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THE HINDU
INDIA'S NATIONAL NEWSPAPER SINCE 1878

Daily News Analysis

The Hindu Important News Articles & Editorial For UPSC CSE

Monday, 28 Oct , 2024

Edition: International Table of Contents

Page 05 : Prelims Fact

India ranked 176th out of 180 countries in the 2024 Nature Conservation Index, highlighting significant environmental conservation challenges.

- Developed with Israel's Ben Gurion University, the index assesses global conservation efforts, sparking debate on India's policies and commitment to biodiversity preservation.

Nature Conservation Index (NCI) 2024:

- The 2024 Nature Conservation Index (NCI) is an international measure evaluating the conservation efforts of 180 countries.
- The NCI is developed by Goldman Sonnenfeldt School of Sustainability and Climate Change at Ben-Gurion University of the Negev and BioDB.com, a non-profit website dedicated to maintaining biodiversity data.

The index rates each nation's performance across four main pillars:

- Land Management: Assesses the effectiveness of protected area coverage, ecosystem preservation, and habitat fragmentation.
- Biodiversity Threats: Evaluates the proportion of species at risk and factors like invasive species and habitat protection.
- Capacity and Governance: Considers conservation policies, international agreements, and resources allocated.
- Future Trends: Includes long-term readiness using metrics like the Environmental Performance Index.
- India ranked low, placing 176th, reflecting significant challenges in biodiversity preservation, habitat fragmentation, and protection of threatened species.

India's Nature Conservation Index rank 176, govt. slammed

Press Trust of India
NEW DELHI

The Congress on Sunday took a swipe at the BJP government over India reportedly being ranked 176 out of 180 countries on the Nature Conservation Index. Adding, "Should the bona fides of Israel's Ben Gurion University that co-developed the index be also questioned."

There was no immediate reaction from the government on the reported ranking.

Congress general secretary in-charge communications Jairam Ramesh said, "Whenever India gets a very low rank on some global index or the other, the immediate response of the non-biological PM's drum-beaters and cheerleaders is to attack the index itself as a plot to defame India by agenda-driven busybody NGOs." But what will be the response to the just-released Nature Conservation Index in which India ranks a miserable 176th out of 180 countries, he asked.

"This Index has been co-developed by Israel's Ben Gurion University. Will the bona fides of this university too be questioned?" Mr. Ramesh said.

India has scored low in the Global Nature Conservation Index, ranking 176 out of 180 countries. It is placed just above Kiribati which ranked 180, Turkey (179), Iraq (178) and Micronesia (177), according to reports.

Page 07 : GS 3 : Science and Technology

The Indian government has approved various new projects in space exploration, enhancing India's role in lunar, planetary, and satellite missions.

- These projects include the development of a new rocket, missions to the Moon and Venus, and upcoming satellite launches like NISAR and Proba-3.
- The private sector is also contributing with satellite development and green propulsion technology.

New rocket, plus moon and Venus missions, herald new beginnings

Building on the moon landing, ISRO is now planning a Venus mission and further moon exploration. A new launcher is being developed as the private sector also begins to take a hand in the space effort. A green propulsion system and low earth orbit satellite developed in the private sector will be seen in action soon

INDIA IN SPACE

Pradeep Mohandas

Preview: The Indian government recently signed off on numerous new projects, including work on a new rocket and new moon and Venus missions. The space programme is thus on the cusp of important new beginnings. India is also preparing to launch the NISAR and Proba-3 satellites, and has received some good news from Astrosat. The private sector is also working on satellite projects of its own.

A slew of approvals

The Union Cabinet on September 18 approved four missions under the 'Gaganyaan' human spaceflight programme and four missions to test technologies for India's first space station, the Bharatiya Antariksh Station 1, by 2028. The Indian Space Research Organisation (ISRO) also added one uncrewed Gaganyaan flight in addition to the planned two.

The Cabinet approved an additional funding of ₹11,170 crore for the four Station-related missions and the additional Gaganyaan flight.

The Cabinet also approved ISRO's development of the Next Generation Launch Vehicle (NGLV) for ₹8,240 crore. This includes the cost of the rocket's first three development flights. ISRO is expected to develop the vehicle in collaboration with industry, so that industry players can seamlessly take over for operational flights when the rocket is tested and ready.

A Polar Satellite Launch Vehicle (PSLV) built by Hindustan Aeronautics, Ltd. and Larsen & Toubro is expected to launch at the end of 2024 or early 2025. Likewise, New Space India, Ltd. is expected to select a private entity to commercialise the LVM-3 rocket.

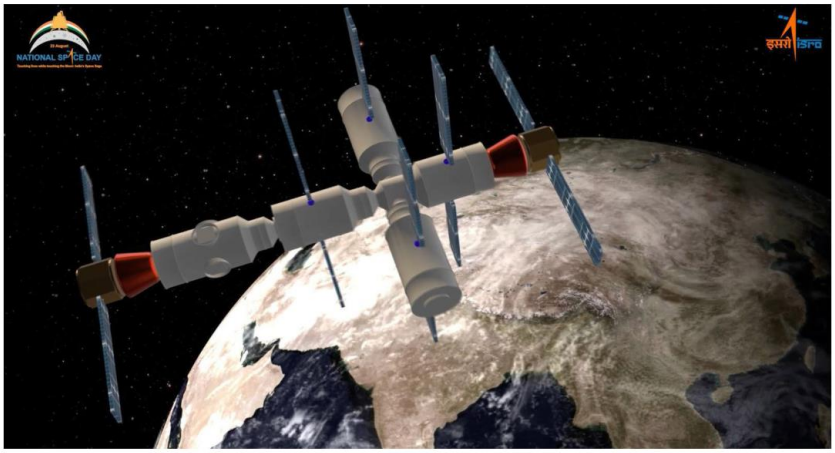
The Cabinet has also approved a scientific mission to Venus and the next Chandrayaan mission to the Moon. The Venus Orbiter Mission is expected to be launched in a window available in March 2028 and will cost ₹1,236 crore. With the mission, scientists hope to study the planet's acerbic surface and atmosphere to understand how different planets of the Solar System evolved.

Chandrayaan-4 and LUPEX

Chandrayaan-4 will be a sample-return mission. Its components will be launched on two separate LVM-3 launch vehicles; they will dock in earth orbit before going to the moon, and land on the surface near the location of Chandrayaan 3. There the mission will scoop up some samples of moon soil and rock and send them back to the earth onboard a bespoke canister. The mission is expected to be launched by 2027 and cost ₹2,104 crore.

The Space Commission also approved a joint moon mission with Japan called the Lunar Polar Exploration Mission (LUPEX). For LUPEX, ISRO is developing a different moon lander than the one it used for Chandrayaan-3, and which it hopes can be used in crewed lunar missions in future.

The Commission also signed off on the development of a third launch pad at Sriharikota, which ISRO will need to test and launch the NGLV.



An artist's rendering of the Bharatiya Antariksh Station in earth orbit. ISRO

SBS and Axiom-4

The Cabinet Committee on Security approved the third phase of the Space Based Surveillance (SBS) missions on October 11. For this, ISRO will build 21 satellites and private companies will build another 31, for ₹26,968 crore in all. This is a significant improvement over the four satellites ISRO built for SBS-1 in 2001 and six for SBS-2 in 2013.

India's astronaut-designate Sudhanshu Shukla had his space suit measured and also underwent pressurisation tests at the SpaceX headquarters. The event marks the official start of his 10-day training programme before he will fly to the International Space Station aboard the Axiom-4 mission next year.

Satellites en route to India

The NASA-ISRO Synthetic Aperture Radar (NISAR) is an earth-observation satellite whose radar antenna reflector recently landed in India from the Jet Propulsion Lab in California. Earlier, tests in India had revealed it may experience higher temperatures than expected during its launch. It had to be flown back to receive a protective coating. ISRO is expected to launch NISAR in early 2025 on board a Geosynchronous Satellite Launch Vehicle.

The Space Commission also approved a joint moon mission with Japan called the Lunar Polar Exploration Mission. For LUPEX, ISRO is developing a different moon lander than the one it used for Chandrayaan-3

The other mission, Proba-3 from Europe, will study the Sun's corona. It will have two satellites flying in formation: one will gaze at the Sun while the other will block the first satellite's view of the Sun's central area, like creating an eclipse, leaving only light from the corona to hit the cameras. The European Space Agency has said Proba 3 is expected to launch on board a PSLV-XL vehicle on November 29. India previously launched Proba-1 on the PSLV-C3 mission, in 2001.

From the private sector

Manastu Space signed an agreement with Dhruva Space to test its green propulsion technology to power the latter's Launching Expeditions for Aspiring Payloads (LEAP-3) mission. LEAP-3 will carry payloads from different companies in 2025. Manastu is developing a green propulsion system using a hydrogen-peroxide-based fuel. It first tested LEAP on the PSLV-C58 mission on January 1 this year.

Bellatrix Aerospace unveiled 'Project 200', a prototype for a satellite that can fly at an altitude of 200 km. a.k.a. the ultra-low earth orbit.

Ananth Technologies became the first private Indian company to assemble, integrate, and test two Space Docking Experiment (SpaDEx) satellites for ISRO at the company's facility in Bengaluru. The satellite was then sent to the U.R. Rao Satellite Center (URSC) in the same city.

Space science

Scientists have found that the crater where Chandrayaan-3 landed is older than the South Pole Aitken Basin, itself 4.2-4.3 billion years old.

This was based on data from the Optical High-Resolution Camera onboard the Chandrayaan-2 orbiter and navigational cameras on board Pragyaan, the Chandrayaan-3 rover.

Astrosat, India's first multi-wavelength space observatory, was built with a mission life of five years but has now operated for nine. Based on fuel readings, it is expected to last for another two years. The data collected by the observatory has been the basis of more than 400 published papers.

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('India in Space' will collect and analyse developments in the country's space, spaceflight, and allied sectors.)

THE GIST

- Four missions under the 'Gaganyaan' programme and four to test technologies for an Indian space station have been approved. ISRO also added one uncrewed Gaganyaan mission
- The Cabinet approved ISRO's development of the Next Generation Launch Vehicle for ₹8,240 crore. ISRO is expected to develop the vehicle with industry, so they can take over for operational flights
- Approval has been granted for a mission to Venus and the next Chandrayaan mission. The Venus Orbiter is expected to be launched in March 2028. Scientists hope to study the planet's acerbic surface
- As part of an expansion of Space Based Surveillance;, ISRO will build 21 satellites and private companies will build another 31, at a cost of ₹26,968 crore. ISRO built four satellites for SBS-1 in 2001 and six for SBS-2 in 2013

Here's a Breakdown of Important ISRO Missions:

- **Gaganyaan Human Spaceflight Programme**
  - Goal: India's first crewed space mission, aimed at demonstrating human spaceflight capabilities.
  - Components: Includes two uncrewed missions and one crewed mission to Low Earth Orbit (LEO).
  - Status: The Union Cabinet has approved additional funding for an extra uncrewed flight, bringing the total to four missions.
  - Budget: Received ₹11,170 crore in additional funding.
  - Timeline: Expected uncrewed missions will occur before the final crewed flight, likely launching by 2025.
- **Bharatiya Antariksh Station 1 (India's Space Station)**
  - Objective: India's first space station, designed to support research in space science and technology.
  - Details: Four missions are planned to test technologies critical for the space station's establishment.
  - Budget: The project received a budget allocation of ₹11,170 crore.
  - Timeline: Planned completion by 2028, after successful technology validation and testing.
- **Next Generation Launch Vehicle (NGLV)**
  - Purpose: A new rocket to replace the PSLV and GSLV series, supporting diverse missions from low earth orbit to interplanetary.
  - Funding: Cabinet approved ₹8,240 crore for its development, including the first three test flights.
  - Industry Role: ISRO to partner with private industry for streamlined operations.
  - Significance: Aims to enable India's space autonomy by supporting various mission payloads and requirements.
- **Polar Satellite Launch Vehicle (PSLV) – Private Sector**
  - Objective: A PSLV constructed by Hindustan Aeronautics Ltd. and Larsen & Toubro.
  - Expected Launch: End of 2024 or early 2025.
  - Role: First PSLV fully developed by Indian private sector entities, marking a shift towards industry-driven launch capabilities.
  - Significance: Enhances ISRO's launch frequency and reduces dependence on in-house manufacturing.
- **Chandrayaan-4 Moon Mission**
  - Mission Type: Sample-return mission targeting lunar surface.
  - Launch Vehicle: Components launched separately on LVM-3 rockets, docked in Earth orbit.
  - Landing Site: Near Chandrayaan-3's site to retrieve moon soil and rock samples.
  - Budget & Timeline: Estimated cost is ₹2,104 crore; planned launch by 2027.
  - Objective: Provides insight into the moon's surface and subsurface properties through returned samples.

- **Lunar Polar Exploration Mission (LUPEX) with Japan**
  - Goal: A joint mission with Japan focusing on exploring lunar poles.
  - ISRO Role: Developing a new lander variant that could support crewed missions in the future.
  - Objective: Studies the lunar south pole region, analysing resources for potential human exploration.
  - Importance: Advances international collaboration and India's lunar exploration expertise.
- **Venus Orbiter Mission**
  - Objective: Explore Venus's surface and atmosphere to understand planetary evolution.
  - Timeline: Expected to launch in March 2028.
  - Budget: Approved at ₹1,236 crore.
  - Focus: Investigation into Venus's greenhouse effect, geological activity, and atmospheric conditions.
- **Space Based Surveillance (SBS-3)**
  - Scope: Third phase of space-based surveillance, building on earlier SBS-1 and SBS-2 missions.
  - Components: Involves deploying 21 ISRO-built satellites and 31 private sector-built satellites.
  - Budget: ₹26,968 crore.
  - Purpose: Enhances India's capability in space-based monitoring, crucial for defence and environmental applications.
- **NISAR (NASA-ISRO Synthetic Aperture Radar)**
  - Purpose: Joint Earth observation mission with NASA to monitor land and ice movements.
  - Challenges: Satellite required additional thermal protection after tests revealed high launch temperatures.
  - Launch Timeline: Expected in early 2025 via GSLV.
  - Significance: One of the most advanced radar satellites, essential for climate and environmental studies.
- **Proba-3**
  - Objective: European Space Agency mission to study the Sun's corona.
  - Mechanism: Two satellites work in tandem, with one satellite blocking the Sun to simulate an eclipse.
  - Launch Timeline: Planned for November 29 on a PSLV-XL.
  - Significance: Enhances understanding of solar corona and solar storms, impacting space weather prediction.
- **Astrosat**
  - Description: India's first multi-wavelength space observatory, launched in 2015.
  - Achievements: Provided data for over 400 research papers; outlasted its initial five-year mission life, now in its ninth year.
  - Current Status: Expected to operate for another two years based on fuel levels.
  - Impact: Contributed significantly to space research in ultraviolet, optical, and X-ray observations.

Carbon credits are crucial financial instruments that enable the trade of emissions rights, with each credit allowing the emission of 1,000 kg of CO_2.

- A significant challenge lies in the verification process, making it difficult for certifying agencies to confirm actual emissions reductions.

WHAT IS IT?

Carbon credit: the right to emit

Vasudevan Mukunth

Carbon credits are an important new instrument of climate finance.

The green-coloured piece of paper printed by the Reserve Bank of India and circulated by the government is worth 20 rupees. The person who possesses it can buy a packet of biscuits by transferring that value to the seller. There are different ways to acquire such pieces of paper. For example, people do different kinds of jobs to earn money. Carbon credits are similar. Just like possessing the green note means you possess 20 rupees of value, possessing one carbon credit gives you a licence to emit 1,000 kg of carbon dioxide (or equivalent).

You can earn a carbon credit by removing 1,000 kg of carbon dioxide from the environment and submitting the proof to a government or suitable certifying agency. Once they sign off, you can sell your credit to potential buyers. Governments around the world have decided which types of work can earn carbon credits, who can certify them, and who can buy them. Such projects include most renewable energy installations, certain forests, and carbon capture facilities. The Paris Agreement set up an international carbon market as part of helping countries meet their emissions targets.

The Thwaites glacier in Antarctica. No matter how much the world cuts back on carbon emissions, a key and sizeable chunk of Antarctica is essentially doomed to an "unavoidable" melt, a new study has found. AP

An important problem with carbon credits is that the certifying agencies struggle to verify whether sellers have actually removed 1,000 kg of carbon dioxide. How countries can fix this problem is an important agenda item at the COP29 climate talks in Baku in November.

For feedback and suggestions
for 'Science', please write to
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with the subject 'Daily page'

Overview of Carbon Credits

- Carbon credits are significant instruments for climate finance, enabling the trading of emissions rights.
- Each carbon credit represents the permission to emit 1,000 kg of carbon dioxide (or equivalent).

Earning and Trading Carbon Credits

- Individuals or organisations can earn carbon credits by removing 1,000 kg of CO_2 from the environment.
- Proof of this removal must be submitted to a certifying agency, which verifies the claim.
- Once verified, carbon credits can be sold to buyers aiming to offset their emissions.

Eligible Projects

- Eligible projects for earning carbon credits include renewable energy installations, reforestation, and carbon capture technologies.

International Framework

- The Paris Agreement has established an international carbon market to assist countries in meeting their emissions targets.

Challenges in Verification

- A major issue facing the carbon credit system is the difficulty certifying agencies encounter in accurately verifying whether the claimed CO_2 reductions have actually taken place.

Upcoming Discussions

- Addressing verification challenges related to carbon credits is a key agenda item for the COP29 climate talks in Baku in November.

Page 10 : GS 3 – Environment – Environmental Pollution And Degradation

As winter approaches, Delhi's air quality is rapidly declining, with PM 2.5 levels frequently exceeding 300 due to stubble burning in Punjab.This seasonal issue has significant implications for public health and environmental policies in the region.

Why is Delhi's air quality deteriorating?

What factors contribute to the deterioration of air quality in Delhi during the winter months? How does stubble burning affect PM 2.5 levels? What role do urban emissions from vehicles play in determining air quality? Why is a coordinated approach necessary to tackle the air pollution crisis?

EXPLAINER

Jacob Koshy

The story so far:

With the withdrawal of the southwest monsoon and the onset of winter, the air quality in Delhi has started to nose-dive. This week, the city and its adjoining territories have consistently recorded particulate matter (PM 2.5) levels exceeding 300, or 'very poor' air quality, and forecasts suggest that this could worsen in the coming days. As is now an established pattern, the decline in air quality coincides with the burning of farm stubble, primarily from Punjab.

What is the contribution of stubble burning to air pollution?

Stubble burning refers to a traditional practice of farmers burning the remnants of paddy stalks after harvesting. This method is often the quickest way, as farmers in Punjab and Haryana have a narrow window of October and November to clear their fields and sow wheat for the winter. The environmental impact of stubble burning has been known since the 1990s. Agricultural researchers, while analysing the economics of rice-wheat cropping pointed out that rising labour costs made it expensive for farmers to collect rice stalks strewn across the field that resulted from the use of mechanical devices such as rice shredders and combine harvesters. Though the burning of rice stalk was initially condemned as a waste of valuable manure, concerns were also raised about its harm to farmers' health. However, its link to worsening air quality in Delhi was quantified only over the last decade and a half. Today, the use of sophisticated instruments, modelling studies, and computational methods have enabled the estimation, almost daily, of stubble burning's contribution to air quality in Delhi.

A study by the research and advocacy group Climate Trends of winter pollution trends in 2023 found a "strong correlation" between wind direction originating from Punjab and Haryana and the resulting pollution levels in Delhi. In the case of Punjab, during winter, 54% of the time the wind from the State blew towards Delhi, it led to a spike in air pollution; when the wind originated from Haryana, the figure stood at 27%. Every additional fire incident was correlated with an increase in PM2.5 levels of 12.44 units. Studies over the years, most recently in 2023 by a consortium of IIT Kanpur, IIT Delhi, TERI, and Airshed, Kanpur, found that from mid-October to the end of November 2022, the role of stubble burning to air quality was on average 22% and peaked to as much as 35%. This is fairly consistent with previous studies that have estimated the contribution of stubble burning to range from 20%- 40%. Based on these measurements, the Indian Institute of Tropical Meteorology-Pune (IITM-Pune) maintains an air quality forecast system that models the flow of airborne pollutants through cities. It shows the dynamic nature of stubble burning's impact on Delhi's pollution. For instance, from October 8 to 19 this year, farm fires accounted for less than 1.2% of the PM 2.5 load in Delhi. During this period, the average AQI stayed from 130 -198 (or the 'moderate' pollution category). However, on October 21, when stubble burning's relative contribution rose to 3.2%, Delhi's AQI immediately plummeted to 'very poor' (310). On October 23, when the relative contribution of burning reached the seasonal high of 16%, the index deteriorated to 364, still in the 'very poor' region. On October 26, the stubble burning contribution slightly dipped to 14.5%, and the AQI improved to 270 or 'poor' quality.

Stagnant winds: A farmer burns stubble to remove paddy crop residues from a field on the outskirts of Chandigarh. FILE PHOTO

What is the inference from these observations?

The transitioning period from the withdrawal of the monsoon to the onset of winter causes a sharp drop in windspeed, and cause air pollutants to hover closer to the ground rather than being flushed away to the higher realms of the atmosphere. In this situation, any additional source of pollutants – such as from stubble burning – can dramatically spike the pollutant load in Delhi. Also, nearly 55% of the pollution in Delhi originates outside its territorial borders, as studies have shown. Thus, relatively small spikes can push the index as much as 100 points and change categories anywhere from 'poor' to 'very poor.'

So is stubble burning the sole villain in Delhi's pollution?

Urban Emissions, a research outfit that tracks air pollution trends nationally, reports that from 2016-23, the improving air quality reflected in the index going from a high of 285 in 2017 to a low of 173 in 2021. However, in six of these seven years, the index stayed above 216 and therefore within the AQI categorisation of 'poor' air quality. However, in Punjab, the farm fires reduced by over an order of magnitude from 17,467 in 2018 (as of October 25, that year) to 1,749 (October 25) this year. Fire incidents in Haryana too have halved since 2020. The paddy harvested in Punjab is more than twice that in Haryana and yet, this has only improved the index by 65 points at the most. Significantly, December, January, and February are officially considered the winter months by the India Meteorological Department and by this time, the atmospheric conditions that create a trap for pollutants and prevent them from being flushed out, grow stronger. However, stubble burning almost entirely ceases. Despite that, data compiled by Urban Emissions says, the air quality index has consistently remained in the 'very poor' and 'severe' (400+) category from 2016-23. This suggests that sources other than stubble burning contribute significantly to air pollution.

Which are these factors?

On October 25 this year, stubble burning was responsible for nearly 15% of Delhi's air pollution. On the same day, 'Delhi transport' which includes particulate matter from vehicles and vehicles crossing into Delhi was responsible for about 18% of the PM 2.5 load, according to the IITM's air quality forecast system. The IIT Kanpur, IIT Delhi, and Teri consortia analysis of the sources of pollution in Delhi found that the real-time source apportionment of PM 2.5 results show secondary inorganic aerosols (SIA), which travel from beyond Delhi, contribute the highest to Delhi's pollution load. The average of winter pollution source apportionment shows SIA (32%) and biomass burning within and outside Delhi (24%) contribute the most followed by vehicles at 17%. The SIAs form when gaseous precursors like sulfur dioxide (SO2), nitrogen oxides (NOx), and ammonia (NH3) react to form ammonium sulfate or ammonium nitrate. In winter, the mean contribution of SIA from the sources within Delhi is 16% and the rest 84% from outside Delhi. In the last few years, policymakers have realised that the sources of air pollution can be tackled only via an airshed approach that requires coordinated action by multiple States including those beyond Delhi to evolve a joint response to the pollution crisis.

THE GIST

- With the withdrawal of the southwest monsoon and the onset of winter, Delhi's air quality has worsened, recording PM 2.5 levels exceeding 300 (classified as 'very poor').
- Farmers in Punjab and Haryana burn stubble after harvesting to quickly clear fields for winter wheat sowing, a practice linked to air quality issues since the 1990s.
- Other sources of pollution, such as secondary inorganic aerosols and urban emissions from vehicles, also significantly impact Delhi's air quality.
- Addressing air pollution in Delhi requires coordinated action among multiple States, as pollution sources often originate beyond the city's borders.

Declining Air Quality in Delhi

- The withdrawal of the southwest monsoon and the onset of winter have led to deteriorating air quality in Delhi, with PM 2.5 levels exceeding 300, indicating 'very poor' conditions.
- This drop in air quality aligns with the seasonal practice of stubble burning in Punjab, contributing significantly to pollution levels.

Stubble Burning: A Traditional Practice

- Stubble burning involves incinerating leftover paddy stalks after harvest, commonly used by farmers in Punjab and Haryana due to limited time to prepare fields for winter wheat.
- Rising labour costs make alternatives like mechanical shredding expensive, leading to continued reliance on burning, despite environmental concerns.

Contribution to Air Pollution

- Studies indicate a strong correlation between wind direction from Punjab and Haryana and pollution spikes in Delhi; each additional fire incident increases PM 2.5 levels by about 12.44 units.
- Research suggests that stubble burning contributes approximately 20% to 40% of Delhi's air pollution, peaking at 35% during critical periods.

Seasonal Trends and Pollution Dynamics

- The transition from monsoon to winter reduces wind speed, causing pollutants to settle closer to the ground; thus, additional sources like stubble burning can significantly impact the AQI.
- Over 50% of Delhi's pollution is attributed to external sources, indicating that local spikes can dramatically raise the AQI.

Beyond Stubble Burning: Other Pollution Sources

- Despite a reduction in stubble burning incidents—from 17,467 in 2018 to 1,749 in 2023—Delhi's air quality remains poor, suggesting other significant contributors.
- Transportation emissions account for around 18% of PM 2.5 levels, while secondary inorganic aerosols (SIA) from outside Delhi contribute significantly to overall pollution.

A Need for Coordinated Action

- The ongoing poor air quality, even after stubble burning has stopped, highlights the need to address other pollution sources effectively.
- The Indian Institute of Tropical Meteorology advocates for an airshed approach, necessitating collaborative efforts across multiple states to tackle the air quality crisis and improve conditions in Delhi and its vicinity.

In News : Great Indian Bustard

In a groundbreaking feat, a baby great Indian bustard was born via Artificial Insemination (AI) at the Sudasari Great Indian Bustard Breeding Centre in Jaisalmer district of Rajasthan.

About Great Indian Bustard:

- It is a bustard found on the Indian subcontinent.
- It is among the heaviest of the flying birds.
- Habitat: It inhabits dry grasslands and scrublands.
- Distribution: It is found mainly in the Thar Desert of Rajasthan that holds about 100 individuals. Also found in the arid regions of Maharashtra (Solapur), Karnataka (Bellary and Haveri) and Andhra Pradesh (Kurnool)

Features:

- It is a large bird with a horizontal body and long, bare legs, giving it an ostrich-like appearance.
- The sexes are roughly the same size, with the largest individuals weighing 15 kg (33 pounds).
- It can easily be distinguished by its black crown on the forehead, contrasting with the pale neck and head.

- The body is brownish, and the wings are marked with black, brown, and grey.
- They breed mostly during the monsoon season, when females lay a single egg on open ground.
- Lifespan: 12-15 years
- These birds are opportunistic eaters. Their diet ranges widely depending on the seasonal availability of food. They feed on grass seeds, insects like grasshoppers and beetles, and sometimes even small rodents and reptiles.
- **Conservation Status:**
    - IUCN: Critically Endangered
    - Wildlife (Protection)Act, 1972: Schedule 1
    - CITES: Appendix 1

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Daily News Analysis

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The private sector holds the key to India's e-bus push

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In a major push toward achieving India's climate targets, the Union Cabinet recently approved the PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) scheme, which allocates funding for electric vehicles (EVs) across many segments. This includes ₹4,391 crore for subsidies/demand incentives that support procurement of 14,028 electric buses in nine cities. This is an important move that strengthens the public transport sector's shift to EVs. But private bus operators are left out of the subsidy framework, which raises concerns about the potential to scale electric mobility beyond State-run buses.

Public sector driven despite fleet size

Electric bus deployment in India has thus far been driven by the public sector, which was supported with financial subsidies under the national Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles in India (FAME India) scheme. Under FAME I, from 2015-19, 425 buses received approval for purchase subsidies, which rose to 7,120 buses under FAME II, which ran from 2019-24. The incentives were available to State and city transport undertakings, municipal corporations, and other public entities. But public transport buses make up only 7% of the 24 lakh registered buses in India.

Indeed, despite private buses representing 93% of the buses in India, they are not yet included in any major national schemes or special incentive programmes. While a few leading private bus operators such as NueGo and Chartered Speed have electric buses in their fleets, the numbers remain small. If there is to be scale in the electric bus market in India, the transition of private buses is critical, and there are several areas where policy can help.

A recent International Council on Clean Transportation (ICCT) study suggested that the limited availability of financing is a key hurdle for the uptake of electric buses by the private sector. Higher perceived risk-return profiles, high upfront costs, and low perceived resale value of electric buses as collateral have made financing a challenge. Uncertainty regarding battery life increases this perceived risk.

If there is to be scale in the electric bus market in India, private sector participation is critical

The hurdles

Studies show that electric inter-city buses can be more profitable than diesel buses over their service life. However, high interest and loan instalment costs make them less financially viable during the loan period. Despite this, private intercity bus operators in India could benefit greatly from electric buses, as they would offset rising fuel costs. Intercity buses play a major role in India's transport, with 22.8 crore passengers daily, covering 57% of total ridership and 64% of vehicle-kilometres. Additionally, 40% of intercity trips fall within the 250 kilometre to 300 km range that current electric bus models can cover on a single charge. These operations are well suited for electric bus deployment.

As India aims to replace 8,00,000 diesel buses with electric ones by 2030, this ICCT report has highlighted the potential of offering favourable financing options such as interest subsidies and longer loan tenures to ease the financial burden. Additionally, credit guarantees, potentially rolled out through government banks and other designated financial institutions, are a way to help reduce investment risks for financiers.

Another key hurdle for private electric bus adoption is charging infrastructure. FAME-funded facilities are limited to the depots of State transport units, and as 90% of private bus operators in India manage fleets of fewer than five buses, the high land and infrastructure costs can make investing in charging facilities economically impractical. Even if the required space of 70 square metres to 120 sq.m. is available, the high cost of land lease rental could severely impact the economic viability of charging stations. Private intercity bus operators may also face challenges due to power supply interruptions, limited grid capacity, and inadequate upstream infrastructure. To accelerate private-sector electric bus adoption, it is essential to develop shared public charging infrastructure within cities and on high-traffic highways, particularly key intercity corridors. State governments could lead the development by leveraging financial subsidies offered under the PM E-Drive scheme, which aims to subsidise 1,800 bus chargers. To encourage private investment, States could also offer additional fiscal incentives or structure tenders for shared charging infrastructure on a design-build-operate-transfer (DBOT) basis, and ensure viability through guarantees of minimum daily energy consumption per charger.

A business model worth following

Another emerging business model, Battery-as-a-Service (BaaS), could reduce the high upfront costs of electric buses by separating battery ownership from vehicle ownership, as seen in China and Kenya. This model, along with battery swapping, has the potential to accelerate private electric bus adoption through usage-linked leasing and other solutions, such as Macquarie's Vertelo platform in India. An ICCT blog discussed these in detail and highlighted how they could help transform electric bus deployment in India.

To create scale and reduce costs in the electric bus market in India, promoting uptake in the private sector is crucial. As the government forges ahead in supporting the EV transition under the new PM E-DRIVE scheme, there are opportunities for policy in the areas of financing incentives, charging infrastructure, and innovative business models to help overcome barriers to electric bus adoption by private operators.

GS Paper 02&3 : Governance & Indian Economy

PYQ: UPSC CSE (M) GS-3 2023) The adoption of electric vehicles is rapidly growing worldwide. How do electric vehicles contribute to reducing carbon emissions and what are the key benefits they offer compared to traditional combustion engine vehicles? (250 words/15m)

UPSC Mains Practice Question : Discuss the role of the PM E-DRIVE scheme in advancing India's electric mobility goals. Analyse the challenges and potential policy measures needed to include private bus operators in the electric bus transition. (150 Words /10 marks)

Context :

- The PM E-DRIVE scheme aims to boost electric bus adoption in India's public transport with significant subsidies.
- However, it excludes private bus operators, who make up 93% of the country's bus fleet, posing a challenge for nationwide EV transition.
- Policy adjustments in financing and infrastructure could bridge this gap.

PM E-DRIVE Scheme Boosts EV Adoption for Public Buses

- The PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) scheme, recently approved by the Union Cabinet, focuses on accelerating electric vehicle (EV) adoption in public transport.
- It allocates ₹4,391 crore in subsidies to procure 14,028 electric buses across nine cities, signalling a significant step in India's efforts to reduce emissions in public transport.

Limited Inclusion of Private Bus Operators

- Despite private buses comprising 93% of India's 24 lakh registered buses, they are excluded from the subsidy framework, which raises concerns about scaling electric mobility.
- Private bus operators like NueGo and Chartered Speed have begun adopting electric buses, but overall numbers remain small, highlighting a gap in support compared to State-run buses.

Challenges in Financing for Private Sector Buses

- Financing remains a barrier for private bus operators due to high perceived risks, high upfront costs, and limited collateral value.

- A report by the International Council on Clean Transportation (ICCT) identified financing limitations as a significant hurdle, with factors such as uncertain battery life contributing to perceived risks.

Profitability Potential for Intercity Electric Buses

- Studies suggest electric intercity buses may offer higher profitability than diesel buses over time; however, high loan instalments make them less viable during the financing period.
- Intercity buses, which serve 22.8 crore daily passengers and account for 57% of total ridership, are suitable for electrification. Particularly given that 40% of trips fall within the 250–300 km range manageable by current electric buses.

Policy Recommendations for Financing Support

- To alleviate financing barriers, the ICCT report recommends options like interest subsidies, longer loan terms, and credit guarantees from government-backed institutions.
- By making electric buses more financially accessible, these measures could support private bus operators in transitioning to EVs.

Need for Shared Charging Infrastructure

- FAME-funded charging facilities are limited to State transport units, creating a challenge for smaller private operators who cannot afford the land and infrastructure costs of setting up charging stations.
- Expanding shared public charging infrastructure along major highways and intercity routes would enhance economic viability for private operators, with potential State government support.

Battery-as-a-Service Model for Cost Reduction

- Emerging business models like Battery-as-a-Service (BaaS) could help reduce upfront costs by separating battery ownership from vehicle ownership.
- The BaaS model, combined with battery-swapping options, offers a promising solution for private operators, as demonstrated in countries like China and Kenya.

Conclusion

- The PM E-DRIVE scheme presents an opportunity to promote EV transition within the public sector; however, greater private sector inclusion is essential to achieving scale.
- Policy interventions focused on financing, infrastructure, and innovative business models could facilitate private electric bus adoption, driving India's broader electric mobility objectives.