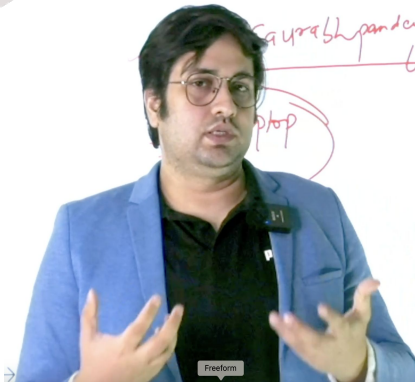
Topics - MINDS MAPS included (Daily current affairs 24th & 23rd Feb 2025

- Panama canal
- Makhana:
- Health Ministry's Regulatory Actions on Unapproved Combination Drugs
- What is Extended Reality?
- First Geological Map:of moon
- Condensed Matter Physics
- Mount Etna:
-



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Topics - MINDS MAPS included (Daily current affairs

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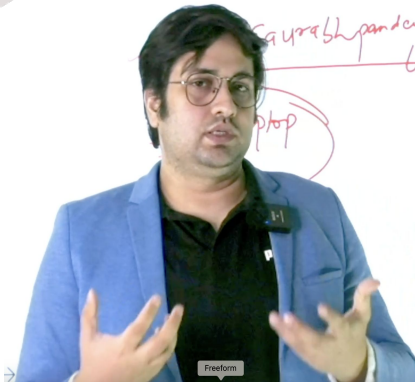
- Ports In News
- Centre vs Tamil Nadu on Three language policy
- India's Clean Energy Landscape
- CAR-T Cell Therapies:



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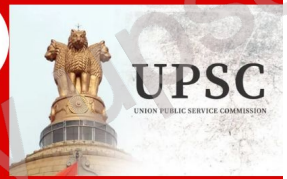

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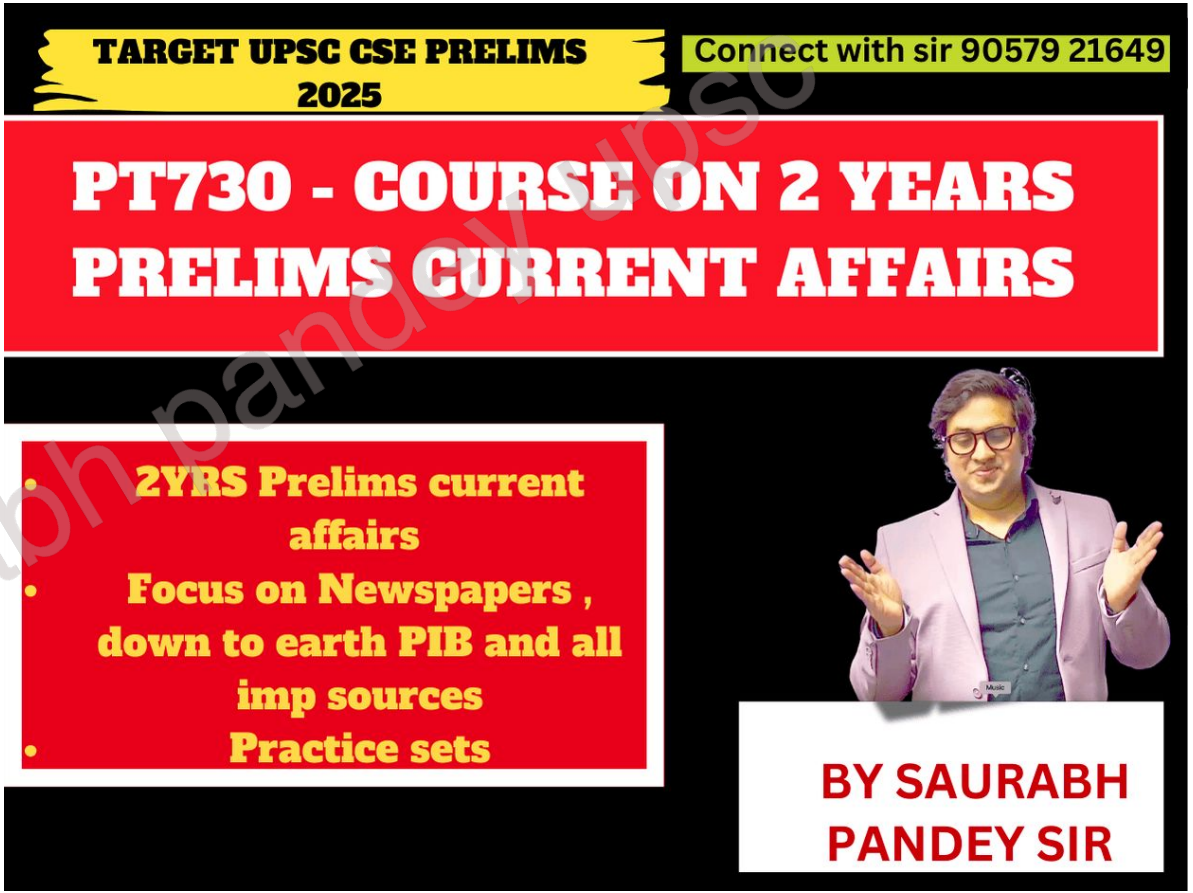

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- Polity . Economy

By saurabh pandey sir

12 Indians reach Delhi days after deportation to Panama by the U.S.

A file photo of the U.S. Air Force aircraft carrying undocumented Indians which arrived in Amritsar on February 5. AFP

Press Trust of India
NEW DELHI

Twelve Indians, deported to Panama by the U.S., returned to India from the Latin American nation on Sunday, officials said.

The deportees arrived at the Indira Gandhi International Airport in New Delhi, marking the first batch of Indians returning from Panama following their deportation by the U.S.

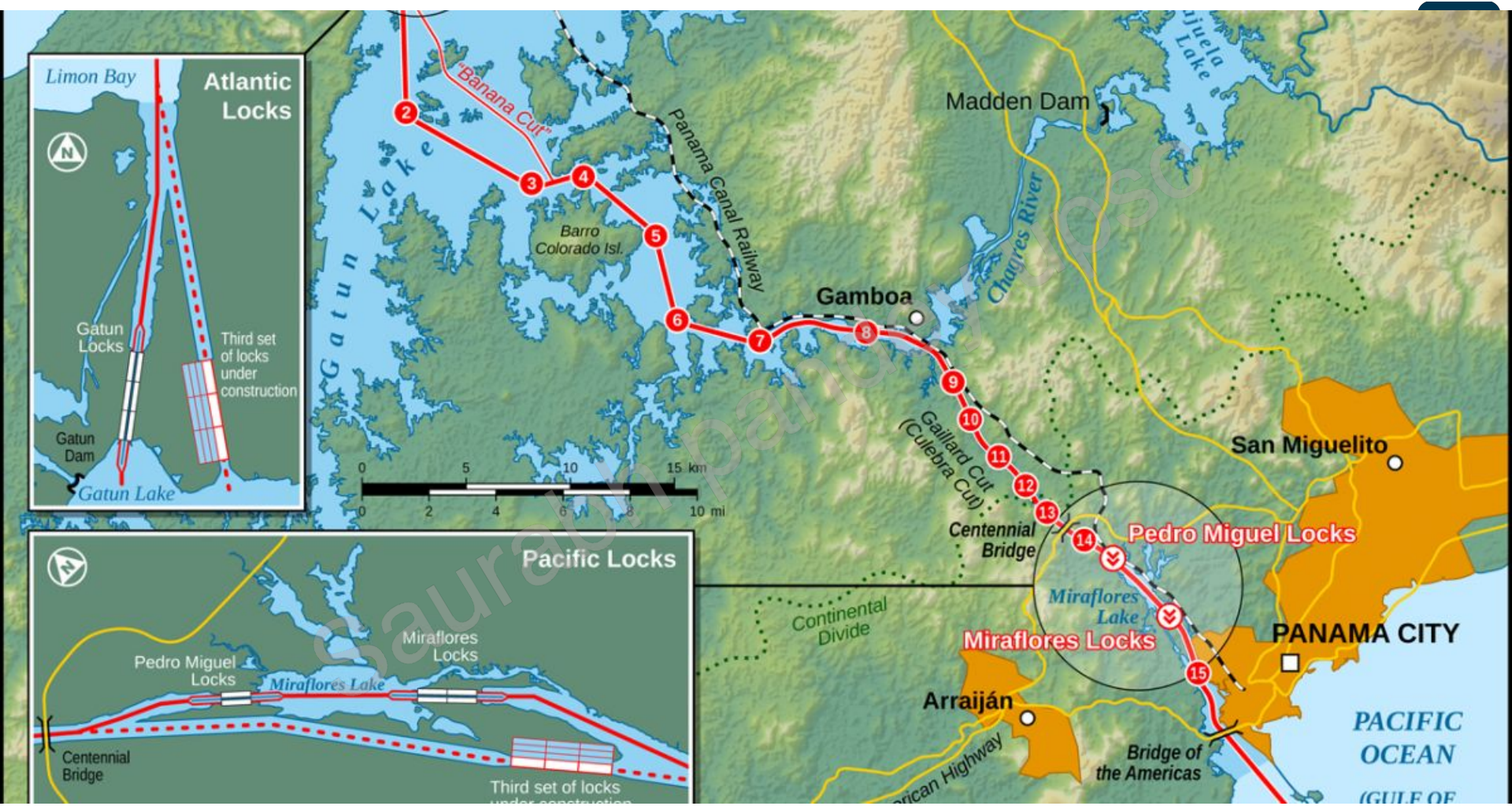
The 12 Indians are learnt to be part of 299 undocumented migrants deported to Panama by the U.S. a few days ago.

The Trump administration has begun a mass deportation programme of foreign nationals living illegally in the U.S..

Over 300 Indians have already been deported to India by the U.S. in three flights this month.

India has been maintaining that it will take back all Indians who have either overstayed in the U.S. or are there without documentation after their nationality is verified. "It is the obligation of all nations to take back their nationals, if they are found to be living illegally abroad," External Affairs Minister S. Jaishankar said in Parliament on February 6.


NEW YORK
SAN FRANCISCO
PANAMA CANAL
Saurabh pandey upsc


Atlantic Locks
Limon Bay
Gatun Locks
Third set of locks under construction
Gatun Dam
Gatun Lake
Pacific Locks
Pedro Miguel Locks
Miraflores Locks
Miraflores Lake
Centennial Bridge
Third set of locks
"Banana Cut"
Panama Canal Railway
Gatun Lake
Barro Colorado Isl.
Madden Dam
Chagres River
Gamboa
Gaillard Cut (Culebra Cut)
Centennial Bridge
San Miguelito
Pedro Miguel Locks
Miraflores Lake
Miraflores Locks
Continental Divide
PANAMA CITY
Arraiján
Bridge of the Americas
PACIFIC OCEAN
0 5 10 15 km
0 2 4 6 8 10 mi

Makhana will take over the world of superfoods in future, says Shivraj Chouhan

Amit Bhelari
PATNA

Days after Finance Minister Nirmala Sitharaman announced the formation of a Makhana Board in Bihar, Union Minister of Agriculture and Farmers' Welfare Shivraj Singh Chouhan on Sunday interacted with makhana producers in Darbhanga district.

He also accompanied farmers to a pond to sow makhana seeds.

Mr. Chouhan said that the Centre was preparing a framework for the Makhana Board by listening to farmers' suggestions and their difficulties.

Along with Bihar Deputy Chief Minister Samrat Choudhary and Darbhanga MP Gopal Jee Thakur, the Union Minister visited a makhana processing unit at the National Research Centre for Makhana.

"One day, makhana will take over the world of superfoods. It has received the blessings of Janaki *Maiya* [Goddess Janaki]. We will provide full cooperation in marketing, branding, and packaging of makhana," Mr. Chouhan said while addressing farmers.

On the ground: Union Minister Shivraj Singh Chouhan visiting a Makhana field in Darbhanga of Bihar on Sunday. ANI

"I bow to the respected Atal Bihari Vajpayee*ji* for establishing the National Makhana Research Centre in Darbhanga. I salute Prime Minister Narendra Modi*ji*, under whose leadership a Makhana Board is being established in Bihar."

Inclusion in schemes

The Union Minister pointed out that his department was considering the inclusion of farmers who cultivated makhana on leased areas in Union government's schemes.

On challenges faced by makhana producers, Mr. Chouhan said, "Makhana is a superfood and a storehouse of nutrition but not easily produced. One can see how much hardship farmers endure to produce makhana. However, thornless makhana seeds and mechanisation will make farming easier."

The Union Minister added, "Makhana Board will go forward in the direction of its value, research, mechanisation, and how the produced crop is sold, while ensuring that Makhana producers get the right price. Efforts will be made to ensure our makhana becomes popular all over the world."

Makhana: The Aquatic Marvel Transforming Health and Agriculture

Introduction

Makhana, often referred to as foxnut, is not just a delicious snack but a powerhouse of nutrients that thrives in tropical wetlands. Known for its numerous health benefits and culinary versatility, this aquatic plant has captured the attention of health enthusiasts and farmers alike. But what makes Makhana so special? Let's dive into the ideal conditions for its cultivation and the myriad uses that make it a rising star in the health food market.

Ideal Growing Conditions

Makhana flourishes in specific environmental conditions that promote its best growth. Understanding these requirements is crucial for successful cultivation.

Temperature: The ideal temperature range for Makhana growth is between 20–[illegible] C. This warmth is essential for optimal development.

Humidity: A relative humidity of 50–90% creates a perfect microclimate for these plants, mimicking their natural habitat.

Rainfall: Makhana thrives with an annual rainfall of 100–250 cm, ensuring that the water level in its growing environment is maintained.

Soil: Smooth, loamy soil is optimal, providing the necessary nutrients and drainage for Makhana roots.

Water Depth: Makhana grows best in stagnant water, typically 1–1.5 meters deep, which should maintain a clarity of at least 50%.

Growing in Different Climates

In cooler regions, greenhouses can be employed to maintain the requisite temperatures and humidity levels. Conversely, in areas with less rainfall, irrigation systems can be implemented to simulate natural conditions, ensuring Makhana continues to thrive.

Cultivation Practices

Makhana is an obligate self-pollinator, which means it doesn't require cross-pollination to set its seeds. Here are the key cultivation practices:

Sowing: Seeds are typically sown in December, taking advantage of the cool months before the heat of summer sets in.

Thinning: Proper thinning of plants is essential to maintain optimal density, allowing sufficient space for each plant to grow.

Flowering and Fruiting: The flowering phase occurs from May to October-November, leading to the production of the seed pods that are harvested for consumption.

Harvesting Techniques

Once the pods mature, they are harvested carefully to avoid damage. Farmers often utilize traditional methods alongside modern techniques, maximizing their yield while preserving the quality of the Makhana.

Uses and Benefits of Makhana

Makhana is not just a tasty snack; it boasts an impressive nutritional profile and myriad applications.

Nutritional Value: Packed with protein, fiber, and essential minerals, Makhana is a beloved choice for health-conscious individuals.
Medicinal Uses: Traditionally used in Ayurvedic medicine, Makhana has properties that may help in managing diabetes, hypertension, and other health issues.
Economic Importance: Makhana farming has become a lucrative venture for many farmers, particularly in regions like Bihar, India, where it contributes significantly to the local economy.

Future Prospects

With increasing global awareness of superfoods, Makhana stands at the forefront of this health revolution, offering vast potential for both culinary innovation and agricultural development.

Health Ministry bans export of drugs containing Tapentadol, Carisoprodol

The Hindu Bureau
NEW DELHI

Following reports about the export of unapproved combination drugs containing Tapentadol and Carisoprodol by Aveo Pharmaceuticals, Mumbai, to certain countries in West Africa, the Health Ministry on Sunday issued a stop activity order and immediate withdrawal of export no-objection certificate (NoC) and manufacturing licences for the combinations.

Tapentadol is an opioid medication that is used to treat moderate to severe pain. Carisoprodol is a muscle relaxant which works on the centres in the brain and spinal cord to relieve pain.

"Both Tapentadol and Carisoprodol are individually approved by the Central Drugs Standard Control Organisation [CDSCO] in India. Tapentadol is approved in 50, 75, and 100 mg tablet forms, as well as 100, 150, and 200 mg extended-release tablets. However, the combination of Tapentadol and Carisoprodol is not approved in India. Neither of these drugs is included in the Narcotic Drugs and Psychotropic Substances (NDPS) list in India," the Health Ministry said.


Tapentadol and Carisoprodol are not part of the NDPS list in India. GETTY IMAGES

In a release issued on Sunday, the Ministry said that to ensure regulatory compliance across the pharmaceutical sector, the CDSCO, in collaboration with State regulators, initiated risk-based inspections of drug manufacturing and testing firms in December 2022. As of now, 905 units have been inspected, resulting in 694 actions being taken. These actions include stop production orders, stop testing orders, licence suspensions/cancellations, warning letters, and show-cause notices, depending on the severity of non-compliance.

Comprehensive audit

Listing the actions taken by the Health Ministry, the release said a joint team from the CDSCO and the State Regulatory Authority conducted a comprehensive audit of Aveo Pharmaceuticals between February 21 and 22. The findings from the audit led to the issuance of a stop activity order, halting all operations at the company's premises.

Following the audit, the investigation team seized all raw materials, in-process materials, and finished products. Approximately 1.3 crore tablets/capsules and 26 batches of APIs (Active Pharmaceutical Ingredients) of Tapentadol and Carisoprodol were seized to prevent further distribution of these potentially dangerous drugs.

The Maharashtra FDA issued a stop production order on Saturday and issued communications to all State Drugs Control Authorities and Zonal Offices to immediately withdraw export NoCs and manufacturing licences granted for any combination of Tapentadol and Carisoprodol.

Health Ministry's Regulatory Actions on Unapproved Combination Drugs

🚫 Export Ban

Action Taken: The Health Ministry has issued a stop activity order.
Details: Export NoCs and manufacturing licenses for unapproved combination drugs containing Tapentadol and Carisoprodol have been withdrawn.

💊 Drug Information

Tapentadol: An opioid used for moderate to severe pain.
Carisoprodol: A muscle relaxant.
Approval Status: Both drugs are approved individually in India, but not in combination.

📜 Regulatory Compliance

Authority: Central Drugs Standard Control Organisation (CDSCO).
Inspections: Conducted risk-based inspections since December 2022.
Actions: Inspected 905 units and took 694 actions against non-compliance.

Audit Findings

Company Audited: Aveo Pharmaceuticals.
Outcome: Issued a stop activity order and seized all raw materials and finished products.

📦 Seizure Details

Seized Items: Approximately 1.3 crore tablets/capsules and 26 batches of APIs of Tapentadol and Carisoprodol.
Purpose: To prevent distribution of these drugs.

🏭 State Actions

Maharashtra FDA: Issued a stop production order.
Communication: Informed all State Drugs Control Authorities to withdraw licenses for the combination drugs.

⚖️ Safety Measures

Objective: Ensure regulatory compliance and prevent the distribution of potentially dangerous drugs.

XR Creator Hackathon throws open opportunities for myriad aspirants

Devesh K. Pandey
NEW DELHI

Solving problems: The challenge saw registration of over 2,200 aspirants, from hobbyists to academicians. SPECIAL ARRANGEMENT

Born with a clubfoot, S. Bala Subramaniyam, 27, a postgraduate from Chennai, was no stranger to mobility challenges and societal biases. Despite holding two Extended Reality (XR) patents, he struggled to find opportunities in the industry. However, the XR Creator Hackathon, organised under the Information and Broadcasting Ministry's "WAVES" initiative, has provided him with a platform to showcase his ideas.

Wavelaps founder Ashutosh Kumar, who is the nodal officer of the hackathon, told *The Hindu*: "Mr. Subramaniyam said the XR industry had been difficult to make an entry as most companies prioritised candidates with conventional tech degrees, making it hard for innovators like him. However, the XR Creator Hackathon provided him with an opportunity to present his ideas. Mr. Subramaniyam said many individuals, due to physical limitations, are unable to travel for work, education, or medical treatment, but XR technology can break these barriers by bringing the world to them".

Mr. Subramaniyam's team, XR Titans, is developing a Virtual Reality solution for enabling remote medical diagnosis and surgery using 3D Magnetic Resonance Imaging (MRI) visualisations. While physiotherapy often is painful, repetitive, and expensive, he is of the view that it can be transformed into an interactive experience using XR-based gaming.

The challenge which was launched in August 2024 saw registration of over 2,200 aspirants – ranging from hobbyists, working professionals, students, freelance professionals, entrepreneurs, and academicians to social workers – from about 250 cities in over 25 States and Union Territories. About 30% of the participants were women.

The XR Creator Hackathon is being organised by Wavelaps in association with the WAVES 2025 initiative of the Ministry. Bharat XR and XDG, two XR communities within India, are co-organisers.With the WAVES grand finale set from May 1 to 5, the top five teams will showcase their innovations. The finalists are exploring various domains for XR/VR applications. Many of them are focusing on "healthcare, fitness, and well-being" for solutions enhancing medical training, mental wellness, and personalised fitness experiences.

What is Extended Reality?

Extended Reality (XR) is an umbrella term encompassing various immersive technologies, including:

Virtual Reality (VR): A fully immersive experience where users are placed in a computer-generated environment.

Augmented Reality (AR): Superimposing digital information onto the real world, enhancing the user's perception of their surroundings.

Mixed Reality (MR): A blend of VR and AR, allowing real and virtual elements to interact in real-time.

Figure 1.1 XR Technologies Overview:

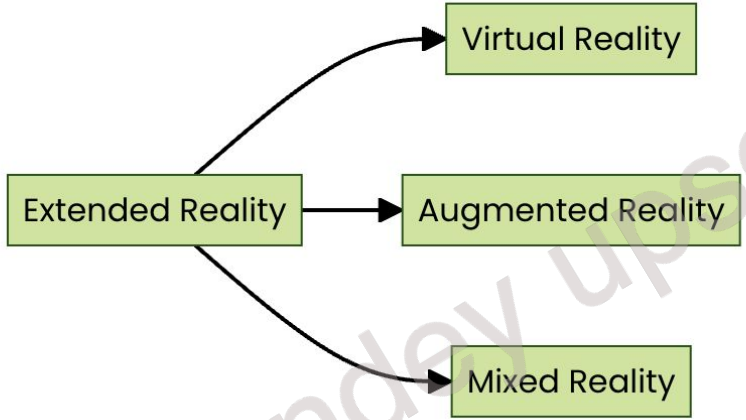


Figure 1.2 XR Industry Applications:

Industry	Application
Healthcare	Virtual surgeries, medical training
Education	Interactive learning experiences
Gaming	Immersive gameplay environments
Real Estate	Virtual property tours
Tourism	Enhanced travel experiences

The Benefits of Extended Reality:

Enhanced Engagement: XR captivates users, making experiences more memorable and interactive.

Improved Training: It offers realistic simulations for training in various fields, such as medicine and aviation.

Cost Efficiency: Businesses can reduce costs by creating virtual prototypes instead of physical ones.

Accessibility: XR can create inclusive experiences for individuals with disabilities.


Virtual Reality
Extended Reality
Mixed Reality

Future of Extended Reality:

With continuous advancements in technology, the future of XR looks promising. Here are some trends to watch:

Integration with AI: Personalized experiences through AI algorithms.

5G Connectivity: Enhanced performance and reduced latency for real-time applications.

Broader Adoption: More industries recognizing the potential of XR for training, marketing, and user engagement

Figure 2.1 Future Trends in XR:

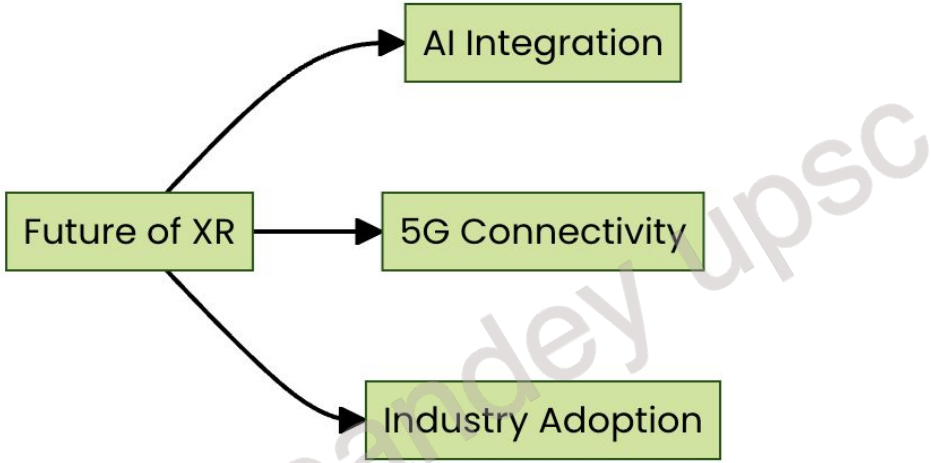


Figure 2.2 XR Market Growth:

Year	Market Size (Billion)
2022	10
2024	20
2026	50

First detailed map of moon's south pole made from Chandrayaan data

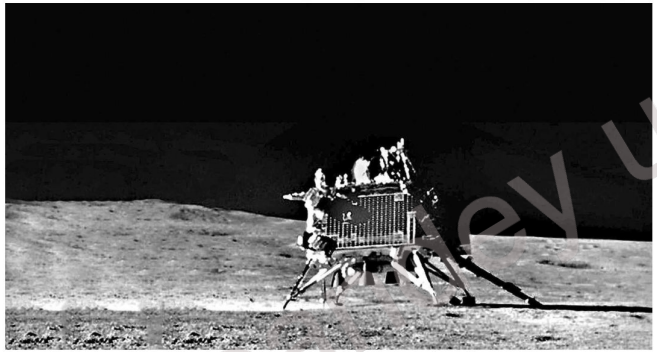
The new map of Vikram's landing site shows an undulating landscape of highlands and low, flat plains around the lander. The researchers traced the alignment of secondary craters and identified Schomberger to be the primary source of debris covering the Chandrayaan-3 landing zone

Prakash Chandra

Astronomers are excited to be poring over the first ever detailed geological map of the moon's south polar region, where India's Chandrayaan-3 lunar module, Vikram, touched down on August 23, 2023.

The map is expected to throw new light on the moon's origin and evolution.

Researchers from the Physical Research Laboratory (PRL) in Ahmedabad, Panjab University in Chandigarh, and the Laboratory for Electro-Optics Systems, Indian Space Research Organisation, Bengaluru, created the map using data from the rover Pragyan, which was deployed by Vikram on a nine-day mission to analyse the chemical composition of the regolith – the loose rock fragments and dust that cover the lunar surface.



An image of the Chandrayaan-3 mission's Vikram lander clicked at about 15 m away by the Pragyan rover's navigation camera. ISRO

Solving the magma mystery

The cornucopia of geological information from the mission has helped scientists confirm what they always suspected: the moon harbours an underground ocean of molten rock, or primordial magma.

Data from previous missions, such as the US uncrewed Surveyor spacecraft, the crewed Apollo moonshots, and the robotic Russian Luna and Chinese Chang'e 3 probes, indicated the presence of such a sea of lava beneath the lunar surface.

But the actual extent of magma on the moon was not known since all the available data came from landing sites near the lunar equatorial and mid-latitude regions, which are far away from the poles.

Chandrayaan-3, however, was the first mission to land in a high-latitude polar region of the moon, 630 km from the south pole, and scientists considered it the best bet to solve the magma mystery. In September 2024, a team of lunar geologists from PRL announced that the Alpha Particle X-ray Spectrometer aboard the Pragyan rover had detected magma under the landing site.'

This meant the ancient ocean of molten lava extended across the entire moon.

The new map of Vikram's landing site, published in the journal *Advances in Space Research* on January 20, shows an undulating landscape of highlands and low, flat plains around the lander.

The researchers traced the alignment of secondary craters – dug up when debris from an impact crater lands elsewhere – and identified Schomberger to be the primary source of the debris covering the Chandrayaan-3 landing zone.

A common origin

Using the map, the scientists calculated the age of the region to be around 3.7 billion years, around the same time the first signs of microbial life emerged on earth.

In fact, earth and the moon have had similar evolutionary trajectories, as is evident in the dynamics of the earth-moon system. The inclination, or tilt, of the moon's orbit is, for example, to the earth's rotation, and both bodies are similarly aligned to the ecliptic plane of the solar system. Their terrestrial and lunar geochemistries are also complementary, with both possessing several common isotopes, pointing to their origins from the same cloud of molten material.

Astronomers believe that some 4.5 billion years ago, when the planets of the solar system were coalescing out of the rubble floating around the sun, the young earth had collided with a massive planetary rock roughly the size of Mars. The resulting debris from the collision was flung outwards explosively before it cooled over millions of years. This proto-planetary material gradually solidified into a molten sphere that was eventually captured by the earth's gravity to become the moon we see today.

In those early millennia, the infant moon must have been pummelled by asteroids and space rocks, as is evidenced by its surface, which is studded with numerous craters. The Vikram lander had touched down close to one of the oldest of these craters: the South Pole-Aitken Basin, which is also one of the largest impact craters in the Solar System.

The moon is a sterile environment in which craters can survive erosion for millenia. These impact basins are important tools for scientists to calculate the age of geological features on other planets with solid surfaces

Lunar craters are of great interest to astrogeologists, who study them to learn more about the evolution of impact craters elsewhere on the earth and on the inner planets of the solar system.

Cratering history

The airless and arid conditions on the moon render it a sterile environment in which craters can survive erosion for millennia.

In fact, lunar impact basins preserve the original records of space-rock crashes that occurred during the formation of the solar system.

Given that lunar craters are important tools for scientists to calculate the age of geological features on other planets with solid surfaces, moon maps like the new one assume greater significance.

Sadly, the lunarscape may not endure undisturbed for very long as efforts to colonise the moon get under way.

Littering the regolith

After the erstwhile Soviet Union's Luna 2 lander became the first probe to 'land' (it was intentionally crash-landed) on the moon way back in 1959, scores of robotic and crewed spacecraft from the U.S., China, India, Israel, Japan, and the European Space Agency have reached the moon's surface. These missions have also left spacecraft components and other waste items behind, littering the regolith.

It is largely unknown how the landers, rovers, and the dozen U.S. astronauts may have disturbed the regolith, which sustains the thin lunar atmosphere. The moon's exosphere was formed when space rocks and the solar wind, the stream of charged particles flowing outwards from the sun, kicked up the powdery dust from the lunar surface.

Scientists also worry about the contamination of lunar ice reserves by exhaust fumes from lunar landers. When a spacecraft touches down on the moon, the water vapour released from its engines spreads across the lunar surface and ends up freezing at the poles. This leads to inaccurate readings for scientists who are studying the presence and the distribution of lunar water ice. These concerns are bound to increase as more and more missions head for the moon and mining for lunar resources eventually becomes a reality.

(Prakash Chandra is a science writer. prakashisat@gmail.com)

THE GIST

- Researchers from the Physical Research Laboratory in Ahmedabad, Panjab University in Chandigarh, and Laboratory for Electro-Optics Systems, Indian Space Research Organisation, Bengaluru, created the map using data from the rover Pragyan
- Using the map, the scientists calculated the age of the region to be around 3.7 billion years, around the same time the first signs of microbial life emerged on earth
- Sadly, the lunarscape may not endure undisturbed for very long as efforts to colonise the moon get underway, accompanied by the risk of lunar littering and the effects on the moon's thin atmosphere

Topic ---> Chandrayaan-3 Mission Insights 🌕

Key Discoveries and Insights

🌕 First Geological Map: Following the successful landing of India's Chandrayaan-3 mission on August 23, 2023, the first detailed geological map of the moon's south polar region was created.

🔍 Magma Discovery: The Pragyan rover's Alpha Particle X-ray Spectrometer confirmed the presence of an underground ocean of primordial magma, extending across the entire moon.

🗺️ Age of the Region: The newly published map reveals that the region around the landing site is approximately 3.7 billion years old, aligning with the emergence of microbial life on Earth.

🌌 Earth-Moon Connection: Geological and chemical similarities between Earth and the moon suggest a shared origin from the same cloud of molten material after a massive collision in the early solar system.

🌑 Impact Craters: The Vikram lander is near the South Pole-Aitken Basin, one of the largest impact craters in the Solar System, offering valuable insights into lunar cratering history and planetary evolution.

🚀 Lunar Pollution: Debris from numerous missions has raised concerns about contamination and its impact on lunar research, particularly regarding water ice reserves.

🌍 Future Missions: As more missions aim to colonize the moon, there are concerns about preserving its geological features and maintaining the accuracy of scientific readings.

Summary

The Chandrayaan-3 mission has provided significant geological insights about the moon, confirming the presence of primordial magma and highlighting the moon's connection to Earth's history. However, it also raises concerns about lunar contamination from ongoing missions.

WHAT IS IT?

Condensed matter: a big piece of physics

Vasudevan Mukunth

Condensed matter physics is one of the largest, most active branches of contemporary physics research. Simply speaking, scientists in this field study the properties and behaviour of solid and liquid matter. Not so simply speaking, scientists here are interested in the behaviour of large collections of particles that are interacting strongly with each other. Such interactions are optional and infrequent in gases.

Because of its size and scope, condensed matter physics has numerous subcategories. For example, the branch of electronic condensed matter is concerned with how electrons behave in solids and liquids. Research on semiconductors would belong here. Likewise, magnetic condensed matter studies different kinds of magnets and magnetism. Soft matter physics studies objects that are easily deformed but not broken, like biological tissue. Nanoscience studies very small objects that can display both classical and quantum properties in the same settings (such work won the Nobel Prize for chemistry in 2023, for example). Superfluidity studies

The three most common phases of matter are visible in this image: the solid earth, the liquid water, and a vaporous mist encircling the waterfall. JOSHUA SORTIN

solids and liquids that flow without resistance, like the electrons in a superconductor. And so on.

Such research has already given us, among other things, modern computing, optical fibres, lasers, nanofabrication, and novel chemical reactions to synthesise new materials.

Of late, researchers have also been exploring quantum condensed matter, where quantum physics processes enable very unusual behaviour not seen in macroscopic solids and liquids. Based on what they learn, they're developing next-generation technologies like novel electronic items and quantum computers.

(mukunth.v@thehindu.co.in)

For feedback and suggestions
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with the subject 'Daily page'

Topic → Condensed Matter Physics: An Overview

Field Overview

🔬 Condensed Matter Physics: A major branch of contemporary physics focused on the properties and behavior of solid and liquid matter.

Particle Interactions

⚛️ Interactions: Studies large collections of particles that interact strongly, unlike gases where interactions are infrequent.

Subcategories

🧪 Electronic Condensed Matter: Involves electrons in solids and liquids.
🧲 Magnetic Condensed Matter: Focuses on magnets and magnetism.
🧬 Soft Matter Physics: Deals with easily deformed materials.

Nanoscience

🌌 Exploration of Small Objects: Examines very small objects exhibiting both classical and quantum properties.
🏆 Achievements: Contributed to significant advancements like the 2023 Nobel Prize in Chemistry.

Superfluidity

💧 Research Focus: Studies solids and liquids that flow without resistance, such as superconductors.

Technological Impact

💻 Innovations: Discoveries have led to modern computing, optical fibers, lasers, and new material synthesis methods.

Quantum Research

🔮 Future Technologies: Current explorations are paving the way for next-generation technologies, including novel electronics and quantum computers.

Summary: Condensed matter physics is a vast field studying the properties of solid and liquid matter, leading to significant technological advancements and new research areas like quantum condensed matter

BIG SHOT

Volcanic steam and ash rise from Mount Etna, Italy, on February 12. Tourists climbing Europe's highest and most active volcano at night in sneakers and light clothing to get a close-up view of an ongoing eruption may be risking their lives, rescuers warned. REUTERS

Mount Etna: A Geological Marvel

Overview

🌋 Mount Etna is an active stratovolcano situated on the east coast of Sicily, Italy.
🇮🇹 It stands as the highest volcano in Europe, reaching approximately 3,329 meters (10,922 feet).

\🌍 Known for its frequent eruptions, it ranks among the most active volcanoes globally.

🏞️ Recognized as a UNESCO World Heritage Site for its geological and ecological importance.

🌱 The area around Mount Etna is abundant in flora and fauna, highlighting its ecological value.

👩‍🔬 A hub for scientific research, it draws both volcanologists and tourists.

🚶 Offers numerous hiking trails and viewpoints, attracting outdoor enthusiasts.

Summary: Mount Etna, Europe's tallest and one of the most active volcanoes, is located in Sicily, Italy, celebrated for its geological and ecological significance

Talent shortage — global challenge, India's opportunity

Jyoti Vij

is Director General, the Federation of Indian Chambers of Commerce and Industry (FICCI)

The demand for skilled workers is set to exceed supply, and India must move quickly to tap the needs in key geographies

The global labour market does not seem to be future-ready. No one has the crystal ball to tell the future exactly, but it can be safely said that the skills needed in 2030 will be quite different from what we have today. This is a challenge for the entire world – and an opportunity for India.

A recent FICCI-KPMG study, 'Global Mobility of Indian Workforce', has estimated that by 2030, the demand for skilled workers will exceed supply, leading to a talent shortage of over 85.2 million people. "This global skills shortage could result in estimated $8.45 trillion in unrealised annual revenue by 2030 – equivalent to the combined GDPs of Germany and Japan," the study says. For India, the challenge, and the opportunity, is to grab as large a slice of the 8.45 trillion pie as soon as possible.

Addressing this challenge requires targeted strategies, international cooperation and proactive policy interventions to optimise workforce mobility and economic productivity. At the national level, the need of the hour is a properly coordinated effort among government, the private sector and other stakeholders.

Geographic regions and their demands

The Gulf Cooperation Council (GCC), Europe (including the United Kingdom) and Australia emerge as three key geographies where workforce mobility will be critical. The talent shortage will neither be uniform across all regions nor follow similar patterns. Each of these regions faces specific workforce demands. However, health care will be a common requirement across all three regions, with aging populations and increasing health-care needs driving demand. In general, services will be prevalent in the three geographies. Manufacturing and construction are pivotal for the GCC and Australia, while Europe, being the oldest post-industrial society, will require more service-sector workers. Besides, there are emerging sectors. As in the study, 'Across all these sectors, there is growing demand towards skills pertaining to automation, AI [Artificial Intelligence], big data, predictive analytics, IoT (internet of things), blockchain, management, resource efficiency and sustainability.'

Existing barriers and strategies

There are several barriers that obstruct the efficient movement of skilled workers across borders. Some of these are regulatory and immigration barriers (complex visa processes and stringent work permit regulations hinder skilled migration) and recruitment malpractices and trafficking (exploitative recruitment practices and human trafficking that pose serious threats to migrant workers' safety and rights). In his recent visit to the United States, Prime Minister Narendra Modi highlighted this menace and underlined the need to fight it. Other obstructions include policy barriers and skill mismatches (many Indian degrees, particularly in medicine, are not recognised everywhere in Europe, leading to underemployment or unemployment of qualified professionals) and language and cultural barriers (integration challenges, including language proficiency and cultural adaptation, affect workforce efficiency and productivity).

The Government of India has initiated various programmes to address the challenges. These include Bilateral Agreements and Free Trade Agreements (FTAs) – India has several agreements with the GCC nations to protect the rights of Indian workers. For instance, the Joint India-United Arab Emirates Vision recognises the importance of skill cooperation between the two nations. Some other notable initiatives are skill development programmes to align workers' skills with global market needs and digital platforms for workforce support, where online recruitment systems are focused on ensuring legal protections for workers and shielding them from fraudsters, particularly in GCC countries.

To capitalise on the global demand for skilled labour, several strategic measures should be prioritised which include sector-specific skill training (workforce training should be aligned with the needs of target geographies and preparation must be made for emerging sectors); regulation of recruitment practices (authorities must implement stricter oversight on recruitment agencies to prevent exploitation and trafficking); recognition of qualifications (international collaborations must focus on mutual recognition of academic and professional qualifications to ease workforce integration); incentivising public-private partnerships (governments at the Centre and in the States should encourage private sector involvement in training programmes and global employment facilitation) and promoting circular migration and mobility (temporary work visas and rotational workforce models can address labour shortages without causing demographic imbalances).

The political climate regarding immigration policies is ever-changing. While Europe may tighten its regulations, Australia remains more open to skilled migration. In the FICCI-KPMG study, the Indian diaspora is the second largest and fastest growing diaspora in Australia.

India's advantage

At any rate, strict immigration policies mainly target illegal migration. India must remain resilient in its efforts to position its skilled workforce globally, undeterred by shifting political rhetoric. A major advantage for Indian workers is the absence of significant hostility towards them, and towards India, in most global markets. Even in countries with growing anti-immigration sentiments, skilled Indian workers continue to find opportunities. However, to maintain and enhance this position, the Indian government must take measures to curb illegal migration. Preventing illegal immigration will not only protect Indian workers from exploitative agents but also enhance India's global reputation as a reliable supplier of skilled labour.

This will also help us realise the dream of becoming Viksit Bharat. The Chairman of the Sixteenth Finance Commission, Arvind Panagariya, recently projected that India's GDP could reach between $6.5 trillion and $9 trillion by 2030. India's ability to move closer to the $9-trillion mark will be directly linked to how much of the estimated $8.45 trillion in unrealised global economic potential it can tap into.

The Global Labour Market: A Future-Ready Challenge for India

Introduction

The global labor market is at a crucial juncture, teetering between the challenges posed by rapid technological advancements and the evolving economic landscape. As the skills we possess today may not serve us tomorrow, it is evident that we face a formidable challenge. Yet, this predicament also represents a golden opportunity for India to step up and fill the emerging gaps in the workforce. 🌍✨

The Skills Gap: What Lies Ahead?

The FICCI-KPMG study, titled *Global Mobility of Indian Workforce*, paints a stark picture of the future labor landscape.

> By 2030, an astounding 85.2 million skilled workers are projected to be missing globally.
> This equates to a plethora of unoccupied positions in various sectors, sending ripples through economies worldwide.

The $8.45 Trillion Opportunity

This talent deficiency could culminate in an unrealized revenue potential of approximately $8.45 trillion annually by the year 2030. To contextualize this figure, it mirrors the combined GDPs of Germany and Japan! For India, this isn't merely a challenge; it’s a chance to secure a substantial stake in this lucrative market. 💰

Geographic Regions and Their Demands

When discussing workforce mobility, three pivotal regions emerge: the Gulf Cooperation Council (GCC), Europe, and Australia.

> Each region presents unique demands for skilled labor, indicating that the talent shortage will not be uniform.

Common Healthcare Needs

Across these territories, a consistent demand for healthcare professionals is evident. With aging demographics and escalating healthcare requirements, skilled workers in this sector will be paramount.

Sector-Specific Demands

> GCC and Australia: Need for skilled workers in manufacturing and construction.
> Europe: A greater emphasis on service-sector professionals.
> Emerging sectors like automation, AI, big data, and sustainability are poised for exponential growth, necessitating a workforce that is adept in these fields. 🚀

Existing Barriers to Workforce Mobility

Despite the burgeoning opportunities, several barriers impede the seamless movement of skilled professionals across borders.

Regulatory and Immigration Barriers

Navigating complex visa processes and stringent work permit regulations can be quite daunting for aspiring migrants.

Recruitment Malpractices and Trafficking

The darker aspects of recruitment, such as exploitative practices and human trafficking, pose significant threats to migrant workers' rights and safety. Recent remarks by Prime Minister Narendra Modi underscore the urgency of combatting these issues.

Policy Barriers and Skill Mismatches

Many Indian qualifications, particularly in fields like medicine, face recognition challenges in various European countries, leading to underemployment or unemployment for qualified professionals.

Language and Cultural Barriers

Integration challenges stemming from language and cultural differences can hinder workforce productivity, making it crucial for skilled workers to adapt effectively. 🌐

Government Initiatives to Address Challenges

The Indian government is cognizant of these issues and has initiated several programs to tackle them.

Bilateral Agreements and FTAs

> Establishing bilateral agreements and Free Trade Agreements (FTAs) with GCC nations to safeguard Indian workers' rights is a significant step in the right direction.

Skill Development Programs

> These programs aim to align workers' skills with global market requirements, ensuring that they remain competitive in the international arena.

Digital Platforms for Workforce Support

Development of digital platforms is underway to bolster legal protections for workers, particularly in GCC nations.

Strategic Measures for Capitalizing on Global Demand

To tap into the burgeoning global demand for skilled labor, India must prioritize strategic initiatives.

Sector-Specific Skill Training

Aligning workforce training with the needs of target geographies is crucial. This includes preparing for emerging sectors that require specialized knowledge.

Regulation of Recruitment Practices

Implementing stricter oversight on recruitment agencies is essential to eradicate exploitation and trafficking.

Recognition of Qualifications

Fostering international collaborations aimed at mutual recognition of academic and professional qualifications will facilitate smoother workforce integration.

Promoting Circular Migration

Encouraging circular migration through temporary work visas and rotational workforce models can help address labor shortages without causing long-term demographic imbalances. 🌍

The Political Climate and Its Impact

The political landscape surrounding immigration policies is in constant flux.

Immigration Policies in Key Regions

While Europe may tighten its regulations, Australia continues to maintain a more open stance towards skilled migration, creating a contrasting backdrop for Indian workers seeking opportunities abroad.

India's Advantage in the Global Market

Despite the challenges, India possesses significant advantages in the global labor market.

Resilience Against Political Rhetoric

> Generally, there is no substantial hostility toward Indian workers in most global markets. Even amidst rising anti-immigration sentiments, skilled Indian professionals continue to discover opportunities abroad.

Curbing Illegal Migration

> To maintain this favorable position, the Indian government must take proactive measures to curb illegal migration. This will not only safeguard Indian workers from exploitative agents but also bolster India’s reputation as a reliable source of skilled labor. 🔍

Conclusion

While the global labor market may appear unprepared for the future, it offers India a unique opportunity to step into the breach. By addressing the challenges head-on and implementing strategic measures, India can position itself as a pivotal player in the global workforce arena. The aspiration of becoming Viksit Bharat is within reach, and the time to seize this moment is now! 🚀💪

Why VOC port needs an outer harbour

The growing size of container ships in the past five years warrants an outer harbour, as the VOC port in Thoothukudi can handle only half this size; mere modernisation of the inner harbour and optimisation of existing berths cannot equip the port to handle large vessels, it is said

NEWS ANALYSIS

TE Raja Simhan

Transshipment hub: Once equipped to handle large vessels, this strategically located port is seen as a worthy rival to Colombo. FILE PHOTO

The ₹7,056-crore outer harbour development project at VOC port, in Thoothukudi, is being revived two decades after it was was initiated without much success. After the first tender for the project evoked poor response, the port authority re-tendered, which saw large companies like Adani Ports, DP World and Vedanta Group participating in the pre-bid meeting. It would be interesting to see who finally bid.

But, first, why does the port need an outer harbour?

The main reason is the growing size of container ships in the past five years — lengths extending beyond 400 m and carrying capacity of nearly 22,000 twenty foot equivalent units (TEUs) — whereas VOC port can handle only half this size.

Mere modernisation of the inner harbour and optimisation of existing berths cannot equip the port to handle the large vessels. An outer harbour is needed to meet future demand, says the detailed project report.

In line with the Centre's Sagarmala scheme, VOC port intends to handle 14,000-TEU Neo Panamax and other larger container vessels, leveraging its proximity to the international sea route.

According to Drewry Maritime Advisers, in two decades VOC port's container traffic will grow to 2.8-4.3 million TEU from 0.74 million TEU in 2023-24. The port can also convert from feeder to mainline to attract more cargo, including cargo that is currently transshipped at Colombo and other Asian ports, the DPR document says.

> The cost and time saving promised by the outer harbour project can make exports competitive and save the country precious foreign exchange as well
>
> **EDWIN SAMUEL,** founder and CEO of Thoothukudi-based Pearl Shipping

Mounting delays

The planned development of a transshipment hub in Kanyakumari has been delayed due to various reasons, the document says. To be able to handle fully laden Neo Panamax vessels in the inner harbour, VOC port has decided to increase vessel draught from 14.2 m to 15.5 m.

Over the past decade, the outer harbour project was deferred to optimise the inner harbour capacity and develop a new transshipment port at Enayam/Kanyakumari. But even the inner harbour works have not commenced due to the revised dredging policy/rate.

Moreover, as Jagannarayan Padmanabhan, Senior Director at CRISIL, pointed out, the backup area in the inner harbour is not enough for a container yard.

Sri Lanka factor

In Sri Lanka, the ongoing economic crisis has hit port operations in Colombo. With timely development of infrastructure to handle large mainline vessels, VOC port could have benefited, an industry source said.

Armed with deep draughted berths, it can not only handle the largest vessels plying in international routes but also serve as a transshipment hub, the DPR document said.

Phase two of the outer harbour project is expected to enable the handling of vessels that require draft up to 18 m.

VOC port stakeholders point out that the paucity of infrastructure needed to handle mainline vessels of 18,000 TEUs is keeping them away. Their demands include an outer harbour capable of handling 18-m draught vessels and a quay length of 1,000 m at minimum.

Forex savings

Nearly 65% containers from Thoothukudi are transshipped at Colombo, an all-weather port with 24x7x365 operations.

Edwin Samuel, founder and CEO of Thoothukudi-based Pearl Shipping, said that local exporters and importers pay about $150 per TEU as transshipment cost and face a week-long transit time.

Thoothukudi, with its locational advantage at the southern tip of the peninsula, can be developed as an alternative to Colombo, he said. The cost and time saving promised by the outer harbour project can make exports competitive and save the country precious foreign exchange as well, he added.

Several new industries have come up in the port's vicinity, including Tata Solar and Vikram Solar in Gangaikondan SEZ, Yinfast and furniture park in Thoothukudi, and the rocket launchpad at Kulasekarapattinam.

These will create additional cargo volumes, calling for expansion of the port's infrastructure, said Mr. Samuel, who is also president of the Association for Tuticorin Hub Port Development.

The association had engaged consultants PwC in 2005 to produce a feasibility report on developing Thoothukudi as a transshipment hub port. In 2013, the then Union finance minister P. Chidambaram announced the first phase of the project at an outlay of ₹7,000 crore; Arun Jaitley had, in the 2014 budget, increased the outlay to ₹11,000 crore.

"Unfortunately, the project was put on the back burner for various reasons and we lost more than a decade," Mr. Samuel said.

(The writer is with The Hindu businessline)

Hub in the making: Vizhinjam port vies for global stature

V. Sajeev Kumar

Plans afoot: In the second phase of expansion, Vizhinjam aims to double connectivity and handle more non-liquid cargo. FILE PHOTO

The deepwater Vizhinjam International Seaport in Kerala is in the spotlight, as industry leaders and policymakers envision it as a premier logistics and transshipment hub driving the State's economic transformation.

At the recently concluded Vizhinjam Conclave 2025, senior officials from Adani Ports & SEZ and the Kerala government laid out a roadmap to position the port as a cornerstone of India's maritime trade.

With a natural depth of 18-20 m and proximity to international shipping routes, Vizhinjam is equipped to handle large mother vessels, a critical factor in transshipment efficiency. The port has handled 144 ships and 2.9 lakh containers within six months of the arrival of the first cargo ship in July 2024.

The Adani Group announced its plan to develop a special economic zone at Vizhinjam, on the lines of Mundra Port in Gujarat.

Harikrishnan Sundaram, Head of Container Business at Adani Ports SEZ, said, "Mundra generates ₹32,000 crore tax revenue annually and has fostered the growth of over 50 large industries, creating employment for 1.5 lakh people. A similar approach at Vizhinjam can unlock Kerala's industrial potential."

The proposed SEZ will integrate logistics hubs, warehouses, and industrial clusters, positioning Vizhinjam as a multimodal trade gateway. Leveraging its connectivity to Trivandrum International Airport and Kerala's spice and seafood belts, the SEZ is expected to help step up exports and attract global businesses.

Beyond cargo handling, Adani Ports CEO Pranav Choudhary emphasises Vizhinjam's development as a sea-air transshipment hub. Vizhinjam's strategic location – linking Shanghai, Busan, and Rotterdam with key Indian ports such as Mundra and Kandla – gives Kerala a unique edge in global logistics, he said.

To bolster capabilities, Adani Group is investing ₹1,300 crore in a new terminal at Trivandrum International Airport, scheduled for completion within three years. The expanded cargo terminal, capable of handling 2,500 tonnes, is expected to strengthen Kerala's export industries, including textiles and food processing.

The phased expansion of Vizhinjam, set to be completed by 2028, will increase its annual handling capacity to 4.5 million TEUs. The project also aligns with Kerala's focus on 22 priority industries across five key sectors – defence, space manufacturing, electronics, pharmaceuticals, and medical device manufacturing.

Kerala Ports Minister V.N. Vasavan announced that a 10-km rail tunnel from Balaramapuram to Vizhinjam Port will be completed within four years for rail freight movement. Additionally, road connectivity to National Highway 66 is expected to be finalised within two years to boost hinterland access.

"The expansion of Vizhinjam Port, along with the introduction of passenger cargo facilities, will position Kerala as a maritime leader in South Asia," the Minister stated.

In the second phase of expansion, Vizhinjam aims to double its connectivity routes and handle more non-liquid cargo.

On Vizhinjam's future growth trajectory, Mr. Choudhary stated, "No Indian port has handled one million TEUs in its first year. We are on track to achieving this milestone, further solidifying Vizhinjam's status as one of the fastest-growing ports in South Asia."

(The writer is with The Hindu businessline)

Ports In News

- **V. O. Chidambaranar Port is a port in Thoothukudi, Tamil Nadu, and is one of the 13 major ports in India. It was declared to be a major port on 11 July 1974. It is the second largest port in Tamil Nadu and third largest container terminal in India. V.O. Chidambaranar Port is an artificial port.**
- The **Vizhinjam International Seaport Thiruvananthapuram** → also known as **Trivandrum Port** is India's first deep water container transshipment port, located in Thiruvananthapuram, the capital city of Kerala. The port is designed to be a multi-purpose, all-weather, green port located around 20 kilometres (12 mi) away from the Thiruvananthapuram International Airport. It is India's first automated port and holds a unique position as the only Indian port directly adjacent to an international shipping lane.

Why is three-language policy controversial?

Why has the Centre withheld funds to Tamil Nadu under the Samagra Shiksha programme? When did the State adopt a two-language policy? What is its stand on mandatory imposition of Hindi? What is the central government's view? How can the issue be resolved?

D. Suresh Kumar

The story so far:

The Union Government has withheld ₹2,152 crore in funds due to Tamil Nadu under the Samagra Shiksha scheme for refusing to join the Prime Minister Schools for Rising India (PMSHRI) initiative. While T.N. is eager to participate in the PM SHRI scheme, it staunchly opposes the accompanying mandate to implement the National Education Policy (NEP) 2020. One of the State's core objections to the NEP is its insistence on adopting a three-language formula in schools. Union Education Minister Dharmendra Pradhan has rejected any concessions, insisting that T.N. must align "with the Constitution". Chief Minister M.K. Stalin, questioning which provision of the Constitution justifies such mandates, has declared that the State will not submit to "blackmail" or abandon its historically adopted two-language policy.

What does the NEP 2020 state?

The NEP 2020 has retained the three-language formula, a concept first introduced in the NEP of 1968. The key difference, however, is that back then the NEP advocated for Hindi to be a compulsory language across the nation.

Not backing down: Deputy Chief Minister Udhayanidhi Stalin and his allies protest against NEP's three-language policy in Chennai on February 18. R. RAGU

Tamil Nadu, with its long-standing two-language policy, has consistently outperformed many other States in key education metrics

Hindi-speaking States were required to teach Hindi, English, and a modern Indian language – preferably a south Indian language – while non-Hindi speaking States were expected to teach the local regional language, Hindi, and English. In contrast, NEP 2020 offers greater flexibility, technically not imposing any specific language on any State. It states that "the three languages learned by children will be the choices of States, regions, and, of course, the students themselves, so long as at least two of the three languages are native to India." This means, in addition to the State's language, children would be required to learn at least one other Indian language – not necessarily Hindi. The policy also emphasises bilingual teaching, particularly in the home language/mother tongue and English. Conspicuously, it places significant emphasis on Sanskrit as an optional choice within the three-language formula.

Why is there opposition to this policy in T.N.?

Tamil Nadu has long resisted the 'imposition of Hindi'. In 1937, when the C. Rajagopalachari (Rajaji) government in Madras proposed making Hindi a compulsory subject in secondary schools, the Justice Party fiercely opposed it. Two young men, Thalamuthu and Natarajan, who participated in the agitation, died and became icons in the anti-Hindi imposition movement. Rajaji eventually resigned, and the British government withdrew the order. In 1965, as the deadline for adopting Hindi as the sole official language across India approached, the State witnessed violent protests that led to the deaths of at least 70 people in police shootings or self-immolations. The agitation resurfaced when Parliament adopted the Official Languages (Amendment) Act, 1967, and the Official Language Resolution, 1968, which mandated the teaching of Hindi as part of the three-language formula. In January 1968, the Madras Assembly, led by the C.N. Annadurai-led first Dravida Munnetra Kazhagam (DMK) government, adopted a resolution calling for the scrapping of the three-language formula and the elimination of Hindi from the curriculum in T.N. schools. Since then, the State has steadfastly followed its two-language policy teaching Tamil and English. Major political parties, including the ruling DMK and the principal opposition All-India Anna Dravida Munnetra Kazhagam (AIADMK), have consistently opposed any efforts to alter this policy. In 2019, backlash led the Kasturirangan Committee to remove the mandatory Hindi learning clause from the draft NEP.

Why is the three-language policy seen as an attempt to impose Hindi?

Political parties and activists in T.N. view the three-language policy as a "smokescreen" and a "backdoor" attempt to impose Hindi. They argue that, in practice, the implementation of a three-language scheme would inevitably lead to the teaching of Hindi, given the limited resources for providing additional language teachers and learning materials. Moreover, the Union Government and prominent BJP leaders have periodically advocated for the promotion of Hindi. In 2019, the Union Budget allocated ₹50 crore to support the appointment of Hindi teachers in non-Hindi speaking States. Critics contend the Centre's actions do not match its rhetoric on promoting regional languages, as evidenced by the lack of efforts to hire adequate regional language teachers in Kendriya Vidyalayas or to ensure south Indian languages are taught in schools above the Vindhyas.

Mr. Pradhan has defended the withholding of funds to T.N., making it clear that adherence to the three-language policy is non-negotiable. He urged Mr. Stalin to "rise above political differences" and criticised the State for viewing the NEP 2020 with a "myopic vision". In response, Mr. Stalin has accused Mr. Pradhan of attempting to "impose Hindi" under the guise of the NEP's policy. Mr. Stalin has vowed that, as long as the DMK and he are around, Tamil and T.N.'s interests will not be compromised.

What is the way forward?

The only viable solution lies in constructive dialogue and a practical compromise between the Centre and the State on an issue like education, which was transferred from the State to the concurrent list during the Emergency. Notably, T.N., with its long-standing two-language policy, has consistently outperformed many other States in key metrics such as Gross Enrolment Ratio and reduced school dropout rates. Disagreements over teaching a third language should not be allowed to derail funding for Samagra Shiksha, a comprehensive programme for education.

Topic - Centre vs Tamil Nadu on Three language policy

The Tamil Nadu government is currently embroiled in a funding crisis, with the Union Government withholding ₹2,152 crore under the Samagra Shiksha scheme. This financial impasse arises from Tamil Nadu's refusal to adopt the three-language policy mandated in the National Education Policy (NEP) 2020. As tensions mount, the implications for students, educators, and the overall education system in the state are becoming increasingly critical.

Understanding the NEP 2020 and Its Three-Language Policy

The NEP 2020's language policy aims to foster multilingualism and cultural diversity in education. While it retains the three-language formula, it allows states flexibility in choosing languages. Importantly, it states:

- States can select languages that resonate with regional demographics.
- At least two languages must be native to India.
- The policy encourages bilingual education, emphasizing the mother tongue and English.

The flexibility of the NEP contrasts with previous mandates, potentially alleviating fears of imposing Hindi across the nation.

Historical Resistance to Hindi in Tamil Nadu

Tamil Nadu's resistance to Hindi is deeply rooted in its history. The opposition began in 1937, when the then-government attempted to make Hindi a compulsory subject. This led to significant protests and even fatalities. The most notable events include:

1937 Protests: Opposition led by the Justice Party against the imposition of Hindi.
1965 Agitation: Violent protests erupted when Hindi was deemed the sole official language.
1968 Resolution: Tamil Nadu's assembly adopted a resolution to eliminate Hindi from the curriculum.

In light of these events, the state has maintained its commitment to a two-language policy—Tamil and English.

Current Political Dynamics and Future Implications

The political landscape surrounding this issue is fraught with contention. Union Education Minister Dharmendra Pradhan has asserted that adherence to the three-language policy is non-negotiable. His statements have been met with fierce rebuttals from Chief Minister M.K. Stalin, who argues that Tamil Nadu will not yield to what he describes as "blackmail." Recent developments include:

Funding Withheld: The Union Government's decision to withhold significant funds from Tamil Nadu.

Political Maneuvering: Responses from both BJP leaders and the DMK, emphasizing the need for a dialogue that respects Tamil Nadu’s linguistic heritage.

The Way Forward: Dialogue and Compromise

The resolution of this crisis hinges on constructive dialogue between the Central and State governments. Both parties must strive for compromise, ensuring that the educational needs of Tamil Nadu's students are met without compromising the state's linguistic identity. Notably, Tamil Nadu's education system has historically outperformed many others, showcasing the effectiveness of its two-language policy.

Constructive Engagement: Encouraging discussions that consider the unique linguistic landscape of Tamil Nadu.

Educational Outcomes: Focusing on maintaining high enrollment ratios and reducing dropout rates, which could be jeopardized by funding cuts.

How glacier ice algae accelerate Greenland ice sheet melting

The Hindu Bureau

A new study reveals that dark-pigmented microalgae, which contribute to the melting of the Greenland ice sheet, are highly efficient at nutrient uptake and growth, allowing them to rapidly colonise expanding areas of exposed ice. The findings suggest that these algae can persist and spread without the need for additional nutrient inputs, intensifying ice sheet darkening and accelerating melt rates. The results were published in the journal *Nature Communications*.

They utilised cutting-edge single-cell imaging techniques to examine the carbon, nitrogen, and phosphorus content of glacier ice algae. By measuring their nutrient assimilation rates, the study found that these algae store phosphorus internally and maintain exceptionally high carbon-to-nutrient ratios, indicating a survival strategy finely tuned to nutrient-poor glacier environments.

'Crucial insights'

"Our study provides crucial insights into how glacier ice algae sustain themselves in such extreme conditions," Dr James Bradley from the Queen Mary University of London and a co-author of the paper said in a release. "They don't require large amounts of external nutrients to grow, which means that as the ice sheet continues to melt and expose more bare ice, these algae are well-positioned to expand their coverage. This is particularly concerning because their dark pigmentation lowers the ice's reflectivity, increasing heat absorption and accelerating melting and therefore sea-level rise."

The melting of the Greenland Ice Sheet is the single largest contributor of freshwater to global sea-level rise. Previous research has shown that algal blooms on the ice sheet's western margin can enhance melt rates by 10 to 13%. However, the factors controlling algal growth have remained unclear. This new study highlights how these resilient microorganisms can optimise their nutrient intake, ensuring their survival and expansion despite the nutrient-poor conditions of the ice sheet.

By revealing the self-sufficiency of these algae, the study underscores the urgent need to incorporate biological processes into climate models predicting ice sheet melt.

Greenland Ice Sheet and Microalgae Impact

Overview of Microalgae on Greenland Ice Sheet

🌊 Dark-pigmented microalgae: Efficient in nutrient uptake and growth, these microorganisms are linked to the melting of the Greenland ice sheet.

❄️ Rapid colonization: Capable of quickly spreading across newly exposed ice areas, contributing to ice sheet darkening without needing additional nutrients.

📊 Nutrient assimilation: Advanced imaging techniques reveal the carbon, nitrogen, and phosphorus content of glacier ice algae, highlighting their nutrient storage capabilities.

🔬 Survival strategy: High carbon-to-nutrient ratios enable algae to thrive in nutrient-poor glacier environments.

📉 Impact on melting: Dark pigmentation reduces ice reflectivity, increasing heat absorption and accelerating melting, contributing to sea-level rise.

🌍 Significant contributor: Algal blooms enhance melt rates by 10-13%, making the Greenland Ice Sheet the largest source of freshwater contributing to global sea-level rise.

📈 Need for biological models: Emphasizes the importance of including biological processes in climate models for better understanding and prediction.

Summary: A study reveals that dark-pigmented microalgae efficiently thrive in nutrient-poor conditions on the Greenland ice sheet, accelerating melting and sea-level rise

Powering a sustainable future

SPEAKING OF SCIENCE

D. Balasubramanian

Generating electricity by burning coal leads to considerable air pollution, which affects human and animal health. Recently, Dr Kirat Singh and colleagues from Stanford Doerr School of Sustainability, the U.S. have shown that in India nitrogen dioxide and ozone emissions from coal-fired power plants diminish yields of staple crops like wheat and rice. Using quantitative methods, they estimate that annual losses are in excess of 10% in parts of India. This works out to a loss of about six years' worth of growth in average yield in recent years. The productivity of our crops has risen due to improved varieties, better irrigation and mechanisation, and this reduction in

Wheat is largely grown in the central and northern states, while rice is mainly produced in southern and eastern states. The amount of coal left in these areas is estimated by the Ministry of Coal to last for the next 120 years. Coal-fired power generation has been used for India's electricity supply since its introduction in 1920 at Hussain Sagar, Hyderabad, under the Nizam's rule, using British equipment. This method is still being used in India, with some improvement over the years. We thus need to think of other methods to generate electricity.

Cleaner methods

One method is from the 'ground to the wind'. This involves the use of wind power by placing windmills to generate electricity. Nine windy States of India generate as much as 50 Gigawatts (GW) of electricity. India is the fourth largest wind power maker in the world. Several private

On top: The top five dams in India together generate 50 GW of hydroelectricity.

windmills that produce electricity for urban and rural Indians.

The second method is 'Sun to the land', which uses energy from sunlight. This involves setting up solar panels on houses and buildings or on large-scale solar farms. These panels absorb sunlight and convert light into electricity. These solar roofs are already very popular, and the

ments offer subsidies to those who install solar panels.

The third method is 'Block a river and generate power'. This involves stopping a part of a river to make electricity, besides offering water for agriculture in areas where the river flows. When a river's water is blocked by a dam and then released, the resultant energy is used to gen-

top five dams across India together generate as much as 50 GWs (Gigawatts) of hydroelectric energy.

The fourth one is when a river flows into the sea. A review paper published in *Nano Research Energy* discusses how electrical energy can be produced when river waters flow into sea water, which is saltier. This osmotic pressure difference has

faei at the Centre for Clean Engineering Technology, University of Sydney, Australia. Likewise, engineers at Penn State, U.S. have generated electricity osmotic pressure differences. India has a vast coastline of 7,500 km, where rivers from the west, south and east drain into the sea, and this technology can effectively generate electricity. Here is an opportunity for Indian scientists and technologists to rise to the challenge.

And the fifth method is to use nuclear reactors for peaceful purposes and generate electricity. Nuclear power plants use nuclear fission to heat water, create steam, and spin turbines to generate electricity.

The set of eight nuclear power plants in India together generate 3.5 GW of electricity.

Given all these, let us give up coal to generate electricity, which pollutes

Topic → India's Clean Energy Landscape 🌍

Overview of India's Renewable Energy Sources

Wind Power 🌬️: India ranks as the fourth largest producer globally, generating 50 GW of electricity. Private companies play a significant role in supplying both urban and rural areas.

Solar Energy ☀️: The 'Sun to the land' initiative involves solar panels on buildings and farms, converting sunlight into electricity. Government subsidies support these installations.

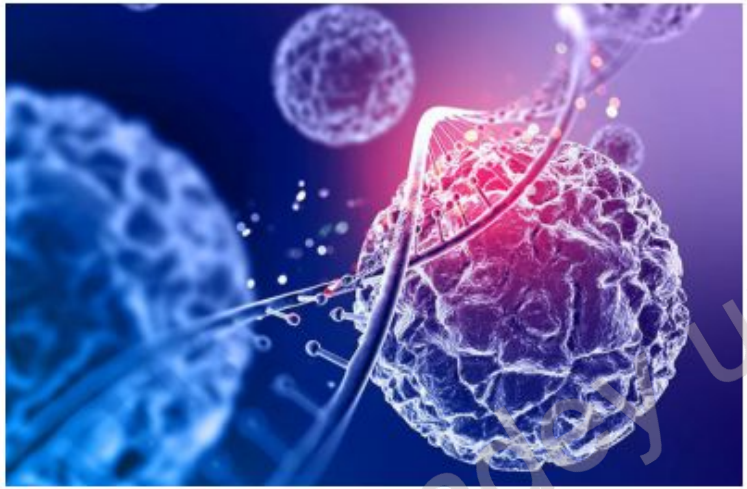
Hydroelectric Power 💧: Dams generate 50 GW of energy by blocking rivers, also providing water for agriculture.

Osmotic Power 🌊: This innovative technology uses osmotic pressure differences at river-sea junctions, with potential along India's 7,500 km coastline.

Nuclear Energy ⚛️: Eight nuclear plants produce 3.5 GW of electricity through nuclear fission, focusing on peaceful energy production.

Coal Alternatives 🚫: Advocates for reducing coal-based electricity due to pollution concerns.

Clean Energy Future 🌱: Highlights the importance of adopting cleaner energy methods to reduce environmental pollution



CAR-T immune treatment keeps cancer in remission

A woman who received CAR-T-cell therapy to treat a nerve-cell cancer, a rare childhood cancer, when she was four years old is still cancer-free 19 years later, the longest reported cancer remission following the treatment. She received the therapy – which uses engineered immune cells called CAR-T cells – in 2006. Since then, CAR-T-cell therapies have proved highly effective in some blood cancers, but researchers have struggled to repeat that success against solid tumours.

CAR-T Cell Therapies: Pioneering Advances in Cancer Treatment.

Introduction to CAR-T Cell Therapies

The dawn of CAR-T cell therapies has ushered in a new era in oncology.

Definition and Overview: CAR-T therapy involves modifying T cells to express Chimeric Antigen Receptors (CARs) that target specific proteins on cancer cells.

Historical Context: The journey began in the early 1990s with the first CAR designed, leading to FDA approvals in recent years for treating certain hematological malignancies like lymphoma and leukemia.

Mechanism of Action

Understanding how CAR-T cells work is crucial for appreciating their impact on cancer treatment.

How CAR-T Cells Work: T cells are harvested from the patient, genetically modified in the lab to express CARs, and then infused back into the patient.

Differences from Traditional Therapies: Unlike conventional chemotherapy, CAR-T therapy specifically targets cancer cells, minimizing damage to healthy tissues.

Latest Developments and Research Insights

The field of CAR-T therapies is rapidly evolving, with new findings reshaping our understanding.

Development of Lymphoma Post-Therapy: Recent studies highlight cases where lymphoma has developed following CAR-T treatment, indicating the need for ongoing monitoring and research.

Intestinal Microbiome's Role: Emerging evidence suggests that the intestinal microbiome may influence the efficacy of CAR-T therapies, potentially leading to tailored treatments based on microbial composition.

Multiomic Profiling: Research is being conducted on the multiomic profiling of T-cell lymphoma to improve therapy outcomes and understand resistance mechanisms.

FAQs

What are CAR-T cell therapies?

CAR-T cell therapies are treatments that genetically modify a patient's T cells to attack cancer cells.

How do CAR-T cells differ from traditional cancer treatments?

Unlike traditional treatments, CAR-T cells specifically target cancer cells, leading to fewer side effects.

What types of cancers can CAR-T therapies treat?

CAR-T therapies are primarily used for hematological cancers like lymphoma and leukemia.

Are there any side effects associated with CAR-T cell therapies?

Yes, potential side effects include cytokine release syndrome and neurological effects.

What is the success rate of CAR-T cell therapies?

Success rates vary but significant remissions have been reported in many cases.

How does the intestinal microbiome affect CAR-T therapy outcomes?

The microbiome may influence the immune response and effectiveness of the therapy.

What recent advancements have been made in CAR-T therapies?

Innovations include the development of therapies for solid tumors and combination approaches.

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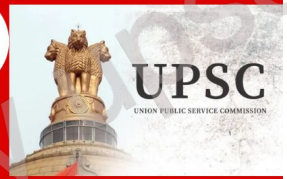

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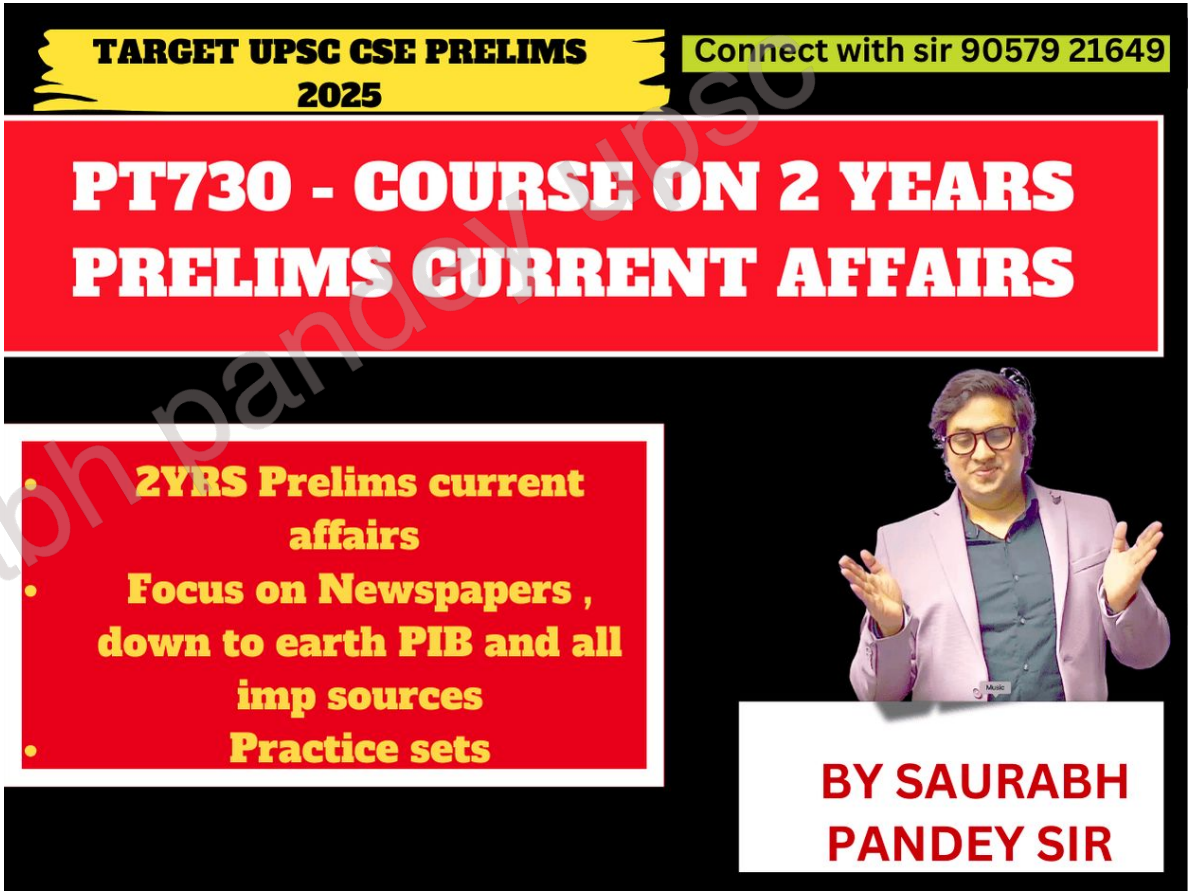

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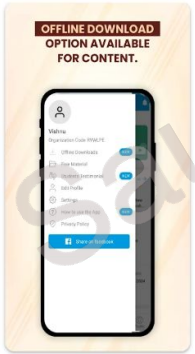

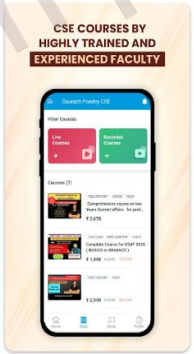

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