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MINISTRY OF SCIENCE AND TECHNOLOGY



MK Yadav Sir

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EUCALYPTUS

(Syllabus: GS Paper 3 – Env and Eco)

The controversy over eucalyptus planting in Kerala

Why did the Kerala government allow the Kerala Forest Development Corporation to plant eucalyptus trees? Why were environmentalists and social activists against the order?

The Hindu Bureau

The story so far:

The Kerala government issued an order allowing the Kerala Forest Development Corporation (KFDC) to plant eucalyptus trees for its financial sustenance in 2024-2025. Environmentalists soon protested the decision saying the move would adversely affect forests and heighten human-animal conflicts in future. Subsequently, the head of the Forest Force submitted a report to the State Forest Minister saying it hadn't permitted the planting of eucalyptus trees inside forests. On May 20, the government amended its order to limit permission to only cut exotic tree species from lands in the KFDC's control.

What are KDFC and its plantations?

The KFDC was established on January 24, 1975, as part of a dynamic production forestry enterprise. According to the KFDC website, the corporation has around 7,000 hectares (ha) of plantations. The plantation working circle includes the following species: Eucalyptus grandis, Acacia auriculiformis, Acacia mangium, Acacia crassicarpa, Acacia pycnantha (also known as wattle), Alnus nepalensis, Casuarina equisetifolia, and Pinus patula.

Eucalyptus plantations have a rotation age of nine years; Acacia auriculiformis trees, 18 years; and Acacia mangium, seven years. At the end of each cycle, plantations approved by the Union Ministry of Environment, Forests and Climate change are felled.

Clear-felled plantations are planted with species listed in a management plan. Before planting, experts check for soil quality and consult with the Kerala Forest Research Institute. As of this month, the KFDC website also said plantations of exotic species, including eucalyptus, would be converted to those of indigenous species once exotic flora has been felled "so as to be more ecologically and environmentally friendly".

What was the issue with the order?

In 2021, the State government had published an eco-restoration policy. Among other things, it sought to address what it called the "proliferation of invasive species that are not suitable for our environment" and the resulting "depletion of natural forests". Such depletion, according to the policy, was in turn forcing wild animals to move to human-occupied land in search of food and thus increasing the prevalence of human-wildlife conflict.

For example, a recent study by the Kerala State Forest Protective Staff Organisation – an association of frontline forest officers – found replacing exotic plants in forested areas with the corresponding natural species could help ensure food for wild elephants at Chinnakanal in Munnar. The Chinnakkanal landscape is prime elephant habitat in the Munnar forest

Eucalyptus Plantations

- **Rotation Age of Plantations**
  - **Eucalyptus Plantations**: Eucalyptus plantations have a rotation age of nine years.
  - **Acacia auriculiformis Trees:** Acacia auriculiformis trees have a rotation age of eighteen years.
  - **Acacia mangium Trees**: Acacia mangium trees have a rotation age of seven years.
- **Approval by Ministry**: Plantations are felled at the end of each cycle, with approval from the Union Ministry of Environment, Forests, and Climate Change.
- **Management Plan Species**: Clear-felled plantations are replanted with species listed in a management plan.

Context: Recently, the Kerala government authorized the Kerala Forest Development Corporation to plant eucalyptus trees for financial sustenance in 2024-2025, prompting environmentalist protests over potential negative impacts on forests and increased human-animal conflicts.

Eucalyptus

- **About:** It is cultivated in almost all states and Union territories of India, and the most suited variety from the 700 available species are picked according to the region of cultivation.
- **Major Production**: Andhra Pradesh and Telangana, Tamil Nadu, Punjab, Haryana are few of the states which produce the bulk of eucalyptus in the country which suffices the demands of the timber, pulp and paper industries.
  - However, Karnataka in 2017, banned eucalyptus
- **Nature**: They can be highly competitive with other plant species and are often dominant in ecosystems where they grow.
- **Origin of Eucalyptus**: These species are native to Australia and nearby islands, primarily found on the Australian continent itself.
- **Uses:** Many medicines to treat coughs and the common cold contain eucalyptus.

INDIAN EXPRESS

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CUBESATS

(Syllabus GS Paper 3 – Sci and Tech)

How tiny satellites will track heat loss from Earth's poles

LIND CHAUHAN
EW DELHI, MAY 27

N MAY 25, NASA launched one of two limate satellites that will study heat missions at the poles of the Earth. The atellite was launched by Rocket Lab's lectron rocket from Mahia, New Zealand.

The shoebox-sized 'cube' satellites, or ubeSats, will measure how much heat he Arctic and Antarctica — two of the oldest regions on the Earth — radiate nto space and how this influences the lanet's climate. The mission has been amed PREFIRE (Polar Radiant Energy in he Far-InfraRed Experiment), and was ointly developed by NASA and the niversity of Wisconsin-Madison.

What are CubeSats?

CubeSats are miniature satellites with basic design size of 10 cm x 10 cm x 10 cm which is "one unit" or "1U") cube — just a ttle bigger than a Rubik's Cube puzzle — nd weight not more than 1.33 kg. Depen- ing on the mission, the CubeSat can be .5, 2, 3, 6, or 12U, according to NASA.

These satellites were first developed n 1999 by California Polytechnic State niversity at San Luis Obispo and tanford University as educational tools. lowever, owing to their low cost and nass in comparison to traditional satel- tes, they began to be put in orbit for tech- ology demonstrations, scientific re- earch, and commercial purposes.

Each of the PREFIRE satellites is a 6U ubeSat. They are around 90 cm in height, nd will be 120 cm in width after the so- r panels, which will power the satellite, re deployed. The satellites will be placed n a near-polar orbit (a type of low Earth rbit) at an altitude of about 525 km.

Why measure heat emissions at the arth's poles?

Temperature and climate on Earth is etermined by the difference between he amount of heat incoming to Earth rom the Sun and the amount of heat out- oing from Earth into space. This balance known as the Earth's energy budget.



PREFIRE CubeSat is loaded on to the rocket payload on May 15. NASA

A large amount of the heat radiated from the Arctic and Antarctica is emitted as far-infrared radiation — with wavelengths of 3 µm to 1,000 µm within the infrared range of electromagnetic radiation. However, there is currently no way to measure this type of energy, resulting in a gap in knowledge about the planet's energy budget.

How will the PREFIRE mission help?

The PREFIRE CubeSats will study far-infrared radiation from the Earth's poles, and the data collected by them would help scientists better understand the energy budget of the planet.

"Their observations will help us understand the fundamentals of Earth's heat balance, allowing us to better predict how our ice, seas, and weather will change in the face of global warming," Laurie Leshin, director of NASA's Jet Propulsion Laboratory, said in a statement.

Each PREFIRE CubeSat is equipped with a Thermal Infrared Spectrometer (TIRS) to measure the amount of infrared and far-infrared radiation. The spectrometer has specially-shaped mirrors and detectors for splitting and measuring infrared light, NASA said.

The CubeSats will also measure the amount of far-infrared radiation trapped by atmospheric water vapour and clouds at the poles, and how this influences the greenhouse effect in the region.

Context: NASA recently launched one of two climate CubeSats from Māhia, New Zealand, to measure heat radiation from the Arctic and Antarctica and its impact on Earth's climate.

CubeSats

- **About:** These are essentially miniature satellites with a basic design of a 10 cm x 10 cm x 10 cm cube, also known as "one unit" or "1U."
- **Size and Weight**: Each unit of a CubeSat is just a little bigger than a Rubik's cube and weighs no more than 1.33 kg.
- **Configurations:** Depending on the mission, CubeSats can be configured in sizes of 1.5, 2, 3, 6, and 12 units (U), according to NASA.
- **Origin**: CubeSats were first developed in 1999 by California Polytechnic State University at San Luis Obispo (Cal Poly) and Stanford University as educational tools.
- **PREFIRE Satellites**: Each of the PREFIRE satellites is a 6U CubeSat.
    - It is a mission aimed at studying heat emissions at the Earth's poles to understand their role in global climate change.
- **Orbit:** The two PREFIRE satellites will be placed in a near-polar orbit, a type of low Earth orbit, at an altitude of about 525 kilometres.
- **Significance:** CubeSats will measure the amount of far-infrared radiation trapped by atmospheric water vapour and clouds at the poles and how this influences the greenhouse effect in the region.

DTE May 26

DHOLE

(Syllabus: GS Paper 3 – Env and Eco)

World Dhole Day 2024: Sambar for lunch, with some coffee

Context: The dhole has recently begun its comeback in Nepal, where it had been locally extinct for over a decade.



Dhole

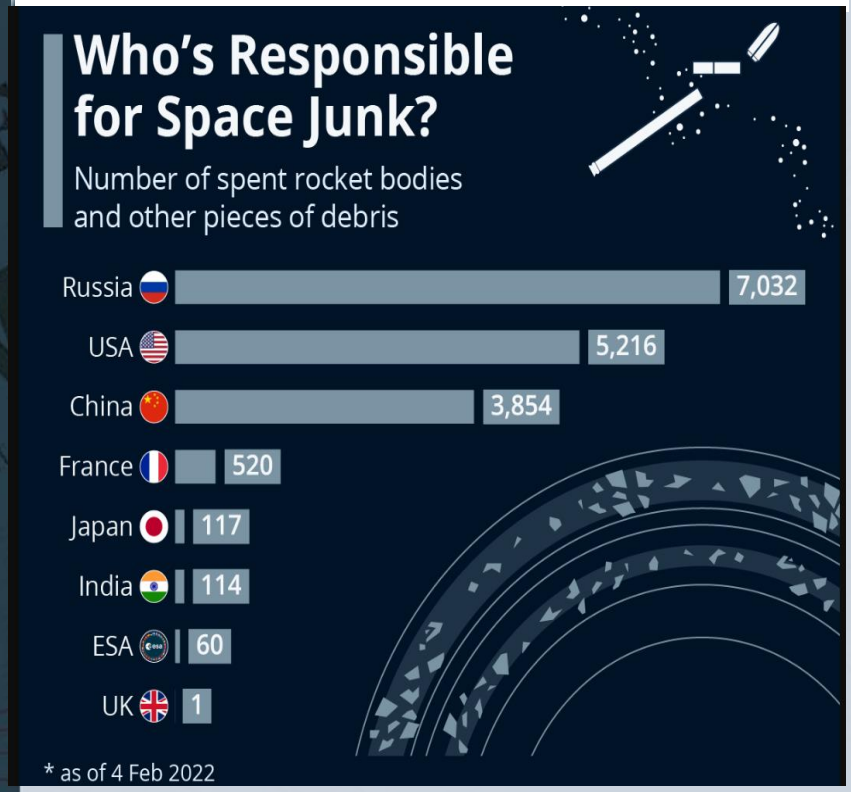
- **About:** is a wild carnivorous animal, belonging to the family Canidae and the class Mammalia.
- **Scientific name**: Cuon alpinus
- **Common Names**: They are also known as Asian wild dogs.
- **Habitat:** Dholes occurred throughout southern Russia, central Asia, south Asia, and southeast Asia.
- **Current Distribution**: Recent research shows they are now restricted to south and southeast Asia, with the northernmost populations in China.
- **Distribution in India**: In India, dholes are found in three main clusters: the Western and Eastern Ghats, the central Indian landscape, and North East India.
- **Conservation Efforts in India**: Karnataka, Maharashtra, and Madhya Pradesh rank high in the conservation of the endangered dhole, as per a 2020 study.
- **Ecological Role**: Dholes play a crucial role as apex predators in forest ecosystems.
- **Conservation Status**
  - **IUCN Red List:** Endangered.
  - **CITES:** Listed in Appendix II.
  - **Wildlife Protection Act, 1972**: Included in Schedule II.

THE HINDU Page 8

ZERO DEBRIS CHARTER

(Syllabus: GS Paper 3 – Economy)

Twelve countries sign the Zero Debris Charter



Context: Recently, twelve nations affirmed their commitment to the long-term sustainability of human activities in Earth orbit by signing the Zero Debris Charter at the ESA/EU Space Council.

Zero Debris Charter

- **Introduced by:** European Space Agency (ESA), was unveiled at the ESA Space Summit in Seville meeting in November 2023.
- **ESA Member States' Encouragement**: The Charter responds to ESA Member States' encouragement for the agency to adopt a "Zero Debris" approach for its missions and to advocate similar strategies among partners and other space actors.
- **Global Collaboration for Sustainability**: It stands as the pioneering initiative uniting diverse space actors worldwide, aiming to eliminate space debris by 2030 and ensure the long-term sustainability of space activities.
- **Guiding Principles**: The Charter integrates comprehensive guiding principles and achievable yet ambitious technical targets, forming the basis of a robust Zero Debris roadmap to drive global efforts in space debris mitigation and remediation.
- **Non-Legally Binding Agreement**: While non-legally binding, the Charter cultivates a proactive community committed to collectively defined objectives for 2030, fostering collaboration among stakeholders.
- **Specific Targets**: Charter include maintaining a mission's space debris generation probability below 1 in 1,000 per object and achieving a 99% success rate for post-mission disposal, supplemented by transparent information sharing and space traffic coordination.
- **Focus Areas for Implementation:** To realize the Charter's objectives, ESA emphasizes the development of groundbreaking technologies for satellite end-of-life disposal, in-orbit servicing, and active debris removal, alongside collaboration with regulatory institutions.

DTE May 27

AMAZON RAINFORESTS
(Syllabus: GS Paper 1 – Geography)

Over a third of Amazon rainforest is unable to recover from frequent droughts

Amazon Rainforests

- **Largest Rainforest:** The Amazon is the world's largest rainforest, surpassing the combined size of the next two largest rainforests in the Congo Basin and Indonesia.
- **Distribution**: The majority of the forest, **60%, is in Brazil**, followed by **Peru with 13%,** Colombia with 10%, and with minor amounts in Bolivia, Ecuador, French Guiana, Guyana, Suriname, and Venezuela.
- **Bounded by:**
  - The Guiana Highlands to the north,
  - Andes Mountains to the west,
  - Brazilian central plateau to the south,
  - Atlantic Ocean to the east.
- **Coverage**: Approximately 6.9 million square kilometers, the Amazon Basin is equivalent in size to the contiguous United States and spans about 40% of the South American continent.
- **Vegetation**: Many species of myrtle, laurel, palm, and acacia, as well as rosewood, Brazil nut, and rubber tree
- **Major wildlife**: Jaguar, manatee, tapir, red deer, capybara and many other types of rodents,
- **National Parks**: Yasuni National Park (Ecuador), Mamiraua Sustainable Development Reserve (Brazil), Tumucumaque National Park (Brazil), Amacayacu National Natural Park (Colombia) etc.



Context: The recent study, "Critical Slowing Down of the Amazon Forest After Increased Drought Occurrence," noted that between 2001 and 2019, the Amazon experienced three "one-in-a-century" droughts, with climate change likely to intensify these events.

SUN'S MAGNETIC FIELD

(Syllabus: GS Paper 3 – Sci and Tech)

NEW FINDING MAY IMPROVE ABILITY TO FORECAST SOLAR STORMS

THE SUN'S magnetic field, which causes solar storms like the one that hit the Earth this month and produced beautiful auroras, may originate at shallower depths in the star's interior than previously thought.

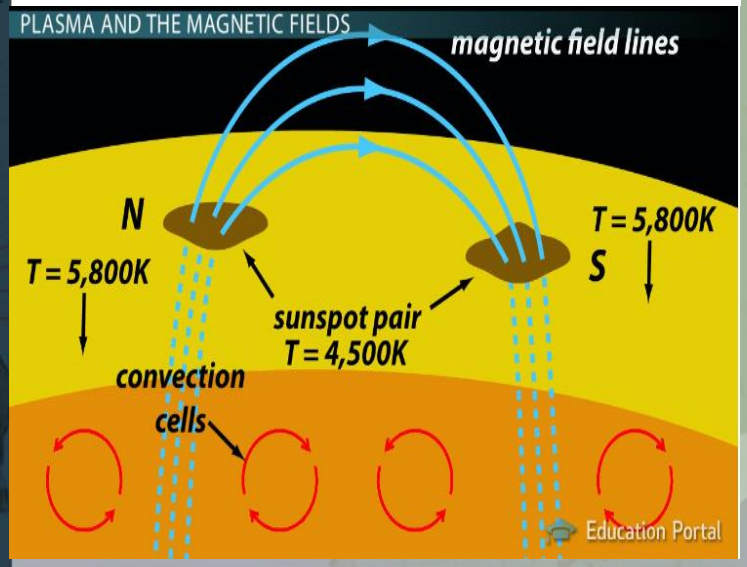
The Sun's outer 30% consists of an "ocean" of churning gases plunging more than 210,000 km below the solar surface. New research, comparing latest theoretical models to observations by the Sun-observing SOHO spacecraft, provides strong evidence that its magnetic field is generated near the top of this ocean — less than 5% inward, or about 32,000 km — rather than near the bottom, as long hypothesised.

In addition to providing insight into the Sun's dynamic processes, the findings may improve the ability to forecast solar storms and guard against potential damage to electricity grids, radio communications, and orbiting satellites, the researchers said.

Most stars have magnetic fields, apparently generated by the motion of super-hot gases inside them. The Sun's ever-changing magnetic field drives the formation of sunspots — shifting dark patches — on its surface and triggers solar flares that blast hot charged particles into space.

The mechanism of the generation of the Sun's magnetic field has been an unsolved problem in theoretical physics. The researchers hypothesise that these flow patterns are the key. REUTERS

PAPER CLIP NEW RESEARCH



Context: Scientists have believed the Sun's powerful magnetic field, responsible for solar storms that impact Earth, originated deep within the star.

Sun's Magnetic Field

- **About**: Magnetic fields are produced in the Sun by the flow of electrically charged ions and electrons. Sunspots are places where very intense magnetic lines of force break through the Sun's surface.
  - The sunspot cycle results from the recycling of magnetic fields by the flow of material in the interior.
- **Magnetic Field Generation**: New research suggests the sun's magnetic field is likely generated near the top of this "ocean," less than 5% inward.
- **Role of Magnetic Fields**: It is driven by the sun's ever-changing field, lead to phenomena like sunspots and solar flares.
- **Windy Regions and Magnetic Fields:** The top 5% to 10% of the sun is ideal for magnetic field generation due to unique wind patterns.
- **Significance:** A better understanding of the Sun's magnetic field and its behavior will allow us to make better predictions of space weather.

Sun vs. Earth Magnetic Fields

- **Origins: Sun vs. Earth Magnetic Fields** The sun and Earth both generate magnetic fields through dynamo processes involving rotating conductive fluids.
- **Composition: Iron vs. Ionized Gases:** Earth's magnetic field arises from molten iron, while the sun's stems from hot, ionized gases.
- **Reversal Frequency**: Earth's magnetic field experiences reversals roughly every 200,000 to 300,000 years, whereas the sun's field flips every 11 years.

KETONE

(Syllabus: GS Paper 3 – Sci and Tech)



WHAT ARE KETONES AND WHAT DOES A HIGH LEVEL IN BODY INDICATE?

Anuja.Jaiswal@timesgroup.com

TOI Explains

WHAT ARE KETONES?

Ketones are organic compounds produced when the human body breaks down fat for energy in a process called ketosis. It occurs when there is inadequate glucose or carbohydrates available to fuel the body's cells and fat has to be broken down. Ketones are water-soluble molecules that can serve as an alternative energy source, particularly for the brain.

HOW DOES THE LEVEL OF KETONE INCREASE IN THE BODY?

Ketone levels increase due to various reasons. According to Dr Richa Chaturvedi, senior endocrinology consultant at Indraprastha Apollo Hospitals, one common cause is a low-carbohydrate or ketogenic diet, where the body shifts its primary fuel source from glucose to fat. But prolonged fasting, starvation and metabolic disorders such as diabetes can trigger ketone production. "In diabetics, insufficient insulin or insulin resistance can lead to increased ketone levels, a condition known as diabetic ketoacidosis (DKA)," explained Chaturvedi.

CAN A HIGH KETONE LEVEL BE CONSIDERED LIFE-THREATENING?

High levels of ketones can prove life-threatening if left untreated. DKA primarily affects those with type 1 diabetes (autoimmune condition in which pancreas produce little or no insulin) and only in some cases, type 2 diabetes (pancreas doesn't produce enough insulin or body does not use insulin properly). "When insulin is insufficient, the body breaks down fat, producing excessive ketones that turn the blood acidic," said Chaturvedi. "Untreated DKA can lead to coma, brain swelling, respiratory failure and death." Other complications include dehydration, electrolyte imbalance and kidney damage. Prompt medical intervention with fluids, insulin and electrolyte replacement is crucial to correct the imbalance and prevent long-term issues.

WHO ARE LIKELY TO SUFFER HIGH KETONE LEVELS?

"People with type 1 diabetes are more likely to get DKA and it's often more serious in them than in people with type 2 diabetes," said Dr Ashok Kumar Jhingan, senior director, Centre for Diabetes, Thyroid, Obesity & Endocrinology, BLK-Max Super Specialty Hospital. People with type 2 diabetes can still get DKA if the insulin their pancreas produce isn't enough to stop their body from burning fat.

WHEN ARE KETONE LEVELS CONSIDERED HIGH?

Ketone levels are considered slightly elevated and call for caution when measured in the blood or urine at 0.6 to 1.5 mmol/litre. A level of 1.6 to 3 mmol/L is considered moderately elevated and requires medical advice, while a reading of 3 mmol/L indicates a risk of diabetic ketoacidosis and necessitates immediate medical intervention, according to Dr Manish Srivastava, consultant, endocrinology, Narayana Hospital.

WHAT ARE THE SYMPTOMS OF A HIGH KETONE LEVEL?

Early symptoms of high ketone levels are similar to symptoms of high blood sugar and include dry mouth, dry skin, dehydration, headache, frequent urination and a feeling of extreme thirst. Without treatment, DKA can progress within 24 hours, sometimes even less. The symptoms include nausea, vomiting, fatigue (feeling tired and weak even with rest), abdominal pain, shortness of breath, confusion and a fruity-smelling breath, sometimes called 'keto breath'.

WHAT DO DOCTORS ADVISE DIABETICS TO PREVENT DKA?

Diabetics are urged to follow the treatment plan agreed upon with their diabetes care team, including adjusting the insulin dose when needed and monitoring blood glucose. They should ask their care team about getting a continuous glucose monitor or flash monitor if they do not have one. Diabetics should go for ketone tests when blood glucose readings are high or when the diabetic is ill. Insulin should never be skipped, even if the individual is not eating.

Context: The Delhi Chief Minister's recent significant weight loss and elevated ketone levels raise concerns.

Ketone

- **About**: Ketones are organic compounds produced during ketosis when the body breaks down fat for energy due to insufficient glucose or carbohydrates.
  - They serve as an alternative energy source, especially for the brain.
- **Level of Ketone in the Body**: Ketone levels increase due to factors like a low-carbohydrate or ketogenic diet, prolonged fasting, starvation, or metabolic disorders such as diabetes.
  - Insufficient insulin or insulin resistance in diabetics can lead to a condition called diabetic ketoacidosis (DKA).
- **Symptoms**:
  - Early symptoms include dry mouth, dry skin, dehydration, headache, frequent urination, and extreme thirst.
  - Without treatment, DKA symptoms can progress rapidly within 24 hours, including nausea, vomiting, fatigue, abdominal pain, shortness of breath, confusion, and fruity-smelling breath.
- **Common Treatments**: It depends on the severity of ketone levels, often involving steps to lower levels at home.
  - Healthcare providers may advise on insulin dosage, food and water intake, safe activity levels, and frequency of blood sugar and ketone monitoring.

PPIRP
(Syllabus: GS Paper 3 – Economy)

Pre-pack insolvency a success for five companies

Context: The Pre-packaged Insolvency Resolution Process (PPIRP) has resulted in the full settlement of operational creditors' claims in five cases.

Pre-packaged Insolvency Resolution Process (PPIRP)

- **About**: PPIRP involves the negotiation of a pre-packaged plan between the debtor and its creditors before the commencement of the insolvency process.
- **Introduced in**: April 2021 to address the impact of the Covid pandemic on small and mid-sized companies.
- Aimed at providing tailored solutions for distressed MSMEs due to their unique business nature.
- **Purpose**: Provides an expedited resolution mechanism for micro, medium, and small enterprises facing financial distress.
- **Process:** Involves negotiation and agreement between debtor and creditors on a resolution plan before formal insolvency proceedings.
    - Upon creditor approval, the pre-packaged plan is submitted to the National Company Law Tribunal (NCLT), resembling an out-of-court settlement.
    - Drafting and finalization of the resolution plan precede formal initiation of the insolvency process.
    - The finalized plan, upon creditor majority approval, is presented to NCLT.
- **Implementation**: It is initiated voluntarily by the debtor.
- **Legal Provision**: It is a recent addition to the Insolvency and Bankruptcy Code, 2016 (IBC) and provides for a faster and more efficient mechanism for the resolution of corporate insolvency.
- **Significance:** Reduces resolution time compared to the traditional corporate insolvency resolution process, with minimal disruptions.

THE HINDU

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GUIDELINES OF MCC

(Syllabus: GS Paper 2 – Polity)

BJP's ads against Trinamool *prima facie* disparaging: SC

Top court says 'degenerating' debates during the Lok Sabha election process will harm voters' interests; the BJP says the advertisements were based on facts; Bench tells it 'your rival is not your enemy'; party to reply to the EC notice today

Krishnadas Rajagopal
NEW DELHI

The Supreme Court told the Bharatiya Janata Party (BJP) on Monday that degenerating debates during the Lok Sabha election would only harm voters' interests while finding advertisements published by the party against the Trinamool Congress "*prima facie* disparaging".

A Vacation Bench of Justices J.K. Maheshwari and K.V. Viswanathan refused to interfere with an injunction issued by the Calcutta High Court against the "derogatory" and "slanderous" advertisements.

"*Prima facie*, these advertisements are disparaging... You [BJP] can promote yourself, you can say you are the best... We [Supreme Court] cannot lend our hand to cause acrimony," Justice Viswanathan told BJP counsel, senior advocate P.S. Patwalia.

Justice Viswanathan said such advertisements "would not be in the interest of the voters. It will degenerate the debate". Justice Maheshwari referred to specific page numbers in the court's records, asking Mr. Patwalia to consider the advertisements contained in them.

'Rival, not enemy'

"Why are you precipitating things by coming here?" Justice Maheshwari asked. Justice Viswanathan told the BJP counsel that his client should keep in mind that "your rival is not your enemy". Mr. Patwalia submitted that the advertisements were based on facts.

The Single Judge of the High Court had passed the interim injunction order *ex parte*, without giving it a chance to be heard.

The Trinamool had already approached the Election Commission (EC) against the advertisements. The EC had issued a show cause notice to the BJP on May 18. The party was supposed to file its response on May 21.

Mr. Patwalia said the Trinamool had, while the EC proceedings were on, simultaneously approached the High Court on May 20. The High Court had proceeded to issue the injunction order, making it applicable till June 4.

"We want to file a reply by tomorrow to the EC notice. We will appear the day after tomorrow. Let the EC pass an appropriate order. We were not even heard by either the EC or the High Court," the senior counsel argued.

CONTINUED ON » PAGE 10

Set standards

Excerpts from the Model Code of Conduct on the general conduct of political parties and candidates:



- Criticism of other political parties, when made, shall be confined to their policies and programme, past record and work
- Refrain from criticism of all aspects of private life, not connected with the public activities of the leaders or workers of other parties
- Criticism of other parties or their workers based on unverified allegations or distortion shall be avoided

Nothing 'corrupt' if poll promises work out, says SC

NEW DELHI

The Supreme Court on Monday said that there is nothing corrupt about promises made in a manifesto working out eventually to the public's financial benefit. It said the view that commitments which help voters get richer amount to a "corrupt practice" was "far-fetched". » PAGE 12

Context: Recently, the Supreme Court declined the ruling party's challenge against a Calcutta High Court order, barring the publication of derogatory ads targeting the opposition party.

Guidelines of MCC

- The MCC contains eight provisions dealing with general conduct, meetings, processions, polling day, polling booths, observers, the party in power, and election manifestos.
- Criticism of other political parties, when made, shall be confined to their policies and programme, past record and work.
- Refrain from criticism of all aspects of private life, not connected with the public activities of the lead- ers or workers of other parties.
- Criticism of other parties or their workers based on unverified allegations or distortion shall be avoided.

Model Code of Conduct

- **About:** The MCC is a set of guidelines established by the Election Commission of India (ECI) to regulate the conduct of political parties and candidates during elections.
- **Objective**: The primary goal of the MCC is to ensure orderly, transparent, and peaceful campaigning, polling, and counting processes.
- **Constitutional Mandate**: It aligns with Article 324 of the Constitution, empowering the ECI to supervise and ensure the fairness of parliamentary and state legislative elections.
- **Legal Status**: The MCC was the result of a consensus among major political parties. It has no statutory backing.
- **Duration:** The MCC remains in effect from the announcement of the election schedule until the declaration of results.
- **History**: Originating from the 1960 Kerala Assembly elections, it evolved from a localized "Code of Conduct" formulated by the state administration.

TIMES OF INDIA

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HYDROGEN FUEL CELL

(Syllabus: GS Paper 3 – Sci and Tech)



Army to develop hydrogen fuel cell tech for e-mobility

TIMES NEWS NETWORK

The two sides also signed an MoU for testing and deployment of hydrogen fuel cell technology for heavy-duty e-mobility

New Delhi: The Indian Army has set its sight on deploying hydrogen fuel cell technology for heavy-duty e-mobility, even as the force on Monday received a state-of-the-art green hydrogen fuel cell bus for use in Delhi from IndianOil, India's largest state-run refiner and fuel retailer.

The two sides also signed an MoU for testing and deployment of hydrogen fuel cell technology for heavy-duty e-mobility at the National War Memorial, India Gate, in the presence of army chief, Gen. Manoj Pande, and IndianOil chairman S M Vaidya.

The trial run of the hydrogen fuel cell bus is the latest in a series of sustainability and green initiatives taken by the Army, a large consumer of hydrocarbons, to reduce its carbon footprint. The initiatives range from tapping renewable energy sources to planting trees and moderating energy use through increased efficiency.

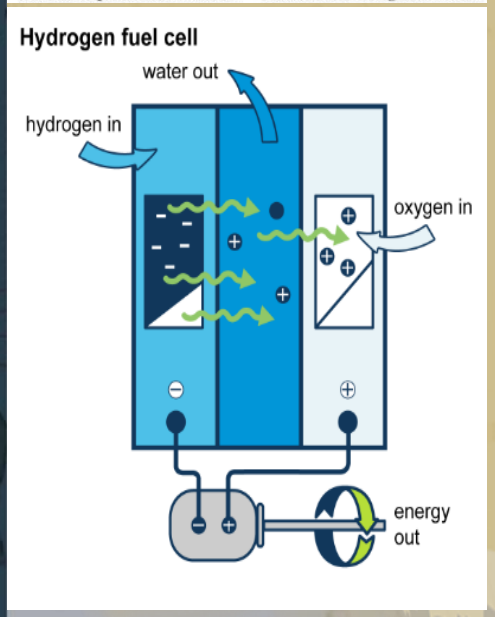
Hydrogen fuel cell bus is one of several initiatives IndianOil is carrying out in the new-age mobility solutions, including a joint venture with an Israeli startup Phinergy on aluminium-air batteries.

"The Indian Army is committed to exploring and adopting innovative technologies that enhance our operational capabilities while ensuring environmental sustainability. We will be testing one of the hydrogen buses, and I must thank IndianOil for choosing the Indian Army as their partner," he said.

Describing the collaboration with the Army as a "landmark step towards a greener and more sustainable future," Vaidya said IndianOil is currently operating 15 fuel cell buses in the Delhi-NCR region, accumulating a total mileage of 3,00,00 km.

The project will assess the performance of fuel cell electric buses for public transit in the demanding climatic conditions of the Delhi-NCR region, analyzing the impact of local fuel and air quality on the performance of fuel cell systems and vehicles. It will also evaluate the effectiveness, longevity, and operational reliability of fuel cell buses intended for public fleet utilisation.

A company statement said the initiative marks a pivotal step in the journey towards sustainable transportation, setting a precedent for future collaborations aimed at advancing green hydrogen and fuel cell technologies in India.



Context: The Indian Army, recently focusing on hydrogen fuel cell technology for heavy-duty e-mobility, received a state-of-the-art green hydrogen fuel cell bus from Indian Oil for use in Delhi.

Hydrogen Fuel Cell

- **About**: It is a device that converts the chemical energy from hydrogen into electricity through an electrochemical reaction.
- This technology involves combining hydrogen and oxygen to produce electricity, heat, and water.
- **Key Component :**
- **Electrolyte**: The fuel cell contains an electrolyte, a substance that conducts ions. Commonly used electrolytes include proton exchange membrane (PEM), phosphoric acid, molten carbonate, and solid oxide.
- **Anode**: Hydrogen gas is fed into the anode side of the fuel cell. At the anode, hydrogen molecules (H2) are split into protons (H+) and electrons (e-) through a process called electrolysis.
- **Cathode**: Oxygen from the air is supplied to the cathode side of the fuel cell. The oxygen molecules combine with electrons and protons that have traveled through an external circuit from the anode, creating water (H2O) as a byproduct.
- **Electrochemical Reaction**: The chemical reactions occurring at the anode and cathode generate an electric current. This electricity can be utilized to power electric vehicles, electronic devices, or provide electricity for various applications.
- **Benefits:** Low-to-zero emissions, High Efficiency, Reliability, Fuel Flexibility, Energy Security, Durability, Scalability and Quiet Operation.
- **Applications:** Hydrogen fuel cells find applications in various sectors, including transportation (fuel cell vehicles), stationary power generation, and portable electronic devices.
- **hydrogen fuel cell bus:** The bus has been developed by the Council of Scientific & Industrial Research (CSIR) and KPIT, an Indian Multinational Corporation.
    - **Significance**: It is in tune with the National Hydrogen Energy Mission.
    - **Environmentally friendly mode of transportation**: The fuel cell utilises Hydrogen and Air to generate electricity to power the bus and the only effluent from the bus is water.

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