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Daily News Analysis

The Hindu Important News Articles & Editorial For UPSC CSE

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Page 03 : GS 3 : Environment & Ecology / Prelims

Kerala's proposal to develop a model electric truck (e-truck) corridor along National Highway-66 under the Union Government's PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) scheme marks a strategic shift in India's electric mobility agenda—from passenger vehicles to freight electrification. This initiative reflects growing recognition that decarbonising the logistics and freight sector is essential for achieving long-term climate, public health, and sustainability goals.

Kerala eyes freight electrification with e-truck corridor under PM E-DRIVE

The Hindu Bureau
THIRUVANANTHAPURAM

Kerala hopes to develop a model electric truck (e-truck) corridor along National Highway (NH) 66 as part of the State's efforts to promote freight electrification under the Centre's PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) scheme.

The Kerala State Electricity Board (KSEB), in collaboration with the International Council on Clean Transportation (ICTT), organised a workshop here on Wednesday, 'Driving E-Truck Ecosystem with PM E-DRIVE Scheme,' for positioning the State as a frontrunner in this emerging area.

Kerala has a little over three lakh electric vehicles, mostly passenger vehicles, on its roads at present. The State is now in the process of laying the groundwork for establishing high-capacity charging infrastructure and related facilities for e-trucks along freight corridors. Electricity Minister K. Krishnankutty, addressing the workshop, said electrification of trucks and other freight carriers is imperative for controlling carbon emissions and reducing air pollution.

Kerala is in the process of laying the groundwork to set up charging infrastructure for e-trucks along freight corridors. FILE PHOTO

Puneet Kumar, Additional Chief Secretary (Power), described freight and logistics as the "next critical frontier" if the State is serious about decarbonisation and long-term sustainability. The ICTT is closely collaborating with the KSEB and its EV Accelerator Cell to support evidence-based planning in this area, he said.

"This includes corridor-driven charging requirements, grid integration strategies, and early pilot designs. This collaboration ensures that Kerala's approach is data-driven, internationally benchmarked, and aligned with global best practices while remaining firmly grounded in local operational realities," Mr. Puneet Kumar said.

Background and Key Features

Policy Framework: The initiative aligns with PM E-DRIVE, which seeks to accelerate electric vehicle adoption through demand incentives, charging infrastructure, and ecosystem development.

Institutional Collaboration: The Kerala State Electricity Board (KSEB), in partnership with the International Council on Clean Transportation (ICCT), is undertaking evidence-based planning through workshops and pilot designs.

Focus Area: Development of high-capacity, corridor-based charging infrastructure for heavy electric trucks along NH-66, a critical coastal freight corridor.

Current EV Profile: Kerala already has over three lakh electric vehicles, predominantly passenger EVs, indicating a mature base for expansion into freight electrification.

Significance for India's Decarbonisation Goals

High Emission Reduction Potential: Freight vehicles, though fewer in number, contribute disproportionately to carbon emissions and urban air pollution. Electrifying trucks can significantly reduce particulate matter (PM2.5), NOx emissions, and diesel dependence.

Strategic Shift in EV Policy: Moving beyond two-wheelers and cars to freight vehicles addresses a structural gap in India's EV transition, which has so far been skewed towards lighter vehicles.

Energy and Grid Integration: Corridor-driven charging and grid integration strategies can help optimise electricity demand, encourage renewable energy use, and strengthen distribution infrastructure.

Federal and Cooperative Governance: The initiative demonstrates effective Centre–State convergence, with a centrally sponsored scheme being adapted to state-specific logistics and infrastructure needs.

Challenges and Concerns

High Upfront Costs: Electric trucks and megawatt-scale charging infrastructure require substantial capital investment.

Grid Readiness: Freight charging demands may strain local grids without adequate upgrades and smart load management.

Operational Viability: Range anxiety, charging time, and fleet operator acceptance remain practical hurdles.

Policy Coordination: Success depends on harmonisation across transport, power, urban development, and industrial policies.

Way Forward

Phased pilot projects with viability gap funding and private sector participation.

Integration of renewable energy and energy storage solutions at charging hubs.

Incentivising fleet operators through targeted subsidies, tax benefits, and assured charging access.

Replication of successful models in other high-density freight corridors across India.

Conclusion

Kerala's proposed e-truck corridor under PM E-DRIVE represents a forward-looking and systemic approach to India's electric mobility transition. By targeting freight electrification—often described as the "next critical frontier" of decarbonisation—the initiative can deliver substantial environmental, economic, and public health benefits. If implemented effectively and scaled up, it has the potential to serve as a national template for sustainable logistics and green transport corridors in India.

UPSC Prelims Practice Question

Ques: **With reference to the PM E-DRIVE scheme, consider the following statements:**

1. It aims to promote electric mobility through demand incentives and charging infrastructure.

2. It focuses only on passenger electric vehicles and excludes freight transport.

3. It supports the integration of EV charging infrastructure with power grids.

Which of the statements given above are correct?

A. 1 and 2 only

B. 1 and 3 only

C. 2 and 3 only

D. 1, 2 and 3

Ans: b)

UPSC Mains Practice Question

Ques : While India's electric mobility transition has largely focused on passenger vehicles, electrification of freight transport remains limited. Examine the opportunities and challenges associated with electric truck corridors in India.. **(250 Words)**

Page 04 : Prelims

The commissioning of INAS 335, the "Ospreys", as the second Indian Naval Air Squadron operating MH-60R helicopters at INS Hansa, Goa, marks a significant milestone in the modernisation of Indian naval aviation. Coming in the year marking 75 years of the Fleet Air Arm, this development reflects India's sustained focus on enhancing maritime combat readiness, surveillance capability, and force projection in the Indian Ocean Region (IOR).

Navy commissions second MH-60R copter squadron, the Ospreys, at *INS Hansa*

Saurabh Trivedi
NEW DELHI

INAS 335, the Ospreys, the second Indian Naval Air Squadron to operate MH-60R helicopters, was commissioned at INS Hansa, Goa, on Wednesday. The ceremony was presided over by Admiral Dinesh K. Tripathi, Chief of the Naval Staff (CNS), marking another major milestone in the modernisation of Indian naval aviation.

The commissioning follows the induction of the first MH-60R helicopter squadron at Kochi, Kerala, in March 2024. With the induction of the versatile, multi-role MH-60R helicopter on the western seaboard as the first operational squadron, the Navy has significantly enhanced its rotary wing combat and surveillance capabilities.

With the latest commissioning, the Navy has significantly enhanced its rotary wing combat and surveillance capabilities. ANI

Addressing the gathering, Admiral Tripathi said the commissioning assumes special significance as 2025 marks 75 years since the Government of India approved the formation of the Fleet Air Arm, a historic decision that gave wings to naval aviation.

Recalling earlier capability additions at INS Hansa, the CNS noted that the Navy had commissioned its second P-8I maritime patrol aircraft squadron at the same airbase in 2022. Complementing the P-8I fleet, the Navy is going ahead with the acquisition of 15 MQ-9B Sea Guardian remotely piloted aircraft.

Background and Key Developments

Platform Inducted: MH-60R Seahawk helicopters, acquired from the United States under the Foreign Military Sales (FMS) framework.

Base: INS Hansa, Goa — a critical naval air station on the western seaboard.

Operational Context: This follows the commissioning of the first MH-60R squadron at Kochi in March 2024.

Capability Synergy: The MH-60R complements existing platforms such as the P-8I maritime patrol aircraft and the upcoming MQ-9B Sea Guardian remotely piloted aircraft.

Strategic and Operational Significance

Enhanced Maritime Domain Awareness (MDA): The MH-60R is equipped with advanced sensors, radar, and dipping sonar, significantly improving the Navy's ability to detect, track, and neutralise surface and sub-surface threats, particularly submarines.

Strengthening Anti-Submarine Warfare (ASW): Given increasing submarine deployments in the IOR, especially by extra-regional powers, the induction strengthens India's ASW posture and protects sea lines of communication (SLOCs).

Force Multiplier for Blue-Water Navy: As a multi-role helicopter capable of anti-surface warfare, ASW, search and rescue, and logistics support, the MH-60R enhances the operational reach of aircraft carriers, destroyers, and frigates.

Western Seaboard Security: Deployment at INS Hansa improves surveillance and rapid response along India's western maritime front, which is strategically sensitive due to energy routes and proximity to choke points.

Integration with Network-Centric Warfare: When combined with P-8I aircraft and MQ-9B drones, the MH-60R contributes to a layered, network-enabled maritime security architecture.

Broader Policy and Strategic Context

Defence Modernisation: The commissioning aligns with India's long-term naval capability roadmap under Maritime Capability Perspective Plan (MCPP).

Strategic Partnerships: Reflects deepening India–US defence cooperation, interoperability, and access to advanced military technology.

Deterrence and Stability: Enhanced naval aviation capability contributes to credible deterrence and stability in the Indo-Pacific.

Challenges and Considerations

Dependence on Foreign Platforms: Raises concerns related to maintenance, spares, and long-term self-reliance.

Need for Indigenous Capability: Highlights the urgency of accelerating indigenous naval helicopter programs under Atmanirbhar Bharat.

Conclusion

The commissioning of INAS 335 with MH-60R helicopters significantly augments India's naval aviation strength and maritime security architecture. By enhancing anti-submarine warfare, surveillance, and multi-role combat capabilities, it reinforces India's preparedness to safeguard its maritime interests in an increasingly contested Indian Ocean Region. Going forward, balancing

advanced foreign acquisitions with indigenous capacity-building will be crucial for ensuring strategic autonomy and sustained naval dominance.

UPSC Prelims Practice Question

Ques : With reference to the MH-60R helicopters recently inducted into the Indian Navy, consider the following statements:

1. They are multi-role helicopters capable of Anti-Submarine Warfare (ASW) and Anti-Surface Warfare (ASuW).

2. They are equipped with dipping sonar and advanced maritime surveillance radar.

3. They are indigenously designed and manufactured under the Atmanirbhar Bharat initiative.

Which of the statements given above is/are correct?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

Ans : (a)

Page 05

Syllabus : GS 3 : Indian Economy / Prelims

The passage of the Sabka Bima Sabki Raksha (Amendment of Insurance Laws) Bill by Parliament, enabling 100% Foreign Direct Investment (FDI) in the insurance sector, marks a major structural reform in India's financial sector. Alongside, the approval of the Repealing and Amending Bill to annul 71 obsolete laws signals the government's intent to simplify the legal framework, promote ease of doing business, and modernise governance. Both legislations have significant economic, regulatory, and institutional implications.

RS passes Bill for 100% FDI in insurance sector

During debate, Opposition says Bill should be sent to a Select Committee of Parliament given its far-reaching impact; House passes Repealing and Amending Bill that annuls 71 obsolete laws

The Hindu Bureau
NEW DELHI

A day after the Lok Sabha passed the Sabka Bima Sabki Raksha (Amendment of Insurance Laws) Bill, the Rajya Sabha on Wednesday passed the legislation which allows 100% foreign direct investment in the insurance sector.

The Upper House also cleared the Repealing and Amending Bill that repeals 71 obsolete laws. The Bill was also passed by the Lok Sabha on Tuesday.

The structure of insurance regulation is very clearly laid out in the Bill, and the premium collected from Indians by foreign insurance companies will be kept in the country, Union Finance Minister Nirmala Sitharaman said, replying to a debate on the Bill. Private sector insurance companies were participating in all welfare schemes of the Union government, and the Bill would ensure that foreign companies would also participate in social sector-related activities and government schemes, Ms. Sitharaman said. "We are not giving them any room to get away from that responsibility," she said.

The increase in the FDI limit to 100% would ensure more foreign companies invest in India as, in many cases, they did not find joint venture partners for various reasons, she said. With more companies, the competition would increase, and premiums should drop, she said.

Earlier, during the debate, the Opposition demanded that the Bill be sent to a Select Committee of Parliament given the far-reaching impact it has on the insurance sector.

'Threat to data privacy'

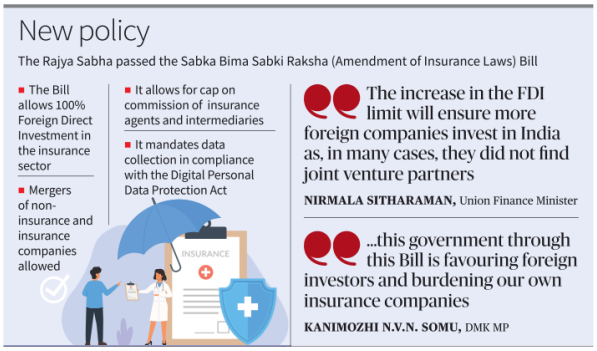
Initiating the debate, senior Congress MP Shaktisinh Gohil said the Bill posed a threat to data privacy as foreign companies would demand PAN and Aadhaar of their customers, which may lead to digital frauds. The Centre should learn from the experience of privatising the civil aviation sector, Mr. Gohil said. He demanded that the Bill be sent to a Select Committee.

Questioning the use of both Hindi and English in the name of the Bill, Saket Gokhale of the All India Trinamool Congress said the Bill opened the door to profit extraction by foreign companies.

A market share of $600 billion would go to foreign investors once the Bill was implemented, Kanimozhi N.V.N. Somu of the Dravida Munnetra Kazhagam said. "This is daylight robbery. The government should not squander opportunities to promote and strengthen its own PSUs (public sector undertakings), but this government through this Bill is favouring foreign investors and burdening our own insurance companies," Ms. Kanimozhi said.

The Rajya Sabha passed the Repealing and Amending Bill. The Bill would remove 71 outdated laws, correcting errors that had crept in during the law-making process, and removing discriminatory aspects of certain laws, Union Law Minister Arjun Ram Meghwal said.

"We give priority to ease of living along with ease of doing business," he said. "These reforms are a step towards liberation from a colonial mindset," he added. It seeks to repeal Acts, including the Indian Tramways Act, 1886; the Levy Sugar Price Equalisation Fund Act, 1976; the Bharat Petroleum Corporation Limited (Determination of Conditions of Service of Employees) Act, 1988; the General Clauses Act, 1897; the Code of Civil Procedure, 1908; and the Indian Succession Act, 1925.



Key Provisions and Rationale

1. 100% FDI in Insurance Sector

Earlier, FDI in insurance was capped at 74%.

The amendment allows full foreign ownership, subject to regulatory safeguards by the Insurance Regulatory and Development Authority of India (IRDAI).

Premiums collected from Indian policyholders must be retained and invested within India.

Foreign insurers are mandated to participate in social sector schemes and government welfare insurance programmes.

Government's Rationale:

To attract higher capital inflows into a capital-intensive sector.

To address the issue of lack of joint venture partners for foreign insurers.

To enhance competition, improve product innovation, and potentially reduce insurance premiums.

To expand insurance penetration, especially in underinsured and rural segments.

Concerns Raised by the Opposition

Data Privacy and Digital Security:

Risk of misuse of sensitive personal data (PAN, Aadhaar) by foreign insurers.

Concerns over increased exposure to digital fraud.

Profit Repatriation and Capital Flight:

Fear that foreign companies may extract profits at the cost of domestic financial stability.

Allegation that domestic public sector insurers could be weakened.

Strategic and Regulatory Concerns:

Insurance is linked to long-term household savings and financial security.

Demand for scrutiny by a Select Committee due to the Bill's far-reaching impact.

Economic and Policy Implications

Positive Impacts:

Increased capital availability can strengthen insurers' solvency and risk-bearing capacity.

Greater competition may improve service quality and product diversity.

Supports India's goal of becoming a $5 trillion economy by deepening financial markets.

Aligns with liberalisation and global integration of India's financial sector.

Potential Risks:

Regulatory capacity of IRDAI will be tested in monitoring fully foreign-owned entities.

Long-term implications for public sector insurers like LIC need careful assessment.

Data protection concerns remain significant in the absence of a fully robust digital governance ecosystem.

Repealing and Amending Bill: Significance

Repeals 71 outdated and redundant laws, many dating back to the colonial era.

Aims to remove inconsistencies, errors, and discriminatory provisions.

Reinforces the objectives of ease of doing business and ease of living.

Symbolises a broader governance reform agenda focused on legal clarity and administrative efficiency.

Conclusion

The decision to allow 100% FDI in the insurance sector represents a bold reform aimed at boosting investment, competition, and insurance coverage in India. While the move has the potential to strengthen the sector and support inclusive growth, concerns regarding data security, regulatory oversight, and the future of domestic insurers underline the need for strong institutional safeguards. Together with the repeal of obsolete laws, these reforms reflect India's continuing transition towards a liberalised, streamlined, and globally integrated economic framework, though their long-term success will depend on effective regulation and balanced implementation.

UPSC Prelims Practice Question

Ques: With reference to the recent amendment allowing 100% FDI in the insurance sector, consider the following statements:

1. Earlier, foreign direct investment in the insurance sector was capped at 74%.

2. The amendment mandates that premiums collected from Indian policyholders must be invested outside India.

3. Foreign-owned insurance companies will be exempted from participating in government welfare insurance schemes.

Which of the statements given above is/are correct?

(a) 1 only

(b) 1 and 2 only

(c) 2 and 3 only

(d) 1, 2 and 3

Ans : a)

UPSC Mains Practice Question

Ques: Financial sector liberalisation must be accompanied by strong regulatory institutions. In the light of recent insurance sector reforms, analyse the challenges before IRDAI in ensuring financial stability and consumer protection. **(150 Words)**

Page 07 : GS 3 : Science and Tech / Prelims

A recent study published in the Journal of Cosmology and Astroparticle Physics has reignited global debate by claiming the possible detection of dark matter through gamma-ray signals observed near the centre of the Milky Way. Given that dark matter constitutes about 27% of the universe and remains one of the biggest unresolved problems in modern physics, any such claim carries profound implications for cosmology, particle physics, and our understanding of the universe. However, experts have urged caution, highlighting the need for rigorous verification and independent confirmation.

Possible discovery of dark matter sparks debate, experts urge caution

Physicists don't know what makes up dark matter; one hypothesis is that it is a new type of subatomic particle called WIMPs, which barely interact with normal matter and never with light; the trick to finding them then is high-energy particles released when two WIMPs annihilate each other

Prakash Chandra

Is it a false alarm or a discovery that solves one of the greatest mysteries in cosmology? This is the question weighing on astronomers as they examine a study published recently in the *Journal of Cosmology and Astroparticle Physics*, which claims to have finally detected the elusive "dark matter".

Dark matter is believed to have been around for most of the 14-billion-year history of the universe. Astronomers began searching for it in the early 1930s after the Swiss astronomer Fritz Zwicky observed that galaxies in the Coma Cluster were moving too quickly for the amount of ordinary matter it contained. He realised the speed of their rotation was so great that they should have flown apart as they didn't have enough matter to generate the gravity needed to hold them together. He deduced that some hidden mass could be providing the "extra gravity" required for the galaxies to stay intact. He named this dark matter.

Invisible WIMPs

According to the Standard Model of particle physics, ordinary (baryonic) matter that makes up the world around us consists of elementary particles such as baryons (protons and neutrons) and electrons, along with massless photons of electromagnetic radiation such as light. Baryons themselves are made up of even smaller particles called quarks and gluons. But all these fundamental particles form just 5% of all mass in the known universe. Dark matter accounts for 27%, while a mysterious force called "dark energy" makes up the rest.

Physicists don't know what dark matter is made up of, but one hypothesis they have is a hitherto unknown type of subatomic particle called WIMPs. The name is short for 'weakly interacting massive particles'. According to physicists, WIMPs barely interact with normal matter and not at all with any form of electromagnetic radiation. Since dark matter doesn't emit, absorb or reflect light, astronomers can only study its gravitational effect on visible matter, such as stars and galaxies.

The trick to finding it is then to spot its tell-tale signature: high-energy particles, such as gamma-ray photons that are released when two WIMPs collide and annihilate each other.

New claim

Tomonori Totani of the University of Tokyo has now claimed to have identified just such a gamma-ray signal in his study, using data from the Fermi Gamma-ray Space Telescope.

"We detected gamma rays with a photon energy of 20 giga-electron-volts (or 20 billion electron-volts, an extremely large amount of energy) extending in a halo-like structure towards the centre of the Milky Way galaxy", Prof. Totani said. "The gamma-ray emission component closely matches the shape expected from the dark matter halo."

He added that the measured gamma ray energy spectrum "closely matches model predictions for the annihilation of hypothetical WIMPs with masses roughly 500-times that of a proton."

Astronomers always knew dark matter must be virtually hiding in plain sight and that they'd find it sooner or later. Has Prof. Totani found it, however? Not quite, say experts, as the research data have to survive rigorous scrutiny and critical evaluation by more independent researchers.

Scientists believe the Milky Way galaxy's disc lies within a much larger, roughly spherical dark matter halo. GETTY IMAGES/ISTOCKPHOTO

'Excess' radiation

"When we see a signal that looks like it could be dark matter, we can check other regions that are rich in dark matter to look for a comparable signal there," Tracy Slatyer, professor of physics and Director, MIT Centre for Theoretical Physics, told this correspondent via email.

"Studying the detailed properties of the signal would tell if it's consistent with what we expect from dark matter or if it has traits more consistent with an alternative source. So far, we have had many signals that seemed at first glance likely to be dark matter, but subsequent in-depth analysis revealed they were from a different source. Moreover, the overall size of the signal is not what you would expect from classic WIMP models (it is too large), and when we do the test of looking at other dark-matter-rich regions, we do not see a corresponding signal."

According to Rishi Khatri of the Department of Theoretical Physics at the Tata Institute of Fundamental Research, Mumbai, the findings suggest the detection of an excess of radiation compared to what cosmologists expect from the model of the Milky Way galaxy.

"It is possible that this excess is just pointing to something missing in the model of our galaxy rather than dark matter." Prof. Khatri said in an email interview. "Based on what the study claims, we can predict what kind of signal we can expect from other nearby galaxies and then try to observe these signals. There have been similar claims many times in the past about the detection of dark matter, but they turned out to be false."

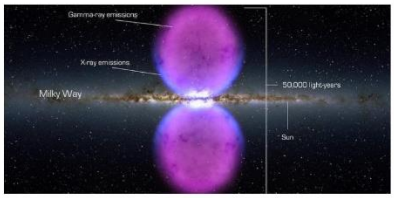
> The measured gamma ray energy spectrum closely matches model predictions for the annihilation of hypothetical WIMPs with masses roughly 500-times that of a proton
>
> TOMONORI TOTANI
> UNIVERSITY OF TOKYO

Radiation from other sources

Discoveries in particle physics have to typically reach a confidence level called '5 sigma' before they are considered valid. Where does the new finding stand on this scale?

"The excess reported in the paper seems to be quite more than 5-sigma, without taking into account the uncertainty in modelling," Prof. Khatri said. "The author has not given a number with the modelling uncertainty included. This should give you an idea about how uncertain we are about the uncertainty (i.e. error on the error bars), which is very important in such studies." An immediate task for astronomers would be to rule out the possibility of the radiation coming from some other sources of high-energy radiation like supernovae, the explosive deaths of massive stars; neutron stars, the ultra-dense collapsed cores of massive stars after supernova explosions; or black holes.

The gravity of dark matter, like normal matter, should cause the light passing nearby to bend, in a phenomenon called gravitational lensing. A spectacular example of this is the Bullet Cluster, where the collision of two clusters of galaxies resulted in the separation of dark matter from normal matter, and astronomers could discern the halos of dark matter around the galaxies by how they bent the path of light.



An illustration of the two gigantic X-ray/gamma-ray bubbles (blue-violet) known to be associated with the Milky Way (centre). NASA

The LCDM model

If the findings stand up to scrutiny and it turns out that a dark matter particle has actually been found, the widely accepted Lambda-Cold Dark Matter model of the universe wouldn't have to be modified. This is because, as Prof. Khatri said, "A new particle that would form dark matter is actually included in the LCDM model."

Instead, "what we do not know is the exact nature of dark matter."

And "if the dark matter is a 500 GeV WIMP as is claimed, it would be expected to have only very tiny interactions with other dark matter particles or with ordinary matter," Prof. Slatyer said. "So it would be safe to treat it as having only gravitational interactions, and many of the predictions of LCDM could remain almost unchanged."

One thing that can be said with certainty is that this grand cosmic narrative is at an exciting stage as astronomers untangle the fabric of the universe to try to understand its evolution and nature.

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

Background: What is Dark Matter?

Dark matter was first proposed by Fritz Zwicky in the 1930s to explain anomalously high galaxy rotation speeds.

It does not emit, absorb, or reflect light, making it invisible to telescopes.

Its presence is inferred only through gravitational effects such as galaxy rotation curves and gravitational lensing.

Ordinary (baryonic) matter makes up only about 5% of the universe, while dark matter accounts for roughly 27%, with the rest being dark energy.

The WIMP Hypothesis and the New Claim

One leading hypothesis suggests dark matter consists of WIMPs (Weakly Interacting Massive Particles).

WIMPs are theorised to interact weakly with normal matter and not at all with light.

When two WIMPs annihilate, they are expected to release high-energy particles such as gamma rays.

The new study, led by Tomonori Totani, claims detection of gamma rays of around 20 GeV energy using data from the Fermi Gamma-ray Space Telescope, with a spatial distribution resembling a dark matter halo.

Scientific Scrutiny and Expert Concerns

Alternative Explanations:

The observed gamma-ray excess could arise from astrophysical sources such as supernova remnants, neutron stars, or black holes.

Experts caution that similar excesses in the past were later explained by conventional astrophysical phenomena.

Modelling Uncertainty:

The Milky Way's structure and radiation background are complex.

Uncertainties in galactic modelling may account for the observed excess rather than dark matter.

Statistical Confidence:

While the signal appears strong, uncertainties in error modelling weaken confidence.

In particle physics, discoveries generally require a 5-sigma confidence level, including all systematic uncertainties.

Lack of Corroboration Elsewhere:

If dark matter annihilation were the cause, similar signals should be observable in other dark-matter-rich regions, which has not yet been confirmed.

Implications for Cosmology and the ΛCDM Model

If confirmed, the discovery would not overturn the Lambda–Cold Dark Matter (ΛCDM) model, the standard cosmological framework.

The ΛCDM model already accommodates dark matter; what remains unknown is its exact nature.

A confirmed WIMP discovery would fill a major gap in particle physics and cosmology without fundamentally altering existing large-scale predictions.

Conclusion

The claimed detection of dark matter through gamma-ray signals represents an exciting but highly tentative development in astrophysics. While the findings are consistent with certain dark matter models, significant uncertainties and alternative explanations remain. As past experiences show, extraordinary claims require extraordinary evidence. Independent verification, improved modelling, and corroborative observations from other galaxies will be crucial before declaring a breakthrough. Regardless of the outcome, the episode highlights both the promise and the discipline of modern science, where caution and skepticism are as vital as discovery itself.

UPSC Prelims Practice Question

Ques : With reference to Dark Matter, consider the following statements:

1. Dark matter emits electromagnetic radiation, which makes it directly observable through telescopes.

2. Dark matter was first proposed to explain anomalous galaxy rotation speeds.

3. Weakly Interacting Massive Particles (WIMPs) are a hypothesised candidate for dark matter.

Which of the statements given above are correct?

A. 1 and 2 only

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Ans : a)

UPSC Mains Practice Question

Ques : Dark matter constitutes a major component of the universe, yet remains undetected directly. In this context, critically examine recent claims of dark matter detection and the reasons for scientific caution. **(150 Words)**

Page 10 : GS 1 : Geography

The recent Supreme Court order settling a uniform definition of the Aravalli hills and pausing fresh mining leases marks a critical intervention in India's environmental jurisprudence. The Aravalli range, India's oldest mountain system, is not merely a geological feature but a key ecological barrier safeguarding the Indo-Gangetic plains from desertification. The judgment reflects a shift from fragmented regulation towards a science-based, integrated approach to conservation and sustainable use.

How is the Aravalli range to be protected?

How do the Aravalli hills and ranges prevent the desertification of the Indo-Gangetic plain? What were the recommendations of the Central Empowered Committee? Why was it necessary to arrive at a uniform definition of the Aravalli hills? Has the Supreme Court completely banned mining in the ranges?

EXPLAINER

Jacob Koshy

The story so far:

The Supreme Court (SC), in an order last month, settled on a uniform definition of the Aravalli hills and ranges, and paused the grant of fresh mining leases inside its areas spanning Delhi, Haryana, Rajasthan and Gujarat.

What is the range's significance?

Apart from being nearly two billion years old and India's oldest mountain range, they serve as an important ecological barrier to prevent the desertification of the Indo-Gangetic plains. They help arrest the eastward spread of the Thar Desert into Haryana, Rajasthan and western Uttar Pradesh, and play a major role in stabilising climate, supporting biodiversity, and recharging groundwater. Stretching from Delhi to Gujarat across 650 km, the mountains support water-recharge systems and are the source of important rivers such as the Chambal, Sabarmati, and Luni. It is richly endowed with sandstone, limestone, marble, granite, and minerals such as lead, zinc, copper, gold, and tungsten. While historically mined for these resources, it has in the past four decades been excessively quarried for stone and sand. This has contributed to deteriorating air quality as well as plummeting groundwater recharge. A proportion of the mining has also been illegal. The Court noted that India is bound by international commitments, under the UN Convention to Combat Desertification, to protect vulnerable ecosystems such as the Aravalli range.

Was action taken against mining?

The Environment Ministry, since the early 1990s, has laid down rules restricting mining to only sanctioned projects but these have been flagrantly violated. In 2009, the SC stepped in and imposed a blanket ban on mining in the Faridabad, Gurugram, and Mewat districts of Haryana. In May 2024, the SC prohibited granting of fresh mining leases and renewals in the range and directed its Central Empowered Committee (CEC) to undertake a detailed examination, leading to a set of recommendations submitted in March 2024. The CEC proposed a comprehensive approach that included a complete scientific mapping of the Aravalli range across all States; a macro-level environmental impact assessment of mining activities; and strict prohibition of mining in ecologically sensitive areas such as protected habitats, water bodies, tiger corridors, key aquifer recharge zones and areas within the National Capital Region. It urged stringent regulation of stone-crushing units. It also recommended that no new mining leases or renewals be permitted until proper mapping and impact assessments were completed. These recommendations were taken up by the Court in its order of November 2025. Futher, in June, 2025, the Centre started an Aravalli 'Green Wall' project. The plan is to expand green cover in the five-km buffer area around the Aravallis in 29 districts of Gujarat, Rajasthan, Haryana and Delhi. The government said this initiative will play a crucial role in restoring 26 million hectares of degraded land by 2030.

Threatened landscape: A sunrise against the Aravalli mountain ranges in Ajmer, Rajasthan, in 2022. AP

Why a uniform definition?

The Court found that States were using inconsistent criteria to identify Aravalli formations. There have also been differing definitions, including by expert groups such as the Forest Survey of India (FSI) on what makes up 'Aravalli Hills and Ranges.' In 2010, the FSI had said hills with "(i) slope >3°, (ii) foothill buffer = 100m, (iii) inter hill distance or valley width= 500m and (iv) the area enclosed by above defined hills from all sides," would make up Aravalli hill and ranges. To resolve this, it constituted a committee comprising representatives from the Environment Ministry, the FSI, State Forest Departments, the Geological Survey of India and the CEC. This committee was tasked with creating a scientifically grounded, nationwide definition of the Aravallis. The committee submitted its findings in October 2025. The SC committee finally ruled that only hills above 100 metres would make the cut. The amicus curae, K. Parameswar, objected that this was too narrow a definition and potentially opened all the hills below 100 metres for mining, compromising "...their continuity and integrity. " However, the Additional Solicitor General, Aishwarya Bhati countered that the definition on slopes, foothill buffers etc. as proposed by the FSI would, on the contrary, exclude large areas from the Aravalli Hills and Ranges. The committee recommendations of 100m was far more inclusive.

What are the SC's other directions?

The Court directed the preparation of a detailed Management Plan for Sustainable Mining (MPSM) covering the entire Aravalli range. The plan must demarcate areas where mining must be absolutely prohibited, identify zones where limited and highly regulated mining may be permitted, map sensitive habitats and wildlife corridors, evaluate cumulative ecological impacts, determine ecological carrying capacity, and articulate restoration and rehabilitation measures.

Why was there no ban on mining?

The Court explained that past experiences show total bans often lead to the rise of illegal mining syndicates, violent sand mafias and unregulated extraction. The Court therefore opted for a calibrated approach: existing legal mining continues under tight regulation, new mining is paused until a scientifically driven plan is prepared, and permanently sensitive areas remain off-limits.

THE GIST

- The Environment Ministry, since the early 1990s, has laid down rules restricting mining to only sanctioned projects but these have been flagrantly violated.
- In June, 2025, the Centre started an Aravalli 'Green Wall' project. The plan is to expand green cover in the five-km buffer area around the Aravallis in 29 districts of Gujarat, Rajasthan, Haryana and Delhi. The government said this initiative will play a crucial role in restoring 26 million hectares of degraded land by 2030.
- The Court explained that past experiences show total bans often lead to the rise of illegal mining syndicates, violent sand mafias and unregulated extraction.

Role of the Aravalli Range in Preventing Desertification

The Aravalli hills play a vital ecological role in north-western India:

- **Barrier against Desert Expansion:** They act as a natural shield preventing the eastward spread of the Thar Desert into Haryana, Rajasthan, western Uttar Pradesh, and the National Capital Region.

Climate Regulation: By influencing wind patterns and moisture retention, they help stabilise the regional climate.

Groundwater Recharge: The range supports aquifer recharge and sustains rivers such as the Chambal, Sabarmati, and Luni.

Biodiversity Support: It provides habitats, wildlife corridors, and ecological connectivity across States.

Unregulated mining and quarrying over the past decades have weakened these functions, accelerating land degradation, air pollution, and groundwater depletion.

Central Empowered Committee (CEC): Key Recommendations

Pursuant to the Supreme Court's directions, the CEC submitted a comprehensive set of recommendations (March 2024), which form the backbone of the Court's approach:

Scientific Mapping:

Complete, State-spanning, GIS-based mapping of the entire Aravalli range.

Environmental Impact Assessment:

A macro-level, cumulative Environmental Impact Assessment (EIA) of mining activities rather than project-by-project clearance.

Mining Prohibitions:

Absolute ban on mining in ecologically sensitive areas such as protected forests, water bodies, tiger corridors, aquifer recharge zones, and areas within the NCR.

Regulation of Allied Activities:

Strict regulation of stone-crushing units and related polluting activities.

Moratorium on New Leases:

No new mining leases or renewals until mapping and impact assessments are completed.

These recommendations were substantially accepted by the Supreme Court in its November 2025 order.

Need for a Uniform Definition of the Aravalli Hills

A central governance challenge was the absence of a consistent definition:

Fragmented State Practices: Different States used varying criteria, enabling regulatory arbitrage and selective classification to permit mining.

Expert Disagreement: The Forest Survey of India (2010) proposed slope- and buffer-based criteria, while other agencies differed.

Judicial Resolution:

The Supreme Court constituted an expert committee including the MoEFCC, FSI, GSI, State Forest Departments, and the CEC.

The committee adopted a **100-metre elevation criterion** to define Aravalli hills and ranges.

While concerns were raised that this may exclude lower hill systems, the Court accepted the definition as more inclusive and administratively workable, aimed at reducing ambiguity and enforcement gaps.

Has the Supreme Court Completely Banned Mining?

No, the Supreme Court has **not imposed a total ban** on mining in the Aravalli range.

Reasoned Approach:

Past blanket bans led to illegal mining, criminal syndicates, and sand mafias.

Calibrated Regulation:

Existing legal mining may continue under strict oversight.

Fresh mining leases and renewals are paused.

Ecologically sensitive zones remain permanently prohibited.

Future Framework:

The Court has directed preparation of a Management Plan for Sustainable Mining (MPSM), which will define permissible and prohibited zones, assess ecological carrying capacity, and mandate restoration measures.

Complementary Executive Action

The Centre's Aravalli Green Wall Project (2025) aims to expand green cover in a 5-km buffer across 29 districts in four States and Delhi, contributing to India's commitment under the UN Convention to Combat Desertification to restore degraded land by 2030.

Conclusion

The Supreme Court's intervention on the Aravalli range represents a mature evolution in environmental governance—moving from ad hoc bans to science-based regulation and cooperative federalism. By recognising the Aravallis as a strategic ecological asset critical to climate resilience, groundwater security, and desertification control, the judgment balances environmental

protection with economic realities. Its success, however, will depend on rigorous implementation, inter-State coordination, and continuous monitoring to ensure that conservation objectives are not undermined by regulatory dilution or enforcement failures.

UPSC Prelims Practice Question

Ques : Consider the following statements regarding the Aravalli Range:

1. The Aravalli range acts as an ecological barrier against the eastward expansion of the Thar Desert.

2. Rivers such as Chambal and Sabarmati originate from the Aravalli system.

3. Excessive mining in the Aravallis has contributed to groundwater depletion and air pollution.

4. The Aravalli range runs entirely within the state of Rajasthan.

Which of the statements given above are correct?

A. 1, 2 and 3 only

B. 1 and 4 only

C. 2, 3 and 4 only

D. 1, 2, 3 and 4

Ans: a)

UPSC Mains Practice Question

Ques : The Aravalli range plays a crucial role in preventing desertification of the Indo-Gangetic plains. Explain the geographical and ecological significance of the Aravalli hills in this context.

Page : 08 : Editorial Analysis

The changing patterns of India's student migration

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India's latest wave of student migration marks a decisive shift that is no longer confined to elite universities or programmes that are fully funded. Today's migration is characterised by self-financed education where middle-class households invest heavily in the promise of a global degree and upward social mobility. In Ministry of External Affairs data, more than 13.2 lakh Indian students were enrolled in over 70 countries by 2023, which rose to 13.35 lakh in 2024, and projected to reach 13.8 lakh in 2025.

India is one of the top senders of international students, with the United States and Canada as the top destinations (40%), followed by the United Kingdom, Australia and Germany. This significant development is reflected in the report of the Parliamentary Committee on the Welfare of Indian Diaspora (2022) which engages with students as one of India's major diaspora categories.

The true picture

While all this is seen by some as a democratisation of foreign education, with doors opening to students from different socio-economic classes, the reality is more complex. Many of these students are channelled into lower-tier institutions and vocational colleges, into courses often unrelated to their expertise and without much job prospects, due to recruitment agencies that operate in a grey legal zone. The partnership between recruitment networks and less credible private colleges abroad is driven primarily by commissions and profit, reflecting the largely unregulated expansion of the foreign education industry.

The outcome is widespread deskilling and underemployment, with many graduates unable to transition into skilled work. In the U.K., what were once polytechnics have become universities post 1992 that cater primarily to international students, sometimes waiving entry requirements and triggering controversy due to declining academic standards. Reports suggest that approximately only one in four Indian postgraduates in the U.K. secures a sponsored skilled visa.

Student migration from India represents a middle-class aspiration with significant risks. Kerala, historically defined by Gulf labour migration, illustrates this transformation as the Kerala Migration Survey (KMS) 2023 reports that student migration doubled in five years, from 1.29 lakh in 2018 to 2.5 lakh in 2023, which is 11.3% of total emigrants. Outward student remittances from Kerala are estimated at ₹43,378 crore, equivalent to about 20% of total inward remittances from labour migrants.

Reverse remittance

Most students migrate through self-financing or education loans, often mortgaging family property, with the hope of better employment and higher wages that would repay debts and enable higher living standards. However, for many, this journey ends in debt, underemployment or forced return, a phenomenon that economists describe as reverse remittances, where Indian households subsidise foreign economies.

FOCUS ON MIGRATION

Foreign students contribute significantly to host economies. In Canada, international students contributed about $30.9 billion to GDP in 2022, supporting over 3,61,000 jobs. In 2023, Canada hosted over 4,27,000 Indian students, which is roughly 45% of international enrolments. In the U.S., roughly 4,00,000 Indian students, in 2024, spent an estimated $7 billion-$8 billion annually on tuition, housing and living costs, sustaining universities and local economies.

Across destinations, students shoulder substantial financial burdens, sometimes to the tune of ₹40 lakh-₹50 lakh, to finance studies abroad. Rising rents, restricted working hours, and visa caps exacerbate financial and mental strains. Unable to find skilled work, many take up low-wage unskilled jobs, often juggling multiple part-time jobs, sometimes undocumented, to work longer hours, and facing exploitation. Restrictive visa rules, limited post-study employment options and a lack of placement support from low-ranked colleges exacerbate this downward mobility. For instance, until 2024, the U.K. allowed students to convert student visas into care visas, offering a survival route in a tight job market, but this pathway has since become impossible due to new restrictions.

The local context

This outflow of students needs to be understood within the domestic context that is driving it. Is it the perceived lack of quality in domestic institutions or an inability to find well-paid domestic employment? With foreign universities establishing offshore campuses in Dubai, Singapore, and other destinations offering western degrees at lower costs, it is telling that Indian students rarely choose them. The reason is more structural. For many, studying in OECD countries is not only about education but about permanent residency, social mobility and an escape from a third world identity.

Ironically, this wave of student migration has also created a new form of cheap labour for OECD countries, akin to Gulf labour migration except that it is now accompanied by reverse remittances often financed through savings and debt.

This rapid expansion of Indian student migration exposes deep systemic contradictions between aspiration and outcome, and between opportunity and exploitation, resulting in a phenomenon that can be described as brain waste. It calls for stronger regulation of education agents, pre-departure counselling, and bilateral frameworks to ensure institutional accountability abroad.

The rapid expansion of Indian student migration points to contradictions between aspiration and outcome, and opportunity and exploitation

GS Paper 2 : Governance

UPSC Mains Practice Question : India's rising student migration is increasingly characterised by self-financed education, deskilling, and reverse remittances rather than human capital gains. Critically examine this trend. Discuss its socio-economic implications for Indian households and the economy, and suggest policy measures to address the emerging challenges. (150 words)

Context :

India's student migration has entered a new phase marked by scale, speed, and structural transformation. No longer limited to elite institutions or fully funded programmes, overseas education is increasingly self-financed by middle-class households seeking global credentials, employment security, and social mobility. With over 13.35 lakh Indian students abroad in 2024 and projections of further growth, student migration has become a significant socio-economic phenomenon with deep implications for India's labour market, household finances, and human capital formation.

Key Trends and Emerging Patterns

Shift from Elite to Mass Migration : Student migration is no longer confined to top universities. A large proportion of Indian students are enrolling in lower-tier institutions, vocational colleges, and non-core courses, often facilitated by private recruitment agents operating in weakly regulated spaces.

Commercialisation of Foreign Education : Partnerships between overseas private colleges and Indian recruitment agencies are driven by commissions rather than academic merit. This has led to dilution of entry standards, particularly in countries such as the U.K. and Canada, raising concerns about quality and employability.

Deskilling and Underemployment: Despite high educational expenditure, outcomes are poor. Limited post-study work opportunities, restrictive visa regimes, and weak placement support result in graduates taking up low-skilled jobs. This phenomenon has been described as *brain waste* rather than brain gain.

Reverse Remittances and Household Risk : Unlike traditional labour migration that generated inward remittances, student migration often results in reverse remittances—Indian households financing foreign economies through tuition fees and living costs. Kerala exemplifies this trend, where outward student remittances now constitute nearly 20% of inward labour remittances.

Host Country Dependence on Indian Students : Indian students significantly support host economies. They contribute billions of dollars annually to GDP, sustain local employment, and help universities offset funding gaps. This creates an asymmetrical dependency where risks are borne largely by Indian families.

Structural Drivers in the Indian Context

Domestic Employment Constraints: Limited availability of well-paid, high-quality jobs in India pushes students to seek overseas opportunities.

Credential and Residency Aspirations: Migration is driven as much by the promise of permanent residency and social mobility as by education itself.

Perception Gap: Despite the presence of offshore campuses offering similar degrees at lower costs, students prefer OECD countries due to perceived status and migration prospects.

Challenges and Policy Concerns

Rising household indebtedness due to education loans and mortgaged assets.

Mental health stress and exploitation of students in low-wage informal work abroad.

Weak regulatory oversight of education agents and foreign institutions.

Loss of productive youth years without commensurate skill utilisation.

Way Forward

Stronger Regulation: Licensing and monitoring of education agents in India.

Pre-departure Counselling: Transparent information on institutional quality, employability, and visa risks.

Bilateral Frameworks: Agreements with destination countries to ensure institutional accountability and fair post-study work pathways.

Domestic Reforms: Improving quality, employability, and global recognition of Indian higher education institutions.

Conclusion

The changing pattern of India's student migration reflects a deep tension between aspiration and outcome. While overseas education symbolises hope for upward mobility, for many it results in debt, underemployment, and vulnerability—turning brain drain into brain waste. Addressing this challenge requires not only regulating the global education market but also strengthening India's domestic education and employment ecosystem. Without such reforms, student migration risks becoming a costly social gamble rather than a pathway to genuine human capital development.