the Colorado-based Society for Mining, Metallurgy and Exploration.

"In China, I used to hire kids right out of university and they're immediately productive," said Constantine Karayannopoulos, former chief executive of rare earths companies Neo Performance Materials and MolyCorp. "Anywhere else I need to train them for three years."



Baotou Research Institute of Rare Earths in China's rare earth industry hub of Baotou, Inner Mongolia. REUTERS

Beijing is now tightly guarding this expertise: It has over the years increased restrictions on exports of rare earths technology and equipment.

China has also limited contact between industry professionals and foreigners, with some technicians having been ordered to surrender their passports, according to three people familiar with the matter. They did not identify the government entity that confiscated the travel documents but said the crackdown intensified after

Trump's "Liberation Day" tariffs in April 2025.

U.S. Department of Energy spokesperson Olivia Tinari said in response to questions about Washington's rare earths rivalry with Beijing that the agency was "investing in American workers, scaling innovation, and expanding domestic production of critical materials."

Academia-industry ties

Billions of federal dollars have flowed into U.S. mining schools, research programmes and other related areas since 2024 as the country seeks to rebuild mining expertise. The U.S. Congress is also considering legislation that would fund international cooperation in mining education.

China's rare earth industry benefited in the 1980s

and 1990s from generous tax incentives and an abundant supply of cheap labour. The government and affiliated entities continue to fund research institutes, and state lenders have offered financing on preferential terms to firms that mine critical minerals.

By the 1990s, the processing industry was "wiped out" in the West, said Ed Richardson, chief executive of U.S. magnet producer Thomas & Skinner. "Therefore, the schools have not been educating mining students for this task."

In contrast, researchers, universities, and industry continue to collaborate closely in China. Scientists at the National Engineering Research Center for Rare Earths in Beijing developed a new technology,

which state-owned Gansu Rare Earth New Materials adopted in 2023 at a refining facility that can churn out 50,000 metric tonnes of highly processed rare earths annually.

That is five times what Australia's Lynas Rare Earths, the largest rare earths company outside China, produced in the 2025 fiscal year.

China produces over 90% of the world's processed rare earths and rare earth magnets.

David Parker, a rare earths expert at Britain's Durham University who reviewed the Chinese institute's course outline for Reuters, described it as "highly specialized" and reflective of the "pre-eminent position of China in rare earth science and engineering."

02J6. As rare earths become strategic assets, China trains youth with specialised courses

दुर्लभ मृदा तत्व रणनीतिक संपत्ति बनते जा रहे हैं, चीन विशेष पाठ्यक्रमों से युवाओं को प्रशिक्षित कर रहा है

- Every year, several hundred young adults head to the steppes of northern China to learn about **rare earths** at schools like the **Inner Mongolia University of Science and Technology**.

हर वर्ष सैकड़ों युवा उत्तरी चीन के घास के मैदानों की ओर जाते हैं ताकि वे **इनर मंगोलिया यूनिवर्सिटी ऑफ साइंस एंड टेक्नोलॉजी** जैसे संस्थानों में **दुर्लभ मृदा तत्वों (Rare Earths)** के बारे में अध्ययन कर सकें।

- After completing undergraduate study, they may venture a few kilometres up the **six-lane Rare Earths Street in Baotou**, where they can work for state-owned refiners that convert the critical minerals into magnets that power jet engines, electric vehicles and wind turbines.

स्नातक अध्ययन पूरा करने के बाद वे **बाओतौ** की छह लेन वाली **रेयर अर्थ्स स्ट्रीट** तक जाते हैं, जहाँ वे सरकारी रिफाइनरियों में काम कर सकते हैं, जो इन महत्वपूर्ण खनिजों को जेट इंजन, इलेक्ट्रिक वाहन और पवन टर्बाइनों को चलाने वाले मैग्नेट में बदलती हैं।

- Or, the graduates may pursue further studies at the nearby **Baotou Rare Earth Research Institute** roughly 150 km from the world's largest rare earths mine.

या फिर छात्र दुनिया की सबसे बड़ी दुर्लभ मृदा खदान से लगभग 150 किमी दूर स्थित **बाओतौ रेयर अर्थ रिसर्च इंस्टीट्यूट** में आगे की पढ़ाई कर सकते हैं।

40 specialist labs

40 विशेष प्रयोगशालाएँ

- China has created an ecosystem of more than **40 specialist rare-earth laboratories** that produce cutting-edge research.

चीन ने **40 से अधिक विशेष रेयर-अर्थ प्रयोगशालाओं** का एक तंत्र विकसित किया है, जो अत्याधुनिक शोध करती हैं।

- Supplemented by at least **11 universities and technical colleges** that collectively enrol more than **500 students annually** in rare earths degree programmes, a Reuters examination has found.

रॉयटर्स की जांच के अनुसार, इनके साथ कम से कम **11 विश्वविद्यालय और तकनीकी कॉलेज** जुड़े हैं, जो हर वर्ष रेयर अर्थ डिग्री कार्यक्रमों में **500 से अधिक छात्रों** को प्रवेश देते हैं।



- That accumulated expertise sustains Beijing's grip on global supplies of refined rare earths. यह संचित विशेषज्ञता परिष्कृत दुर्लभ मृदा की वैश्विक आपूर्ति पर बीजिंग की पकड़ को बनाए रखती है।
- **Several U.S. institutions have begun incorporating more of a focus on rare earths in their curriculum.**
कई अमेरिकी संस्थानों ने अपने पाठ्यक्रम में दुर्लभ मृदा तत्वों पर अधिक ध्यान देना शुरू किया है।
- Though Reuters could not identify a school outside **China that offers a specific undergraduate degree.**
हालांकि रॉयटर्स चीन के बाहर ऐसा कोई संस्थान नहीं खोज सका जो इस विषय में विशेष स्नातक डिग्री प्रदान करता हो।
- **U.S. institutions awarded just over 200 generalist undergraduate mining and metallurgical engineering degrees in 2023.**
अमेरिकी संस्थानों ने 2023 में केवल **200 से कुछ अधिक सामान्य खनन और धातुकर्म इंजीनियरिंग स्नातक डिग्रियाँ** प्रदान कीं।
- The **latest year with nationwide figures available, according to data compiled by the Colorado-based Society for Mining, Metallurgy and Exploration.**
यह नवीनतम वर्ष है जिसके राष्ट्रीय आंकड़े उपलब्ध हैं, जैसा कि **कोलोराडो स्थित सोसाइटी फॉर माइनिंग, मेटलर्जी एंड एक्सप्लोरेशन** के आंकड़ों से पता चलता है।
- **"In China, I used to hire kids right out of university and they're immediately productive," said Constantine Karayannopoulos, former chief executive of rare earths companies Neo Performance Materials and Molycorp.**
दुर्लभ मृदा कंपनियों **नियो परफॉर्मंस मटेरियल्स** और **मोलीकॉर्प** के पूर्व मुख्य कार्यकारी **कॉन्स्टैंटाइन करायान्नोपोलोस** ने कहा, "चीन में मैं सीधे विश्वविद्यालय से छात्रों को नियुक्त करता था और वे तुरंत उत्पादक साबित होते थे।"
- **"Anywhere else I need to train them for three years."**
"दूसरी जगहों पर मुझे उन्हें तीन साल तक प्रशिक्षित करना पड़ता है।"
- **China's rare earth industry benefited in the 1980s and 1990s from generous tax incentives and an abundant supply of cheap labour.**
चीन के दुर्लभ मृदा उद्योग को 1980 और 1990 के दशक में उदार कर प्रोत्साहनों और सस्ते श्रम की प्रचुर उपलब्धता से लाभ मिला।
- The **government and affiliated entities continue to fund research institutes, and state lenders have offered financing on preferential terms to firms that mine critical minerals.**
सरकार और उससे जुड़े संस्थान शोध संस्थानों को वित्तपोषित करते हैं और सरकारी ऋणदाताओं ने महत्वपूर्ण खनिजों का खनन करने वाली कंपनियों को रियायती शर्तों पर वित्त उपलब्ध कराया है।
- **By the 1990s, the processing industry was "wiped out" in the West, said Ed Richardson, chief executive of U.S. magnet producer Thomas & Skinner.**
अमेरिकी मैग्नेट निर्माता **थॉमस एंड स्किनर** के मुख्य कार्यकारी **एड रिचर्डसन** ने कहा कि 1990 के दशक तक पश्चिम में प्रसंस्करण उद्योग "समाप्त" हो चुका था।
- **"Therefore, the schools have not been educating mining students for this task."**
"इसलिए स्कूल इस कार्य के लिए खनन छात्रों को शिक्षित नहीं कर रहे थे।"
- **In contrast, researchers, universities, and industry continue to collaborate closely in China.**
इसके विपरीत, चीन में शोधकर्ता, विश्वविद्यालय और उद्योग अब भी निकट सहयोग बनाए हुए हैं।
- Scientists at the **National Engineering Research Center for Rare Earths in Beijing developed a new technology.**
बीजिंग स्थित नेशनल इंजीनियरिंग रिसर्च सेंटर फॉर रेयर अर्थ्स के वैज्ञानिकों ने एक नई तकनीक विकसित की।
- Which state-owned **Gansu Rare Earth New Materials** adopted in 2023 at a refining facility that can churn out **50,000 metric tonnes** of highly processed rare earths annually.



जिसे सरकारी कंपनी गांसू रेयर अर्थ न्यू मटेरियल्स ने 2023 में ऐसी रिफाइनिंग सुविधा में अपनाया जो हर वर्ष 50,000 मीट्रिक टन अत्यधिक प्रसंस्कृत दुर्लभ मृदा तत्वों का उत्पादन कर सकती है।

- That is five times what **Australia's Lynas Rare Earths**, the largest rare earths company outside China, produced in the 2025 fiscal year.

यह चीन के बाहर की सबसे बड़ी रेयर अर्थ कंपनी ऑस्ट्रेलिया की लिनास रेयर अर्थ्स के 2025 वित्तीय वर्ष के उत्पादन से पाँच गुना अधिक है।

- China produces over **90%** of the world's processed rare earths and rare earth magnets. चीन दुनिया के 90% से अधिक प्रसंस्कृत दुर्लभ मृदा तत्वों और रेयर अर्थ मैग्नेट का उत्पादन करता है।

GS Paper III: Science and Technology

02 June 2026

TOPICS COVERED

02J6	The genie of synthetic biology is out, and with it comes power and peril सिंथेटिक बायोलॉजी का जिन्न बाहर आ चुका है, और इसके साथ शक्ति तथा संकट दोनों आए हैं।
02J6	Orbital rivalry — the challenge of China's space power कक्षीय प्रतिद्वंद्विता — चीन की अंतरिक्ष शक्ति की चुनौती।
02J6	The FemTech industry's approach to PMOS फेमटेक उद्योग का PMOS के प्रति दृष्टिकोण।

The genie of synthetic biology is out, and with it comes power and peril

The quest to understand the universe releases the genie from the lamp, kept inside. It is of no use and leashes human thought and creativity; released but unregulated, it risks creating new and unforeseen problems released and used wisely, the applications are many and valuable.

For the first time in about four billion years of life on the earth, one species is learning not just to read the book of life but to write new versions. Humans' quest to understand and explain the natural world has always carried a double consequence: every success also enhances our ability to change the world. By understanding how diseases act, we create drugs and vaccines that change the prevalence of infectious agents. The elimination of smallpox is one example. Understanding the basis of some hereditary disorders has meant that dietary management can help those affected to live full lives. Phenylketonuria, a condition in which the body cannot process a common amino acid, phenylalanine, is one such example.

Verbosity in genes
At the core of our efforts to understand and explain the extraordinary diversity of forms and functions of life lies one molecule: deoxyribonucleic acid, popularly known by its abbreviation, DNA. DNA resides in cells, the unit of construction of our bodies — indeed of any organism — and we humans are made up of trillions of cells. The DNA in a cell is called its genome. The linear thread of DNA that makes up the genome has an alphabet of four nucleotides, denoted by the letters 'A', 'T', 'G', and 'C'. A genome can have thousands of genes, and through the specific ordering of these letters, each gene can encode a specific protein. Proteins in their various forms make up or help manufacture, all that is needed for each cell to perform its unique function.

If we were to look simultaneously at a bacterium, a fruit fly, a mouse, and a human, and think about their varying complexity, we would be tempted to hypothesize that the human has many thousands of times more genes than the fly or the bacterium. After all, we are a far more complex organism than a fly, a mouse, or a bacterium. However, the commonly studied bacterium *Escherichia coli* has about 4,300 genes. The fruit fly has about 20,000. The mouse, about 20,000. And the human, about 22,000. There is only a twofold difference in gene number between a bacterium and a human. The mouse has more protein-coding genes than us, and a water flea, *Daphnia*, has about 31,000 genes, more than either us or the mouse.

Verbosity in genes, as in conservation, is not a measure of complexity. Just as one can compare something complex and information dense in a short, non-redundant paragraph, it is how, where, how much, and where in the cell gene products are expressed that determines complexity. While genes encode proteins, they also have DNA sequences involved in regulating where, when, and to what extent genes are expressed. These regulatory regions are located where other specific proteins, called transcription factors bind, to turn genes 'on' and 'off'. These regulatory proteins are themselves encoded by genes.

Three extraordinary insights
The decreasing cost and increasing speed of DNA sequencing means that we can, today, sequence the genome of any organism we choose. At the start of the human Genome Project, sequencing a human genome took more than a decade, cost close to \$1 billion, and involved thousands of scientists across about 20 countries. Today this is possible in a few hours, at a cost of a few hundred dollars, in a small laboratory. As our computational capacity also increases, so does our ability to analyze the genomes we have sequenced. The growing bank of genome sequences across organisms offers three extraordinary insights into all life on the earth.

First, genome sequences taken together give us a history of life on the planet. The relative detail of organisms we provide complements the fossil record available to us — but it also tells us the history of life where no fossil record exists. No social history of humans can provide this degree of precision and accuracy over such an extended period. Second, when we examine genomes in the context of how an organism functions, plan its animal functions in its environment, we learn how they are adapted. Genes, famously described as selfish, ensure their own propagation by using their host organisms 'as a vehicle for their transmission. By studying



Life chemistry. The exquisite detail that genomes provide complements the fossil record where it is available — but it also tells us the history of life where no fossil record exists. No social history of humans can provide this degree of precision and accuracy over such an extended period. www.nature.com/scienceimages

With access to computing power and memory that AI provides, it is possible to analyse cellular and environmental information and design sections of genomes or entire genomes, with the desired properties on our computers
engineer nature in many ways. But what we can currently do with genetic engineering is modest compared to the potential from new avenues now opening. Engineering cells and organisms not just at the level of one or a few genes, but at a genome-wide scale, is becoming possible. These technologies will become more accurate, less expensive, and more accessible. With access to computing power and memory that AI provides, it is possible to analyse cellular and environmental information and design sections of genomes or entire genomes, with the desired properties on our computers. Today, the predictability of what happens when such designs are implemented still remains low, and organisms are notorious for resisting attempts to alter them. But this too will change, through a combination of analytical and experimental work. Designer cells that make chemicals, drugs, materials, and fuels are already with us, but they will become ubiquitous and far broader in their uses than what we see today.

It is not only cells for biotechnological applications that will be created, often making products never before seen in nature. Creating complex new forms of multicellular organisms, plants or animals, is also a real possibility. Applying the genome of a cell with one designed and manufactured by humans is now feasible for small genomes and will



Building blocks. The growing bank of genome sequences across organisms offers extraordinary insights into all life on the earth. www.nature.com/scienceimages

02J6. The genie of synthetic biology is out, and with it comes power and peril
सिंथेटिक बायोलॉजी का जिन्न बाहर आ चुका है, और इसके साथ शक्ति तथा संकट दोनों आए हैं।

- For the first time in about **four billion years of life on the earth**, one species is learning not just to read the book of life but to write new versions. पृथ्वी पर लगभग चार अरब वर्षों के जीवन इतिहास में पहली बार, एक प्रजाति केवल जीवन की पुस्तक को पढ़ना ही नहीं बल्कि उसके नए संस्करण लिखना भी सीख रही है।

- The elimination of **smallpox** is one example. चेचक का उन्मूलन इसका एक उदाहरण है।

- **Phenylketonuria**, a condition in which the body cannot process a common amino acid, phenylalanine, is one such example. फेनिलकीटोनूरिया, एक ऐसी स्थिति जिसमें शरीर सामान्य अमीनो अम्ल फेनिलएलनिन को संसाधित नहीं कर पाता, इसका एक उदाहरण है।

Verbosity in genes
जीनों में शब्दबहुलता

Verbosity in genes

जीनों में शब्दबहुलता

- At the core of our efforts to understand and explain the extraordinary **diversity of forms and functions of life lies one molecule: deoxyribonucleic acid**, popularly known by its abbreviation, **DNA**.

जीवन के रूपों और कार्यों की असाधारण विविधता को समझने और



उसकी व्याख्या करने के हमारे प्रयासों के केंद्र में एक अणु स्थित है: डीऑक्सीराइबोन्यूक्लिक अम्ल, जिसे सामान्यतः उसके संक्षिप्त नाम डीएनए से जाना जाता है।

- DNA resides in cells, the unit of construction of our bodies — indeed of any organism — and we humans are made up of trillions of cells.
डीएनए कोशिकाओं में स्थित होता है, जो हमारे शरीर — और वास्तव में किसी भी जीव — की निर्माण इकाई हैं, तथा हम मनुष्य खरबों कोशिकाओं से बने हैं।
- The DNA in a cell is called its genome.
किसी कोशिका में उपस्थित डीएनए को उसका जीनोम कहा जाता है।
- The linear thread of DNA that makes up the genome has an alphabet of four molecules, denoted by the letters 'A', 'T', 'G', and 'C'.
जीनोम का निर्माण करने वाले डीएनए के रेखिक सूत्र में चार अणुओं की वर्णमाला होती है, जिन्हें 'A', 'T', 'G' और 'C' अक्षरों द्वारा दर्शाया जाता है।
- A genome can have thousands of genes, and through the specific ordering of these letters, each gene can encode a specific protein.
एक जीनोम में हजारों जीन हो सकते हैं, और इन अक्षरों के विशिष्ट क्रम के माध्यम से प्रत्येक जीन एक विशिष्ट प्रोटीन को कूटबद्ध कर सकता है।
- Proteins in their various forms make up, or help manufacture, all that is needed for each cell to perform its unique function.
प्रोटीन अपने विभिन्न रूपों में उन सभी आवश्यक तत्वों का निर्माण करते हैं अथवा उनके निर्माण में सहायता करते हैं, जिनकी प्रत्येक कोशिका को अपना विशिष्ट कार्य करने के लिए आवश्यकता होती है।
- However, the commonly studied bacterium **Escherichia coli** has about 4,300 genes.
हालाँकि, सामान्यतः अध्ययन किए जाने वाले जीवाणु एशेरिशिया कोलाई में लगभग 4,300 जीन होते हैं।
- The fruit fly, about 17,000.
फल मक्खी में लगभग 17,000 जीन होते हैं।
- The mouse, about 21,000.
चूहे में लगभग 21,000 जीन होते हैं।
- And the human, about 22,000.
और मनुष्य में लगभग 22,000 जीन होते हैं।
- There is only a fivefold difference in gene number between a bacterium and a human.
एक जीवाणु और मनुष्य के बीच जीनों की संख्या में केवल पाँच गुना का अंतर है।
- The mouse has more protein-coding genes than us, and a water flea, **Daphnia**, has about 31,000 genes, more than either us or the mouse.
चूहे में हमसे अधिक प्रोटीन-कूटबद्ध करने वाले जीन होते हैं, और एक जल पिस्सू डैफिनिया, में लगभग 31,000 जीन होते हैं, जो हम और चूहे दोनों से अधिक हैं।
- While genes encode proteins, they also have DNA sequences involved in regulating when, where, and to what extent genes are expressed.
यद्यपि जीन प्रोटीन को कूटबद्ध करते हैं, उनमें ऐसे डीएनए अनुक्रम भी होते हैं जो यह नियंत्रित करते हैं कि जीन कब, कहाँ और किस सीमा तक अभिव्यक्त होंगे।
- These regulatory regions are locations where other specific proteins, called **transcription factors** bind, to turn genes 'on' and 'off'.
ये नियामक क्षेत्र वे स्थान होते हैं जहाँ अन्य विशिष्ट प्रोटीन, जिन्हें ट्रांसक्रिप्शन फैक्टर्स कहा जाता है, जीनों को 'चालू' और 'बंद' करने के लिए जुड़ते हैं।
- These regulatory proteins are themselves encoded by genes.
ये नियामक प्रोटीन स्वयं भी जीनों द्वारा कूटबद्ध किए जाते हैं।

Three extraordinary insights तीन असाधारण अंतर्दृष्टियाँ



- The **decreasing cost and increasing speed of DNA sequencing** means that we can, today, sequence the genome of any organism we choose.
डीएनए अनुक्रमण की घटती लागत और बढ़ती गति का अर्थ है कि आज हम किसी भी चुने गए जीव के जीनोम का अनुक्रमण कर सकते हैं।
- At the start of the **Human Genome Project**, sequencing a human genome took more than a decade, cost close to \$3 billion, and involved thousands of scientists across about 20 countries.
ह्यूमन जीनोम प्रोजेक्ट की शुरुआत में मानव जीनोम का अनुक्रमण करने में एक दशक से अधिक समय लगा, लगभग 3 अरब डॉलर की लागत आई, और इसमें लगभग 20 देशों के हजारों वैज्ञानिक शामिल थे।
- As our computational capacity also increases, so does our ability to study the genomes we have sequenced.
जैसे-जैसे हमारी संगणनात्मक क्षमता बढ़ रही है, वैसे-वैसे अनुक्रमित जीनोमों का अध्ययन करने की हमारी क्षमता भी बढ़ रही है।
- The growing bank of genome sequences across organisms offers three extraordinary insights into all life on the earth.
विभिन्न जीवों के जीनोम अनुक्रमों का बढ़ता भंडार पृथ्वी पर समस्त जीवन के संबंध में तीन असाधारण अंतर्दृष्टियाँ प्रदान करता है।
- First, genome sequences taken together give us a history of life on the planet, the relatedness of organisms, and how the tree of life branched in different ways.
प्रथम, जीनोम अनुक्रम सामूहिक रूप से हमें पृथ्वी पर जीवन का इतिहास, जीवों की पारस्परिक संबंधता, तथा जीवन-वृक्ष किस प्रकार विभिन्न दिशाओं में विभाजित हुआ, इसकी जानकारी देते हैं।
- The exquisite detail that genomes provide complements the fossil record where it is available — but it also tells us the history of life where no fossil record exists.
जीनोम द्वारा प्रदान किया गया सूक्ष्म विवरण वहाँ जीवाश्म अभिलेखों का पूरक बनता है जहाँ वे उपलब्ध हैं — किंतु यह हमें वहाँ के जीवन का इतिहास भी बताता है जहाँ कोई जीवाश्म अभिलेख मौजूद नहीं है।
- No social history of humans can provide this degree of precision and accuracy over such an extended period.
मानवों का कोई सामाजिक इतिहास इतने विस्तृत कालखंड के लिए इस स्तर की परिशुद्धता और सटीकता प्रदान नहीं कर सकता।
- Second, when we examine genomes in the context of how an organism (bacterium, plant or animal) functions in its environment, we learn how they are adapted.
द्वितीय, जब हम जीनोम का अध्ययन इस संदर्भ में करते हैं कि कोई जीव (जीवाणु, पौधा अथवा प्राणी) अपने पर्यावरण में किस प्रकार कार्य करता है, तब हम यह समझते हैं कि वे किस प्रकार अनुकूलित हुए हैं।
- Genes, famously described as selfish, ensure their own propagation by using their host organism's survival as a vehicle for their transmission.
जीन, जिन्हें प्रसिद्ध रूप से स्वार्थी कहा गया है, अपने वाहक जीव के अस्तित्व को अपने संचरण के माध्यम के रूप में उपयोग करके अपने स्वयं के प्रसार को सुनिश्चित करते हैं।
- By studying variations in genes, we learn how mutations are selected as organisms adapt to their environments.
जीनों में विविधताओं का अध्ययन करके हम यह समझते हैं कि जीव अपने पर्यावरण के अनुरूप ढलते समय उत्परिवर्तन किस प्रकार चयनित होते हैं।
- Human populations that today carry genes predisposing them to **type II diabetes** are typically descended from groups that lived in environments where food supply rose and fell cyclically over long intervals.
वे मानव जनसंख्या समूह जो आज **टाइप-II मधुमेह** की प्रवृत्ति वाले जीन धारण करते हैं, सामान्यतः उन समूहों के वंशज हैं जो ऐसे वातावरण में रहते थे जहाँ लंबे अंतरालों में खाद्य आपूर्ति चक्रीय रूप से घटती-बढ़ती रहती थी।



- In today's environment of abundant food, this genetic inheritance leads to disease.**
आज के प्रचुर खाद्य उपलब्धता वाले वातावरण में यही आनुवंशिक विरासत रोग का कारण बनती है।
- Third, just as with DNA sequencing, we are rapidly accumulating detailed information on all aspects of the cellular environment across a variety of organisms — which genes are expressed, where their products are localised, what they do, and so on.**
तृतीय, ठीक डीएनए अनुक्रमण की तरह, हम विभिन्न जीवों में कोशिकीय वातावरण के सभी पहलुओं से संबंधित विस्तृत जानकारी तीव्र गति से एकत्र कर रहे हैं — कौन-से जीन अभिव्यक्त होते हैं, उनके उत्पाद कहाँ स्थित होते हैं, वे क्या कार्य करते हैं, आदि।
- When taken together, this detailed 'cell map' can give us a picture of all the complexity within a cell in each organism we study.**
सामूहिक रूप से देखा जाए तो यह विस्तृत 'कोशिका मानचित्र' हमें प्रत्येक अध्ययन किए गए जीव की कोशिका के भीतर विद्यमान समस्त जटिलताओं का चित्र प्रदान कर सकता है।
- From all of this, one can expect a substantial advance in our understanding of how life in all its diversity came about, how organisms are made, and how they work.**
इन सभी प्रयासों से यह अपेक्षा की जा सकती है कि जीवन अपनी समस्त विविधताओं सहित कैसे उत्पन्न हुआ, जीवों का निर्माण कैसे हुआ, और वे किस प्रकार कार्य करते हैं — इस संबंध में हमारी समझ में महत्वपूर्ण प्रगति होगी।
- With this knowledge will come expanded power in synthetic biology.**
इस ज्ञान के साथ **सिंथेटिक बायोलॉजी** में विस्तारित शक्ति भी आएगी।
- Our understanding of how genes, cells, and environments collaborate to make organisms has already enabled us to engineer nature in many ways.**
जीन, कोशिकाएँ और पर्यावरण किस प्रकार मिलकर जीवों का निर्माण करते हैं, इसकी हमारी समझ ने हमें पहले ही अनेक प्रकार से प्रकृति का अभियांत्रिकीकरण करने में सक्षम बना दिया है।
- Engineering cells and organisms not just at the level of one or a few genes, but on a genome-wide scale, is becoming possible.**
केवल एक या कुछ जीनों के स्तर पर ही नहीं, बल्कि संपूर्ण जीनोम स्तर पर कोशिकाओं और जीवों का अभियांत्रिकीकरण अब संभव होता जा रहा है।
- These technologies will become more accurate, less expensive, and more accessible.**
ये प्रौद्योगिकियाँ अधिक सटीक, कम महंगी और अधिक सुलभ बनेंगी।
- With access to computing power and memory that AI provides, it is possible to analyse cellular and environmental information and design sections of genomes or entire genomes, with the desired properties on our computers.**
एआई द्वारा उपलब्ध कराई गई संगणनात्मक शक्ति और स्मृति तक पहुँच के माध्यम से कोशिकीय एवं पर्यावरणीय जानकारी का विश्लेषण करना तथा इच्छित गुणों वाले जीनोम के भागों अथवा संपूर्ण जीनोम का कंप्यूटर पर डिज़ाइन तैयार करना संभव है।
- Designer cells that make chemicals, drugs, materials, and fuels are already with us but they will become ubiquitous and far broader in their uses than what we see today.**
रसायन, औषधियाँ, पदार्थ और ईंधन बनाने वाली डिज़ाइनर कोशिकाएँ पहले से ही हमारे बीच मौजूद हैं, किन्तु भविष्य में वे सर्वव्यापी होंगी और उनके उपयोग आज की तुलना में कहीं अधिक व्यापक होंगे।
- Creating complex new forms of multicellular organisms, plants or animals, is also a real possibility.**
बहुकोशिकीय जीवों, पौधों अथवा प्राणियों के जटिल नए रूपों का निर्माण भी एक वास्तविक संभावना है।
- Replacing the genome of a cell with one designed and manufactured by humans is now feasible for small genomes and will soon be possible for larger ones.**
किसी कोशिका के जीनोम को मनुष्यों द्वारा डिज़ाइन और निर्मित जीनोम से प्रतिस्थापित करना अब छोटे जीनोमों के लिए संभव है और शीघ्र ही बड़े जीनोमों के लिए भी संभव होगा।
- In 2010, American scientist J. Craig Venter (1946-2026) and his team chemically synthesised a complete bacterial genome and introduced it into a bacterial cell whose native**



DNA had been removed.

वर्ष 2010 में अमेरिकी वैज्ञानिक जे. क्रेग वेंटर (1946-2026) और उनकी टीम ने रासायनिक रूप से एक पूर्ण जीवाणु जीनोम का संश्लेषण किया और उसे एक ऐसी जीवाणु कोशिका में प्रविष्ट कराया जिसका मूल डीएनए

Orbital rivalry — the challenge of China's space power

GS III: S&T

GS III: Internal Security

China's expanding counter-space capabilities are a cause for concern. While no conflict has ever been fought in space, the incentive to influence activities on earth by controlling outer space remains a potential trigger for future confrontation. Beijing's development of anti-satellite missiles and co-orbital systems blurs the line between routine space operations and counter-space activities.

The key question is how Beijing views its space ambitions and control of outer space, and what India can do to safeguard its vital interests in this domain.

Beijing's space ambitions

While the Chinese space programme emphasises the peaceful use of space, evidence suggests that China is preparing for an orbital war.

In January 2007, it targeted its own satellite from earth. In October 2015, China tested an exo-atmospheric vehicle designed to strike a hostile satellite. In 2022, China used a robotic spacecraft to push a defunct satellite into the graveyard orbit. In 2024, it demonstrated an orbital dog-fight. There is a clear research and developmental push for fielding offensive capabilities in space.

China's space ambitions operate at two levels. First, it seeks to remain competitive in the emerging space race, both technologically and numerically. China has around 1,900 satellites in orbit, compared to more than 8,000 American satellites, including the SpaceX satellites.

Second, it recognises the military and economic implications of the weaponisation of space. A single strike could disrupt communications, power grids, navigation systems, financial markets, and military command-and-control (C2) and intelligence, surveillance and reconnaissance (ISR) networks.

Accordingly, China aims to land on the moon by 2036, launch a nuclear-powered shuttle by 2040, and establish a solar power system by 2050. Chinese start-ups such as LandSpace, iSpace and OneSpace are challenging rivals such as SpaceX and Blue Origin. China is also exploring lunar and asteroid mining for energy



Harinder Singh
Former corps commander

and critical minerals. The growing demand for energy-efficient data centres is likely to further intensify the space race.

China is seeking to assert control over outer space in two distinct ways. First, by leveraging space-based assets to safeguard its military and economic systems. Second, by competing with its rivals – both numerically and technologically – to maintain space superiority. Its most immediate competition is with Starlink in low-earth orbit (LEO). China plans to deploy more than 36,000 LEO satellites by 2030. This rivalry could intensify if China were to become the first to establish a presence on the far side of the moon or demonstrate a particular interest in exploiting asteroid resources. Such developments could create an escalatory dynamic in an environment that lacks a comprehensive regulatory framework.

Consequently, China's capabilities are evolving in three key areas. First, kinetic attack systems such as the DN-3 and SC-19 missiles, which can physically destroy satellites. Second, laser-based systems that can dazzle or blind satellites, disrupting navigation and communications. Third, co-orbital satellites, such as the SJ and TJS series, designed to interfere with or dislodge other satellites from orbit. Together, these capabilities could enable the People's Liberation Army (PLA) to cripple Intelligence, Surveillance, and Reconnaissance (ISR), GPS and communication networks, shaping the battlespace during the first 24 to 48 hours of a conflict.

Implications for India

If a contingency arises in Taiwan, the PLA is likely to first blind ISR and communication networks before resorting to hard-kill attacks. This would give Beijing time to shape the narrative, whereas a hard kill could trigger immediate escalation.

The U.S. would then have to assess China's military objectives, and, if an invasion proceeds, neutralise its counter-space capabilities. While both sides may lose assets, the U.S. would likely retain an advantage due to its greater redundancy and resilience. The Taiwan scenario applies to

India albeit on a lesser scale. India has around 60 operational satellites as against 400-plus Chinese military satellites alone, which implies lesser redundancy. Losing five to six satellites will hurt India more.

Hypothetically, China could strike at the CARTOSAT/RISAT series, which could lead to loss of tactical-level imagery for hours, if not days. Instead, if it only choose to lase as these satellites as they pass over the Line of Actual Control, it could lead to temporary blind spots. They could even deploy jammers to disable India's NavIC system.

The key strategic takeaway is that while China can conduct peacetime harassment using lasers and jammers, or temporarily blind a few satellites during a border crisis, it cannot inflict crippling damage without destroying a large number of Indian satellites and risking severe Kessler Syndrome consequences. While Mission Shakti has strengthened India's deterrence posture, its utility remains restricted. Moreover, a single successful test does not guarantee operational reliability, and India still lacks co-orbital capabilities to counter satellites such as the SJ and TJS series.

Safeguarding India's interests

A few measures are pertinent. First, India must expand its space industry beyond the Indian Space Research Organisation to increase satellite production and launch capacity. Greater capacity translates into greater redundancy. Second, it should disaggregate large satellite programmes, such as GSAT, into smaller constellations, which are more resilient and survivable. Third, India must strengthen the protection of its ground space assets to mitigate the impact of hard-kill attacks. Fourth, it should enhance data-sharing arrangements with strategic partners so that, in the event of satellite losses, critical services can be restored through commercial or partner networks within hours.

Besides, India should also clearly define its red lines and the scope of a proportionate response to ensure that China fully understands the potential escalation ladder.

हटा दिया गया था।

02J6. rbital rivalry — the challenge of China's space power

कक्षीय प्रतिद्वंद्विता — चीन की अंतरिक्ष शक्ति की चुनौती।

- **Beijing's development of anti-satellite missiles and co-orbital systems blurs the line between routine space operations and counter-space activities.**

बीजिंग द्वारा विकसित उपग्रह-रोधी मिसाइलें और सह-कक्षीय प्रणालियाँ सामान्य अंतरिक्ष अभियानों और प्रतिअंतरिक्ष गतिविधियों के बीच की रेखा को धुंधला कर देती हैं।

- **In January 2007, it targeted its own satellite from earth.**

जनवरी 2007 में उसने पृथ्वी से अपने ही उपग्रह को निशाना बनाया।

- **In October 2015, China tested an exo-atmospheric vehicle designed to strike a hostile satellite.**

अक्टूबर 2015 में चीन ने एक बाह्य-वायुमंडलीय वाहन का परीक्षण किया, जिसे शत्रु उपग्रह पर प्रहार करने हेतु डिज़ाइन किया गया था।

- **In 2022, China used a robotic spacecraft to push a defunct satellite into the graveyard orbit.**

वर्ष 2022 में चीन ने एक रोबोटिक अंतरिक्ष यान का उपयोग कर निष्क्रिय उपग्रह को ग्रेवयार्ड कक्षा में धकेल दिया।



- China has around 1,900 satellites in orbit, compared to more than 8,000 American satellites, including the **SpaceX** satellites.
चीन के लगभग 1,900 उपग्रह कक्षा में हैं, जबकि अमेरिका के पास **SpaceX** उपग्रहों सहित 8,000 से अधिक उपग्रह हैं।
- A single strike could disrupt communications, power grids, navigation systems, financial markets, and military command-and-control (C2) and intelligence, surveillance and reconnaissance (ISR) networks.
एकमात्र हमला संचार, विद्युत ग्रिड, नेविगेशन प्रणालियों, वित्तीय बाजारों तथा सैन्य कमांड एंड कंट्रोल (C2) और इंटेलिजेंस, सर्विलांस एंड रिकॉनिसेंस (ISR) नेटवर्क को बाधित कर सकता है।
- Accordingly, China aims to land on the moon by 2036, launch a nuclear-powered shuttle by 2040, and establish a solar power system by 2050.
इसी के अनुरूप, चीन का लक्ष्य 2036 तक चंद्रमा पर उतरना, 2040 तक परमाणु-संचालित शटल प्रक्षेपित करना और 2050 तक सौर ऊर्जा प्रणाली स्थापित करना है।
- Chinese start-ups such as **LandSpace**, **iSpace** and **OneSpace** are challenging rivals such as **SpaceX** and **Blue Origin**.
लैंडस्पेस, आईस्पेस और वनस्पेस जैसे चीनी स्टार्ट-अप्स **स्पेसएक्स** और **ब्लू ओरिजिन** जैसी प्रतिस्पर्धी कंपनियों को चुनौती दे रहे हैं।
- China is also exploring lunar and asteroid mining for energy and critical minerals.
चीन ऊर्जा और महत्वपूर्ण खनिजों के लिए चंद्रमा तथा क्षुद्रग्रहों के खनन की संभावनाओं का भी अन्वेषण कर रहा है।
- Its most immediate competition is with **Starlink** in low-earth orbit (LEO).
निम्न-पृथ्वी कक्षा (LEO) में उसका सबसे तात्कालिक प्रतिस्पर्धी **स्टारलिंक** है।
- China plans to deploy more than 36,000 LEO satellites by 2030.
चीन की योजना 2030 तक 36,000 से अधिक LEO उपग्रह तैनात करने की है।
- First, kinetic attack systems such as the **DN-3** and **SC-19** missiles, which can physically destroy satellites.
पहला, **DN-3** और **SC-19** जैसी गतिज आक्रमण प्रणालियाँ, जो उपग्रहों को भौतिक रूप से नष्ट कर सकती हैं।
- Second, laser-based systems that can dazzle or blind satellites, disrupting navigation and communications.
दूसरा, लेज़र-आधारित प्रणालियाँ, जो उपग्रहों को चकाचौंध या अंधा कर सकती हैं तथा नेविगेशन और संचार को बाधित कर सकती हैं।
- Third, co-orbital satellites, such as the **SJ** and **TJS** series, designed to interfere with or dislodge other satellites from orbit.
तीसरा, **SJ** और **TJS** श्रृंखला जैसे सह-कक्षीय उपग्रह, जिन्हें अन्य उपग्रहों में हस्तक्षेप करने अथवा उन्हें कक्षा से हटाने के लिए डिज़ाइन किया गया है।
- India has around 60 operational satellites as against 400-plus Chinese military satellites alone, which implies lesser redundancy.
भारत के पास लगभग 60 परिचालन उपग्रह हैं, जबकि केवल चीन के सैन्य उपग्रहों की संख्या ही 400 से अधिक है, जो भारत की कम वैकल्पिक क्षमता को दर्शाता है।
- Losing 6 to 10 satellites will hurt India more.
पाँच से छह उपग्रहों की क्षति भारत को अधिक प्रभावित करेगी।
- Hypothetically, China could strike at the **CARTOSAT/RISAT** series, which could lead to loss of tactical-level imagery for hours, if not days.
काल्पनिक रूप से, चीन **CARTOSAT/RISAT** श्रृंखला को निशाना बना सकता है, जिससे कई घंटों, यदि दिनों तक नहीं, सामरिक स्तर की चित्रात्मक जानकारी का नुकसान हो सकता है।
- They could even deploy jammers to disable India's **NavIC** system.
वे भारत की **NavIC** प्रणाली को निष्क्रिय करने के लिए जैमर भी तैनात कर सकते हैं।
- The key strategic takeaway is that while China can conduct peacetime harassment using lasers and jammers, or temporarily blind a few satellites during a border crisis, it cannot inflict



crippling damage without destroying a large number of Indian satellites and risking severe **Kessler Syndrome** consequences.

मुख्य रणनीतिक निष्कर्ष यह है कि यद्यपि चीन शांति काल में लेज़र और जैमर का उपयोग कर उत्पीड़न कर सकता है अथवा सीमा संकट के दौरान कुछ उपग्रहों को अस्थायी रूप से अंधा कर सकता है, किन्तु वह बड़ी संख्या में भारतीय उपग्रहों को नष्ट किए बिना और गंभीर **केसलर सिंड्रोम** के जोखिम उठाए बिना विनाशकारी क्षति नहीं पहुँचा सकता।

- While **Mission Shakti** has strengthened India's deterrence posture, its utility remains restricted.

यद्यपि **मिशन शक्ति** ने भारत की प्रतिरोधक क्षमता को सुदृढ़ किया है, फिर भी इसकी उपयोगिता सीमित बनी हुई है।

- Moreover, a single successful test does not guarantee operational reliability, and India still lacks co-orbital capabilities to counter satellites such as the **SJ** and **TJS** series.

इसके अतिरिक्त, एक सफल परीक्षण परिचालन विश्वसनीयता की गारंटी नहीं देता, और भारत के पास अभी भी **SJ** और **TJS** श्रृंखला जैसे उपग्रहों का मुकाबला करने हेतु सह-कक्षीय क्षमताओं का अभाव है।

Safeguarding India's interests

भारत के हितों की सुरक्षा

- Second, it should disaggregate large satellite programmes, such as **GSAT**, into smaller constellations, which are more resilient and survivable.

दूसरा, भारत को **GSAT** जैसे बड़े उपग्रह कार्यक्रमों को छोटे उपग्रह समूहों में विभाजित करना चाहिए, जो अधिक लचीले और सुरक्षित होते हैं।

- Third, India must strengthen the protection of its ground space assets to mitigate the impact of hard-kill attacks.

तीसरा, भारत को कठोर विनाशकारी हमलों के प्रभाव को कम करने हेतु अपने भू-आधारित अंतरिक्ष संसाधनों की सुरक्षा को सुदृढ़ करना होगा।

- Fourth, it should enhance data-sharing arrangements with strategic partners so that, in the event of satellite losses, critical services can be restored through commercial or partner networks within hours.

चौथा, भारत को अपने रणनीतिक साझेदारों के साथ डेटा-साझाकरण व्यवस्थाओं को मजबूत करना चाहिए ताकि उपग्रह क्षति की स्थिति में कुछ ही घंटों के भीतर व्यावसायिक अथवा साझेदार नेटवर्कों के माध्यम से महत्वपूर्ण सेवाओं को पुनर्स्थापित किया जा सके।



The FemTech industry's approach to PMOS

GS III: S&T

The global decision to rename Polycystic Ovary Syndrome (PCOS) as Polyendocrine Metabolic Ovarian Syndrome (PMOS) is a culmination of a decade-long collaboration between doctors, researchers, and patient groups. Led by Professor Helena Teede, Director of the Monash Centre for Health Research and Implementation in Melbourne, the rationale for the change was published in *The Lancet* last month. At the heart of the renaming was a growing recognition that the term PCOS could not capture the condition's complexity, and reduced it to a reproductive disorder centred on the ovaries. It is a long overdue acknowledgement of the condition's multisystem nature as PMOS manifests through a wide range of endocrine, metabolic, reproductive, psychological, and dermatological symptoms.

India's FemTech response

Yet, even as the formal medical renaming to PMOS is enforced, India's FemTech (female technology) industry had already begun treating PCOS as a multisystem condition. A paper published in 2024 by the authors of this article titled, "Platforming PCOS Treatment Online: FemTech Logics of Care," showed how FemTech platforms curated integrated care packages that brought together general practitioners, diabetologists, endocrinologists, gynaecologists, dermatologists, nutritionists, fitness trainers, and psychologists to treat PCOS.

Backed by venture capital funding, FemTech platforms conducted extensive market research to identify the gaps in conventional healthcare systems that stymied the long-term management of PCOS. Several platform founders were themselves women who had struggled to navigate gynaecological care that centred fertility and weight loss as the individual responsibility of



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Discussions around PMOS rarely engage with broader environmental factors such as adulterated food, pollution, chronic stress, and toxins

patients. Their experiences shaped the emergence of platforms that framed PCOS as requiring coordinated and long-term care. Platforms also sought to improve doctor-patient interactions by training gynaecologists to avoid prejudiced language around marital status, fertility, and body weight. Since many aspects of PMOS management could be coordinated remotely, digital consultations also offered women greater privacy and flexibility in a culture that stigmatises unmarried women visiting gynaecologists unchaperoned.

PMOS often first appears through irregular menstrual cycles. The underlying hormonal and metabolic imbalances can remain poorly understood for years delaying treatment. In both families and clinical settings, it is viewed primarily through the lens of fertility and weight loss, generating shame and anxiety around marriage prospects and hostility within marriages itself.

FemTech platforms positioned themselves as offering an integrated and non-judgemental approach to PCOS care. They foregrounded its multifaceted nature, and as of 2025, India's FemTech market was estimated to be worth \$1.48 billion.

Limits of privatised care

However, reliance on FemTech platforms creates new vulnerabilities for long-term healthcare delivery. First, access to these platforms depends on the ability to afford uninterrupted internet connectivity and recurring subscription costs. As a result, these services cater disproportionately to urban, digitally savvy women. For most people, gynaecologists in conventional healthcare systems are usually the first point of contact when they start showing PMOS symptoms. Strengthening these systems is therefore essential to public health.

Second, as start-ups, FemTech platforms are vulnerable to market

volatility. They are dependent on investor confidence. None of the platform founders who were interviewed had secured funding beyond the preliminary 'Series A round' and one of the platforms had to cease operations stranding patients. In the absence of regulatory safeguards, these issues weaken FemTech platforms' claim of being robust alternatives to conventional healthcare systems.

Third, while platforms attempt to improve gynaecologist-patient interactions, scaling such interventions is challenging without broader reforms in medical education and clinical training. The shortage of gynaecologists in India, particularly in rural regions, further intensifies this challenge.

The larger healthcare crisis

Therefore, while FemTech platforms address a real and underserved need, they equally reflect deeper infrastructural failures. The long-term solution to conditions such as PMOS requires investment in public healthcare infrastructure and medical education that move beyond a narrow, fertility-first framework. Doctor-patient interactions must become more inclusive and respectful to women. At the same time, it is important to recognise the strain under which gynaecologists work, particularly in public hospitals. Overcrowded conditions, high patient volumes, and inadequate infrastructure leave little room for privacy and counselling. While FemTech platforms may ease some pressures by coordinating care digitally, they cannot substitute public healthcare.

Moreover, discussions around PMOS rarely engage with broader environmental factors such as adulterated food, pollution, chronic stress, and toxins. If the shift from PCOS to PMOS is to be meaningful, it should encourage a deeper reconsideration of how chronic women's health conditions are understood, prevented, and cared for in India.

02J6. The FemTech industry's approach to PMOS

फेमटेक उद्योग का PMOS के प्रति दृष्टिकोण।



- **The global decision to rename Polycystic Ovary Syndrome (PCOS) as Polyendocrine Metabolic Ovarian Syndrome (PMOS)** is a culmination of a decade-long collaboration between doctors, researchers, and patient groups.
पॉलीसिस्टिक ओवरी सिंड्रोम (PCOS) का नाम बदलकर पॉलीएंडोक्राइन मेटाबोलिक ओवेरियन सिंड्रोम (PMOS) करने का वैश्विक निर्णय चिकित्सकों, शोधकर्ताओं और रोगी समूहों के बीच एक दशक लंबे सहयोग का परिणाम है।
- Led by Professor **Helena Teede**, Director of the **Monash Centre for Health Research and Implementation** in Melbourne, the rationale for the change was published in **The Lancet** last month.
मेलबर्न स्थित **मोनाश सेंटर फॉर हेल्थ रिसर्च एंड इम्प्लीमेंटेशन** की निदेशक प्रोफेसर **हेलेना टीडे** के नेतृत्व में इस परिवर्तन के औचित्य को पिछले महीने **द लैंसेट** में प्रकाशित किया गया।
- At the heart of the renaming was a growing recognition that the term **PCOS** could not capture the condition's complexity, and reduced it to a reproductive disorder centred on the ovaries.
इस नाम परिवर्तन के मूल में यह बढ़ती समझ थी कि **PCOS** शब्द इस स्थिति की जटिलता को व्यक्त नहीं कर पाता और इसे केवल अंडाशयों से संबंधित प्रजनन विकार तक सीमित कर देता है।
- It is a long overdue acknowledgement of the condition's multisystem nature as **PMOS** manifests through a wide range of endocrine, metabolic, reproductive, psychological, and dermatological symptoms.
यह इस स्थिति की बहु-प्रणालीगत प्रकृति की लंबे समय से अपेक्षित स्वीकृति है, क्योंकि **PMOS** अंतःस्रावी, चयापचयी, प्रजनन, मनोवैज्ञानिक और त्वचा संबंधी अनेक लक्षणों के रूप में प्रकट होता है।

India's FemTech response

भारत की फेमटेक प्रतिक्रिया

- Yet, even as the formal medical renaming to **PMOS** is enforced, India's **FemTech** (female technology) industry had already begun treating **PCOS** as a multisystem condition.
यद्यपि औपचारिक चिकित्सा नाम परिवर्तन के तहत **PMOS** को लागू किया जा रहा है, भारत का **फेमटेक** (महिला प्रौद्योगिकी) उद्योग पहले ही **PCOS** को एक बहु-प्रणालीगत स्थिति के रूप में देखना प्रारंभ कर चुका था।
- A paper published in 2024 by the authors of this article titled, "**Platforming PCOS Treatment Online: FemTech Logics of Care**," showed how **FemTech** platforms curated integrated care packages that brought together general practitioners, diabetologists, endocrinologists, gynaecologists, dermatologists, nutritionists, fitness trainers, and psychologists to treat **PCOS**.
इस लेख के लेखकों द्वारा 2024 में प्रकाशित शोधपत्र "**Platforming PCOS Treatment Online: FemTech Logics of Care**" ने यह दर्शाया कि किस प्रकार **फेमटेक** प्लेटफॉर्म सामान्य चिकित्सकों, मधुमेह विशेषज्ञों, अंतःस्राव विशेषज्ञों, स्त्रीरोग विशेषज्ञों, त्वचा विशेषज्ञों, पोषण विशेषज्ञों, फिटनेस प्रशिक्षकों और मनोवैज्ञानिकों को एक साथ जोड़कर **PCOS** के उपचार हेतु समेकित देखभाल पैकेज तैयार कर रहे थे।
- Several platform founders were themselves women who had struggled to **navigate gynaecological care that centred fertility and weight loss** as the individual responsibility of patients.
कई प्लेटफॉर्म संस्थापक स्वयं ऐसी महिलाएँ थीं जिन्होंने ऐसे स्त्रीरोग उपचार तंत्र का सामना किया था, जो प्रजनन क्षमता और वजन घटाने को रोगियों की व्यक्तिगत जिम्मेदारी के रूप में देखता था।
- Platforms also sought to improve **doctor-patient interactions by training gynaecologists to avoid prejudiced language around marital status, fertility, and body weight**.
इन प्लेटफॉर्मों ने स्त्रीरोग विशेषज्ञों को वैवाहिक स्थिति, प्रजनन क्षमता और शारीरिक वजन के संबंध में पूर्वाग्रहपूर्ण भाषा से बचने का प्रशिक्षण देकर डॉक्टर-रोगी संबंधों को बेहतर बनाने का प्रयास भी किया।
- Since many aspects of **PMOS** management could be coordinated remotely, digital consultations also offered women greater privacy and flexibility in a culture that stigmatises unmarried women visiting gynaecologists unchaperoned.



चूँकि **PMOS** प्रबंधन के अनेक पहलुओं का दूरस्थ समन्वय संभव था, इसलिए डिजिटल परामर्श ने महिलाओं को अधिक गोपनीयता और लचीलापन प्रदान किया, विशेषकर ऐसे सामाजिक परिवेश में जहाँ अविवाहित महिलाओं का अकेले स्त्रीरोग विशेषज्ञ के पास जाना कलंकित माना जाता है।

- **PMOS often first appears through irregular menstrual cycles.**
PMOS प्रायः अनियमित मासिक चक्रों के माध्यम से सबसे पहले प्रकट होता है।
- **The underlying hormonal and metabolic imbalances can remain poorly understood for years delaying treatment.**
इसके अंतर्निहित हार्मोनल और चयापचयी असंतुलन वर्षों तक ठीक से समझ में नहीं आते, जिससे उपचार में देरी होती है।
- **In both families and clinical settings, it is viewed primarily through the lens of fertility and weight loss, generating shame and anxiety around marriage prospects and hostility within marriages itself.**

परिवारों और चिकित्सकीय परिवेश दोनों में इसे मुख्यतः प्रजनन क्षमता और वजन घटाने के दृष्टिकोण से देखा जाता है, जिससे विवाह की संभावनाओं को लेकर शर्म और चिंता उत्पन्न होती है तथा वैवाहिक संबंधों में तनाव पैदा होता है।

Limits of privatised care

निजीकृत स्वास्थ्य सेवा की सीमाएँ

- **First, access to these platforms depends on the ability to afford uninterrupted internet connectivity and recurring subscription costs.**
पहला, इन प्लेटफॉर्मों तक पहुँच निर्बाध इंटरनेट कनेक्टिविटी और नियमित सदस्यता शुल्क वहन करने की क्षमता पर निर्भर करती है।
- **As a result, these services cater disproportionately to urban, digitally savvy women.**
परिणामस्वरूप, ये सेवाएँ मुख्यतः शहरी और डिजिटल रूप से सक्षम महिलाओं तक सीमित रह जाती हैं।
- **Doctor-patient interactions must become more inclusive and respectful to women.**
चिकित्सक-रोगी संवाद महिलाओं के प्रति अधिक समावेशी और सम्मानजनक होना चाहिए।
- **Moreover, discussions around PMOS rarely engage with broader environmental factors such as adulterated food, pollution, chronic stress, and toxins.**
इसके अतिरिक्त, **PMOS** से संबंधित चर्चाएँ प्रायः मिलावटी भोजन, प्रदूषण, दीर्घकालिक तनाव और विषैले तत्वों जैसे व्यापक पर्यावरणीय कारकों को शामिल नहीं करतीं।

GS Paper III: Environment		02 June 2026
TOPICS COVERED		
02J6	Why do cities get polluted in summer? गर्मियों में शहर प्रदूषित क्यों हो जाते हैं?	



Why do cities get polluted in summer?

How is summer air pollution different from that in winter? Why does ozone rise in hot weather? What drives PM10 spikes in Indian cities? How do dust storms affect air quality? How do human activities worsen summer air pollution? What can cities do to combat summer air pollution?

SS III: Environment

EXPLAINER

Mohammad Rafiuddin
Sneha Maria Ignatious

The story so far:

In March, the Commission for Air Quality Management in the National Capital Region and Adjoining Areas (CAQM) revoked all curbs under the Graded Response Action Plan (GRAP), signalling the end of the winter air pollution in Delhi. A month later, as temperatures rose, it reimposed Stage 1 of the GRAP to combat summer air pollution. It was briefly revoked and reimposed again in May, while North India was reeling under heatwaves.

Why are cities witnessing pollution episodes during summer? Delhi and the Indo-Gangetic plain are known for winter smog because low temperatures, low wind speeds, and their basin-like topography trap pollutants close to the ground.

Summer brings stronger winds, occasional thunderstorms that wash out pollutants, and warmer temperatures that allow pollutants to mix higher in the atmosphere. Despite such meteorological favours, Delhi has already witnessed 54 days between 1 April and 31 May 2026 where daily average PM10 levels exceeded the 24-hour National Ambient Air Quality Standard (NAAQS) of 100 µg/m³. At the same time, on 40 days, at least one Continuous Ambient Air Quality Monitoring Station (CAAQMS) in the city recorded a breach in the hourly ozone standard of 180 µg/m³.

Unlike most headlines, this is not the story of Delhi alone. Other large cities like Mumbai, Chennai, Hyderabad, Bengaluru, and Kolkata also recorded pollution spikes in the same period this summer, with PM10 and ozone levels going above the national standards to varying degrees. These spikes were shaped by local sources such as vehicular emissions, road dust, construction activity, industrial emissions, and dust from local storms. Mumbai, for instance, has been recording high PM10 and ozone levels over the last few years due to construction activity, dust, and traffic. While Chennai's PM10 breaches are occasional, its high vehicular density and hot weather also make it an ozone hotspot.

How is summer air pollution different from that in winter?

While winter pollution is dominated by finer PM2.5 particles, summer air pollution is driven by the coarser PM10 and ozone.

Vehicles, industries, waste burning, agricultural residue burning, construction sites, and broken roads remain year-round sources of pollution. Winter adds biomass burning for heating. Summer brings in dust storms that hike PM10 levels, while heat and sunlight catalyse ozone formation.

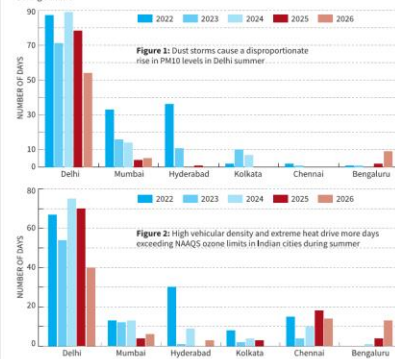
Why does ozone rise in hot weather? Ozone is not emitted directly from a tailpipe or chimney. It forms when nitrogen oxides (NOx), largely from vehicles and volatile organic compounds (VOCs) from industrial emissions, vehicle exhaust, paints, and other sources, react under strong sunlight. Hotter, sunnier days therefore create favourable conditions for ozone formation, which, along with particulate matter, could cause respiratory illnesses.



Summer brings in dust storms that hike PM10 levels, while heat and sunlight catalyse ozone formation. PTI

The urban burden

Dust, heat, and urban emissions continue to drive pollution episodes across Indian cities even during summer



Note: The data for 2026 is from 1 April to 31 May 2026. For other years, the data is from 1 April to 30 June. SOURCE: CEEW ANALYSIS OF CAAQMS DATA

What causes India's PM10 to spike?

Hot conditions over the Indian subcontinent create a low-pressure area that extends towards Iran. Its interaction with surrounding high-pressure areas produces hot, windy conditions. These winds could stir up dust storms, including hot winds called loo, which carry dust from West Asia and the Thar Desert across India towards the Bay of Bengal. Such episodes could elevate PM10 levels for days, as seen during the severe North Indian dust storms of 2018.

The Indian subcontinent also experiences shorter, localised dust storms known as 'andhi' that usually subside within hours. These form when strong downward-moving air associated with thunderstorms hits the ground, lifts loose dust, and carries it at high speed. While loo-type dust storms are common in

North India, cities like Mumbai and Hyderabad generally face dusty episodes due to local thunderstorms.

Human activity worsens this natural dust load. Construction and demolition work often resumes after the more stringent winter GRAP restrictions are lifted. Without adequate site-level dust control, these activities add to PM10 levels. Vehicles moving over broken roads also further resuspend loose, dry dust into the air in the dry summer months.

What can cities do to combat summer air pollution?

While natural sources of dust cannot be controlled, they can be predicted. Delhi's Air Quality Early Warning System (AQEWS) was created in response to severe dust storms in 2018 and smog episodes of the previous years, and now

runs year-round. It has since been extended to other cities such as Jaipur and Mumbai, and provides forecasts of multiple pollutants several days in advance. Its bulletin provides detailed weather information for Delhi and three-day Air Quality Index forecasts for 140 Indian cities.

The India Meteorological Department (IMD) also publishes national weather forecast bulletins several times a day. Authorities should use these systems to issue local alerts on dust storms, ozone, and poor air quality so citizens can reduce exposure.

For controllable non-natural sources, enforcement matters. Construction sites need active dust management even outside winter.

A study by the Council on Energy, Environment and Water (CEEW) found that simply reducing heavy-vehicle movement at construction sites can lower local particulate matter levels. The Brihanmumbai Municipal Corporation (BMC)'s Air Quality Decision Support System (AQDSS), also developed with CEEW, for example, assists in monitoring construction sites. It has already helped authorities take measures against more than 1,000 sites since October 2025 in Mumbai.

Reducing ozone requires cutting NOx and VOC emissions from vehicles and industries through cleaner transport, better compliance, and attention to solvents, paints, and fuel combustion. Even simple behavioural measures, like the 'Red Light On, Gaadi Off' campaign of the Delhi government that urges drivers to switch vehicles off while waiting at junctions to reduce idling emissions, can reduce ozone formation. But Indian cities need more sustained action.

Delhi has had a summer action plan since 2022. Other cities need similar plans that combine forecasting, public health advisories, construction dust control, road dust management, and action on ozone-forming emissions. Summer may disperse some pollutants better than winter, but heat and sunlight create their own pollution chemistry. Indian cities must plan for both seasons, treating them with equal seriousness.

(Mohammad Rafiuddin is Programme Lead and Sneha Maria Ignatious is Programme Associate at the Council on Energy, Environment and Water)

THE GIST

Summer air pollution is driven largely by PM10 and ozone, with several Indian cities recording repeated breaches of national standards.

Dust storms, construction activity, road dust, vehicular emissions and industrial pollution contribute to pollution episodes during the hotter months.

Heat and strong sunlight promote ozone formation, underscoring the need for year-round air quality management rather than a focus on winter smog alone.

02J6. Why do cities get polluted in summer?

गर्मियों में शहर प्रदूषित क्यों हो जाते हैं?

- In March, the **Commission for Air Quality Management in the National Capital Region and Adjoining Areas (CAQM)** revoked all curbs under the **Graded Response Action Plan (GRAP)**, signalling the end of the winter air pollution in **Delhi**.

मार्च में, राष्ट्रीय राजधानी क्षेत्र और आस-पास के क्षेत्रों में वायु गुणवत्ता प्रबंधन आयोग (CAQM) ने ग्रेडेड रिस्पॉन्स एक्शन प्लान (GRAP) के अंतर्गत लगाए गए सभी प्रतिबंध हटा दिए, जिससे दिल्ली में शीतकालीन वायु प्रदूषण के अंत का संकेत मिला।

- A month later, as temperatures rose, it reimposed **Stage 1 of the GRAP to combat summer air pollution**.

एक माह बाद, तापमान बढ़ने के साथ, ग्रीष्मकालीन वायु प्रदूषण से निपटने हेतु GRAP के चरण 1 को पुनः लागू किया गया।



- **Delhi and the Indo-Gangetic plain** are known for winter smog because low temperatures, low wind speeds, and their basin-like topography trap pollutants close to the ground. दिल्ली और इंडो-गंगेटिक मैदान शीतकालीन धुंध के लिए प्रसिद्ध हैं क्योंकि निम्न तापमान, कम पवन गति और उनकी बेसिन जैसी स्थलाकृति प्रदूषकों को भूमि के निकट फँसा देती है।
- **Summer brings stronger winds, occasional thunderstorms that wash out pollutants, and warmer temperatures that allow pollutants to mix higher in the atmosphere.** ग्रीष्म ऋतु में तेज हवाएँ, कभी-कभी आने वाले आंधी-तूफान जो प्रदूषकों को साफ कर देते हैं, तथा अधिक तापमान होता है, जिससे प्रदूषक वायुमंडल में अधिक ऊँचाई तक मिश्रित हो जाते हैं।
- Despite such meteorological favours, Delhi has already witnessed 54 days between 1 April and 31 May 2026 where daily average **PM10** levels exceeded the 24-hour **National Ambient Air Quality Standard (NAAQS)** of 100 ug/m³.
ऐसी अनुकूल मौसमीय परिस्थितियों के बावजूद, दिल्ली में 1 अप्रैल से 31 मई 2026 के बीच 54 दिनों तक दैनिक औसत **PM10** स्तर 24 घंटे के राष्ट्रीय परिवेशी वायु गुणवत्ता मानक (**NAAQS**) 100 ug/m³ से अधिक रहा।
- At the same time, on 40 days, at least one **Continuous Ambient Air Quality Monitoring Station (CAAQMS)** in the city recorded a breach in the hourly ozone standard of 180 ug/m³. इसी अवधि में 40 दिनों तक शहर के कम-से-कम एक सतत परिवेशी वायु गुणवत्ता निगरानी स्टेशन (**CAAQMS**) ने प्रति घंटे के ओजोन मानक 180 ug/m³ के उल्लंघन को दर्ज किया।
- Unlike most headlines, this is not the story of Delhi alone. अधिकांश समाचारों के विपरीत, यह केवल दिल्ली की कहानी नहीं है।
- Other large cities like **Mumbai, Chennai, Hyderabad, Bengaluru, and Kolkata** also recorded pollution spikes in the same period this summer, with **PM10** and ozone levels going above the national standards to varying degrees.
मुंबई, चेन्नई, हैदराबाद, बेंगलुरु और कोलकाता जैसे अन्य बड़े शहरों में भी इसी अवधि के दौरान प्रदूषण स्तर में वृद्धि दर्ज की गई, जहाँ **PM10** और ओजोन स्तर विभिन्न स्तरों पर राष्ट्रीय मानकों से ऊपर पहुँचे।
- These spikes were shaped by local sources such as vehicular emissions, road dust, construction activity, industrial emissions, and dust from local storms.
इन प्रदूषण वृद्धि घटनाओं के पीछे स्थानीय स्रोत जैसे वाहन उत्सर्जन, सड़क की धूल, निर्माण गतिविधियाँ, औद्योगिक उत्सर्जन तथा स्थानीय आंधियों से उत्पन्न धूल जिम्मेदार रहे।
- While winter pollution is dominated by finer **PM2.5** particles, summer air pollution is driven by the coarser **PM10** and ozone.
जहाँ शीतकालीन प्रदूषण मुख्यतः सूक्ष्म **PM2.5** कणों से प्रभावित होता है, वहीं ग्रीष्मकालीन वायु प्रदूषण का प्रमुख कारण अपेक्षाकृत बड़े **PM10** कण और ओजोन होते हैं।
- **Vehicles, industries, waste burning, agricultural residue burning, construction sites, and broken roads remain year-round sources of pollution.**
वाहन, उद्योग, कचरा जलाना, कृषि अवशेषों का दहन, निर्माण स्थल तथा टूटी हुई सड़कें वर्षभर प्रदूषण के स्रोत बने रहते हैं।
- **Winter adds biomass burning for heating.**
शीतकाल में ताप प्राप्त करने हेतु बायोमास जलाना अतिरिक्त प्रदूषण का कारण बनता है।
- **Summer brings in dust storms that hike **PM10** levels, while heat and sunlight catalyse ozone formation.**
ग्रीष्म ऋतु धूल भरी आँधियाँ लेकर आती है, जो **PM10** स्तर को बढ़ाती हैं, जबकि गर्मी और सूर्यप्रकाश ओजोन निर्माण को उत्प्रेरित करते हैं।

Why does ozone rise in hot weather?

गर्म मौसम में ओजोन का स्तर क्यों बढ़ता है?

- **Ozone is not emitted directly from a tailpipe or chimney.**
ओजोन सीधे वाहन के एग्जॉस्ट पाइप या चिमनी से उत्सर्जित नहीं होती है।



- It forms when nitrogen oxides (**NOx**), largely from vehicles and volatile organic compounds (**VOCs**) from industrial emissions, vehicle exhaust, paints, and other sources, react under strong sunlight.
यह तब बनती है जब नाइट्रोजन ऑक्साइड (**NOx**), जो मुख्यतः वाहनों से निकलते हैं, तथा वाष्पशील कार्बनिक यौगिक (**VOCs**), जो औद्योगिक उत्सर्जन, वाहन धुएँ, पेंट और अन्य स्रोतों से उत्पन्न होते हैं, तीव्र सूर्यप्रकाश में परस्पर अभिक्रिया करते हैं।
- Hotter, sunnier days therefore create favourable conditions for ozone formation, which, along with particulate matter, could cause respiratory illnesses.
अतः अधिक गर्म और धूप वाले दिन ओजोन निर्माण के लिए अनुकूल परिस्थितियाँ उत्पन्न करते हैं, जो कणीय पदार्थों के साथ मिलकर श्वसन संबंधी रोग उत्पन्न कर सकते हैं।

What causes India's PM10 to spike?

भारत में PM10 स्तर में वृद्धि का कारण क्या है?

- Hot conditions over the Indian subcontinent create a low-pressure area that extends towards Iran.
भारतीय उपमहाद्वीप के ऊपर की गर्म परिस्थितियाँ एक निम्न दाब क्षेत्र उत्पन्न करती हैं, जो ईरान की ओर विस्तारित होता है।
- Its interaction with surrounding high-pressure areas produces hot, windy conditions.
इसके आसपास के उच्च दाब क्षेत्रों के साथ संपर्क से गर्म और तेज हवाओं वाली परिस्थितियाँ उत्पन्न होती हैं।
- These winds could stir up dust storms, including hot winds called loo, which carry dust from West Asia and the Thar Desert across India towards the Bay of Bengal.
ये हवाएँ धूल भरी आँधियाँ उत्पन्न कर सकती हैं, जिनमें लू नामक गर्म हवाएँ भी शामिल हैं, जो पश्चिम एशिया और थार मरुस्थल की धूल को भारत के पार बंगाल की खाड़ी की ओर ले जाती हैं।
- localised dust storms known as 'andhi' that usually subside within hours forms when strong downward-moving air associated with thunderstorms hits the ground, lifts loose dust, and carries it at high speed.
ये तब बनते हैं जब आंधी-तूफान से जुड़ी तीव्र नीचे की ओर चलने वाली हवा भूमि से टकराती है, ढीली धूल को उठाती है और उसे तेज गति से ले जाती है।

What can cities do to combat summer air pollution?

ग्रीष्मकालीन वायु प्रदूषण से निपटने के लिए शहर क्या कर सकते हैं?

- Delhi's Air Quality Early Warning System (AQEWS) was created in response to severe dust storms in 2018 and smog episodes of the previous years, and now runs year-round.
दिल्ली की वायु गुणवत्ता प्रारंभिक चेतावनी प्रणाली (AQEWS) वर्ष 2018 के गंभीर धूल तूफानों और पूर्ववर्ती वर्षों के धुंध प्रदूषण की घटनाओं के उत्तर में विकसित की गई थी और अब यह पूरे वर्ष कार्य करती है।
- Its bulletin provides detailed weather information for Delhi and three-day Air Quality Index forecasts for 140 Indian cities.
इसका बुलेटिन दिल्ली के लिए विस्तृत मौसम संबंधी जानकारी तथा 140 भारतीय शहरों के लिए तीन-दिवसीय वायु गुणवत्ता सूचकांक पूर्वानुमान प्रदान करता है।
- The India Meteorological Department (IMD) also publishes national weather forecast bulletins several times a day.
भारत मौसम विज्ञान विभाग (IMD) भी प्रतिदिन कई बार राष्ट्रीय मौसम पूर्वानुमान बुलेटिन जारी करता है।
- Authorities should use these systems to issue local alerts on dust storms, ozone, and poor air quality so citizens can reduce exposure.
प्राधिकरणों को इन प्रणालियों का उपयोग धूल तूफान, ओजोन और खराब वायु गुणवत्ता के संबंध में स्थानीय चेतावनी जारी करने हेतु करना चाहिए ताकि नागरिक अपने जोखिम को कम कर सकें।



- Reducing ozone requires cutting **NOx** and **VOC** emissions from vehicles and industries through cleaner transport, better compliance, and attention to solvents, paints, and fuel combustion.
ओजोन स्तर कम करने के लिए वाहनों और उद्योगों से निकलने वाले **NOx** और **VOC** उत्सर्जन में कमी लाना आवश्यक है, जिसके लिए स्वच्छ परिवहन, बेहतर अनुपालन तथा सॉल्वेंट, पेंट और ईंधन दहन पर ध्यान देना होगा।
- Even simple behavioural measures, like the '**Red Light On, Gaadi Off**' campaign of the **Delhi government** that urges drivers to switch vehicles off while waiting at junctions to reduce idling emissions, **can reduce ozone formation**.
यहाँ तक कि सरल व्यवहारिक उपाय, जैसे **दिल्ली सरकार** का 'रेड लाइट ऑन, गाड़ी ऑफ' अभियान, जो चालकों को चौराहों पर प्रतीक्षा के दौरान वाहन बंद रखने के लिए प्रेरित करता है, भी ओजोन निर्माण को कम कर सकते हैं।

GS Paper III: Internal Security		02 June 2026
TOPICS COVERED		
02J6	New chief of Central Air Command takes charge सेंट्रल एयर कमांड के नए प्रमुख ने पदभार संभाला	
02J6	Operation Mule Hunt exposes cyberfraud network; 638 held ऑपरेशन म्यूल हंट ने साइबर धोखाधड़ी नेटवर्क का खुलासा किया; 638 गिरफ्तार	

New chief of Central Air Command takes charge

GS III: Internal Security: Defence
NEW DELHI

Air Marshal Tarun Chaudhry on Monday assumed charge as the Air Officer Commanding-in-Chief (AOC-in-C) of the Indian Air Force's Central Air Command.

Commissioned into the fighter stream of the Indian Air Force in December 1989, Air Marshal Chaudhry is a highly accomplished officer with extensive experience in operational, staff, and diplomatic assignments.

Prior to taking over the Central Air Command, he was serving as the Senior Air Staff Officer at Headquarters, Southern Air Command.

02J6. New chief of Central Air Command takes charge

सेंट्रल एयर कमांड के नए प्रमुख ने पदभार संभाला

- Air Marshal **Tarun Chaudhry** on Monday assumed charge as the **Air Officer Commanding-in-Chief (AOC-in-C)** of the **Indian Air Force's Central Air Command**.
एयर मार्शल तरुण चौधरी ने सोमवार को भारतीय वायु सेना की सेंट्रल एयर कमांड के एयर ऑफिसर कमांडिंग-इन-चीफ (AOC-in-C) के रूप में पदभार ग्रहण किया।

02J6. Operation Mule Hunt exposes cyberfraud network; 638 held

ऑपरेशन म्यूल हंट ने साइबर धोखाधड़ी नेटवर्क का खुलासा किया; 638 गिरफ्तार

- In one of **Gujarat's** largest crackdowns on cybercrime-linked financial networks, the State police have uncovered cyberfraud worth **₹2,289 crore** and taken action against **913 mule bank accounts** during a **special operation aimed at dismantling the financial infrastructure used by cybercriminals**.

गुजरात में साइबर अपराध से जुड़े वित्तीय नेटवर्क पर की गई सबसे बड़ी कार्रवाई में से एक के दौरान राज्य पुलिस ने **₹2,289 करोड़** की साइबर धोखाधड़ी का खुलासा किया और साइबर अपराधियों द्वारा इस्तेमाल किए जा रहे वित्तीय ढांचे को ध्वस्त करने के उद्देश्य से चलाए गए विशेष अभियान में **913 म्यूल बैंक खातों** के खिलाफ कार्रवाई की।

GS III: Internal Security

Operation Mule Hunt exposes cyberfraud network; 638 held

In one of Gujarat's largest crackdowns on cybercrime-linked financial networks, the State police have uncovered cyberfraud worth **₹2,289 crore** and taken action against **913 mule bank accounts** during a special operation aimed at dismantling the financial infrastructure used by cybercriminals. The crackdown, titled **Operation Mule Hunt 1.0**, led to the registration of 565 FIRs and the arrest of 638 accused, according to details shared by the State on Monday. The **drive** was conducted by the Gujarat Police and the Cyber Centre of Excellence under the supervision of Deputy Chief Minister Harsh Sanghavi as part of the government's broader effort to combat cybercrime, officials said.