

## DAILY CURRENT AFFAIRS (DCA)

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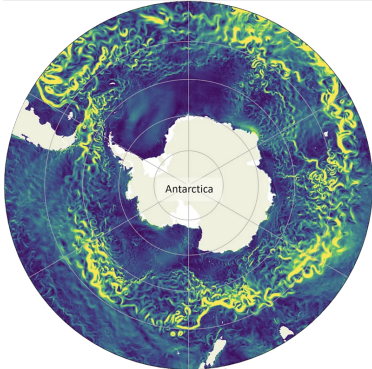
## ANTARCTIC CIRCUMPOLAR CURRENT (ACC) IS SLOWING DOWN RAPIDLY

### Context

- Scientists warn that the **Antarctic Circumpolar Current (ACC)** could slow by about **20% by 2050** under a high carbon emissions scenario.

### About

- ACC** is the **world's strongest ocean current**.
  - It's **five times stronger than the Gulf Stream** and **more than 100 times stronger than the Amazon River**.



- It forms **part of the global ocean "conveyor belt"** connecting the Pacific, Atlantic and Indian oceans.
- ACC's Role:** ACC moves **clockwise** around **Antarctica** and **regulates global climate** by influencing the ocean's ability to **absorb heat and CO2** and **preventing warm waters from reaching Antarctica**.
  - The system **regulates Earth's climate** and pumps water, heat and nutrients around the globe.

### Impacts of Slowing down of ACC

- Impact on Climate and Carbon Absorption:** If the ACC breaks down, it could lead to more climate variability, extreme weather in certain

regions, and accelerated global warming due to reduced carbon absorption by the ocean.

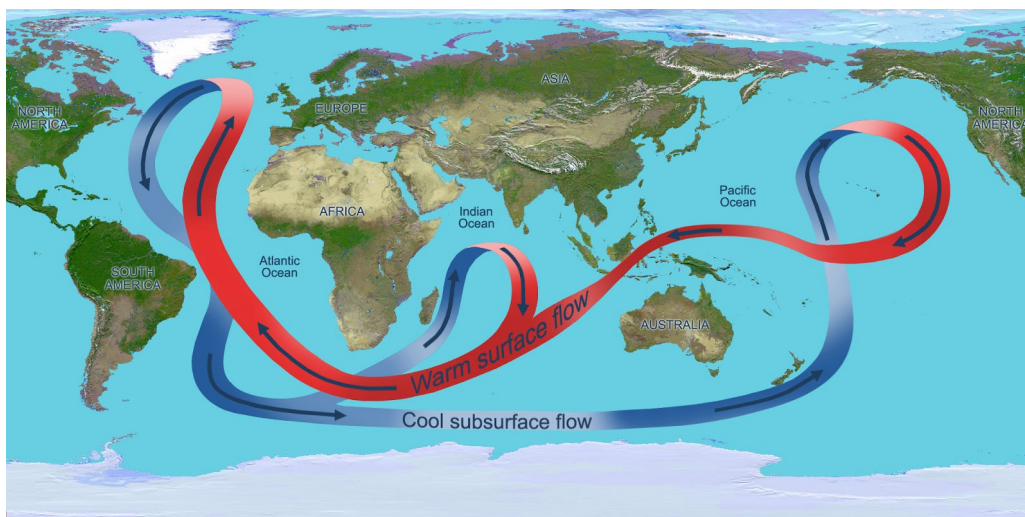
- Threat to Antarctic Ecosystem:** Slowing of the ACC could allow invasive species (e.g., southern bull kelp, shrimp, mollusks) to reach Antarctica, disrupting the local food web and affecting native species like penguins.
- Impact of Melting Ice Sheets:** Melting ice shelves add fresh water to the ocean, altering its salinity, weakening the Antarctic Bottom Water formation, and reducing the strength of the ocean jet around Antarctica.

### Ocean Currents

- Ocean currents** are the continuous, predictable, directional movement of seawater driven by gravity, wind (Coriolis Effect), and water density.
- Ocean water moves in two directions:** horizontally and vertically.
  - Horizontal movements are referred to as **currents**, while vertical changes are called **upwellings or downwellings**.
- The system is responsible for the **transfer of heat, variations in biodiversity, and Earth's climate system**.

### Ocean Conveyor Belt

- The ocean conveyor belt, also known as the **global thermohaline circulation (THC)**, is a large-scale ocean current system that moves water throughout the world's oceans.
  - The path starts in the **North Atlantic**, where cold water sinks, creating a flow of deep water that moves southward.
  - It travels through the **Southern Ocean**, moves into the Indian and Pacific Oceans, and finally upwells in the **Pacific and Indian Oceans**, where the surface water returns toward the equator.





- This system plays a crucial role in **regulating Earth's climate** by redistributing heat, nutrients, and gases like carbon dioxide.

#### Role of Ocean Currents

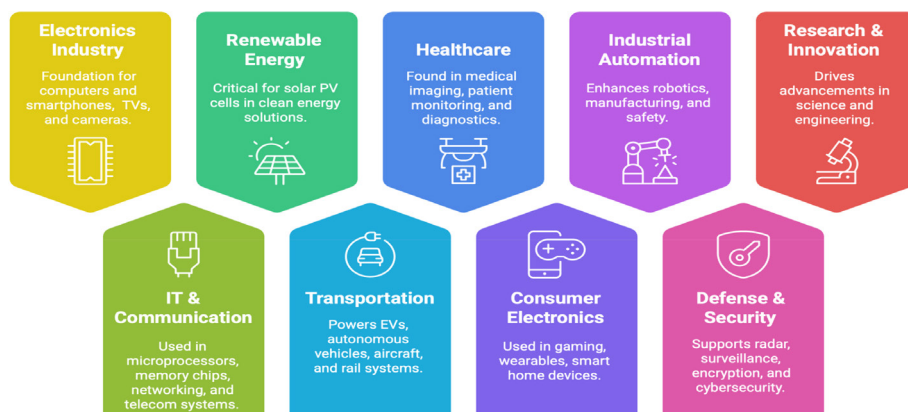
- **Climate Regulation:** Transport heat from the equator to the poles and vice versa, helping to stabilize global temperatures.
- **Supporting Marine Life:** Distribute nutrients that support the growth of phytoplankton, forming the base of the ocean's food chain.
- **Influencing Weather Patterns:** Affect weather systems and phenomena like El Niño and La Niña, influencing rainfall and storm activity.
- **Carbon Sequestration:** Help absorb and store carbon dioxide from the atmosphere, acting as a carbon sink.
- **Fisheries and Economy:** Influence fish distribution, affecting global fisheries, and provide efficient shipping routes.
- **Ocean Mixing:** Aid in mixing surface and deep ocean waters, regulating temperature, salinity, and oxygen levels.
- **Sea Level and Coastal Erosion:** Impact sea levels and contribute to coastal erosion through water movement.

#### Conclusion

- While our findings present a bleak prognosis for the Antarctic Circumpolar Current, the future is not predetermined.
- Concerted efforts to reduce greenhouse gas emissions could still limit melting around Antarctica.
- Establishing long-term studies in the Southern Ocean will be crucial for monitoring these changes accurately.

Source: ET

#### Significance of Semiconductor Manufacturing



## INDIA'S FIRST COMMERCIAL SEMICONDUCTOR FAB UNIT

#### Context

- India Semiconductor Mission (ISM), Tata Electronics, and Tata Semiconductor Manufacturing signed a **Fiscal Support Agreement (FSA)** for **India's first commercial semiconductor fab in Dholera, Gujarat.**

#### More About the News

- **Taiwan's Powerchip is collaborating**, focusing on automotive, computing, communications, and AI markets.
  - ♦ This will **attract fab construction companies from Taiwan to Gujarat.**
- The **\$11 billion Tata-PSMC fab** is **one of five semiconductor projects** approved under the **India Semiconductor Mission (ISM).**
- Four **additional semiconductor projects** are under construction, including by **Micron, Tata, CG Power (with Renesas), and Kaynes Semicon.**
- The agreement **strengthens India's self-reliance in semiconductor** and display manufacturing.

#### What are Semiconductors?

- Semiconductors have **electrical properties between conductors (metals) and insulators (rubber).**
  - ♦ They conduct electricity under certain conditions and act as insulators under others.
- Often made from silicon or germanium, semiconductors are also known as **integrated circuits (ICs) or microchips.**
  - ♦ Doping involves adding impurities to change the material's conductivity.
- **Applications:** Semiconductors are used in various electronic devices, including transistors, which function as switches or amplifiers.
  - ♦ They are crucial in computers, cell phones, solar cells, LEDs, and integrated circuits.

### India Semiconductor Mission (ISM) (2021)

- It functions as a dedicated business division within the **Digital India Corporation**.
- Objective:** To develop a robust semiconductor ecosystem in India, reducing dependency on imports and strengthening technological self-reliance.
- Government Support:** The Indian government has committed 50% fiscal support for eligible project costs under ISM.
- Global Collaboration:** The mission encourages collaborations with international companies like Taiwan's Powerchip and Micron Technology.

### PLI (Production Linked Incentive) Scheme

- Encourages domestic chip manufacturing with 4%-6% incentives.

### SPECS (Scheme for Promotion of Manufacturing of Electronic Components & Semiconductors)

- Supports electronic components & semiconductors

- Supply Chain Vulnerability:** The 2021 chip shortage highlighted global dependence on a few key suppliers.
- Taiwan's Dominance:** Taiwan is the world's largest chip manufacturer, controlling a major share of production.
- India's Ambition:** India aims to become a significant player in semiconductor manufacturing.
- Geopolitical Competition:** Rising tensions with China are pushing countries to diversify chip production.

### Way Ahead



Source: IE

## RBI ANNOUNCES OVER US\$21 BILLION LIQUIDITY INFUSION

### In News

- In response to **tight liquidity conditions** in the banking system, the **Reserve Bank of India (RBI)** has announced a **liquidity infusion initiative** using **two Open Market Operations (OMOs)** and a **USD/INR Buy/Sell Swap auction**.

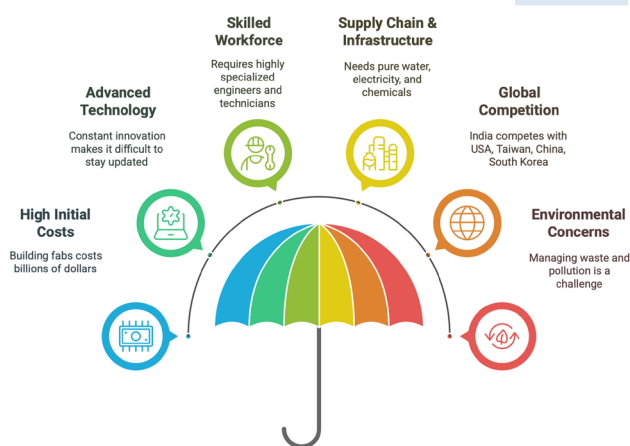
### Background

- Liquidity conditions have been strained since **November 2024** due to **tax outflows**, **foreign portfolio investor (FPI) withdrawals**, and **RBI's forex interventions**. With banks facing a **liquidity crunch**, these measures seek to **stabilize the money supply** and **promote smoother credit flow**.
- This move aims to **ease financial constraints**, **support lending**, and **ensure economic stability**.

### About Open Market Operations (OMO) & Dollar Currency Swap

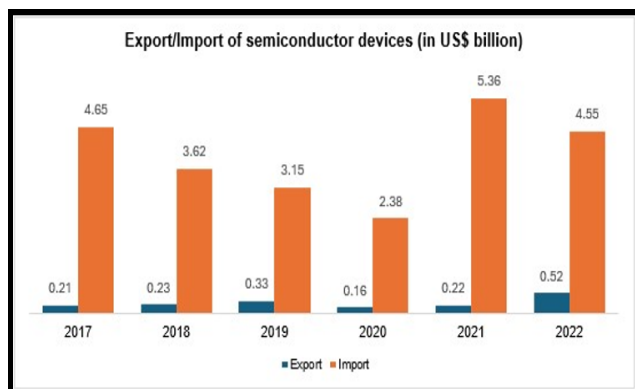
- Open Market Operations (OMO):** OMO refers to the **buying or selling of Government Securities (G-Secs)** in the open market to regulate **liquidity** and **interest rates**.
  - RBI **buys G-Secs**, increasing **high-powered money**, which boosts liquidity. **High-powered money** includes **commercial bank reserves** and **currency held by the public**.
  - RBI **sells G-Secs**, reducing **money supply**, tightening liquidity.

### Challenges in Semiconductor Manufacturing



### Why is there an Increased focus on Semiconductors?

- Strategic Importance:** Semiconductors are crucial for the economy, driving technology, defense, and industrial growth.



- **US Dollar-Indian Rupee Swap Auction:** A USD/INR Buy/Sell Swap involves:
  - ♦ **Banks selling US dollars to RBI** now and agreeing to **buy them back later at a pre-determined rate**.
  - ♦ Conducted via **auction**, where banks **quote swap rates (forward premium/discount)**, and the **lowest bidder is accepted first**.

#### Why is Liquidity Infusion Needed?

- Since **November 2024**, liquidity challenges have emerged due to:
  - ♦ **Tax outflows** reducing cash availability in the banking system.
  - ♦ **Significant FPI selling in Indian equities**, leading to capital outflows.
  - ♦ **RBI's forex market interventions** to stabilize the rupee, which drained rupee liquidity.

#### Significance of RBI's Liquidity Infusion

- **Eases lending conditions** for banks, improving credit flow.
- **Stabilizes interest rates**, preventing sudden spikes in borrowing costs.
- **Enhances market confidence**, reassuring investors and businesses.
- **Encourages policy effectiveness**, ensuring rate cuts are passed on to borrowers.
- **Boosting economic growth** by supporting consumption and investment.

#### Concerns and Risks

- **Inflationary pressures:** Excess liquidity may push inflation higher.
- **Depreciation risk:** Forex swaps could lead to rupee weakening if excess liquidity is not managed well.
- **Uneven liquidity distribution:** Large banks may benefit more than smaller financial institutions.

#### Other Liquidity Measures Used by RBI

- **Quantitative Tools** (directly impacting money supply):
  - ♦ **Liquidity Adjustment Facility (LAF):** Repo & Reverse Repo to regulate short-term liquidity.
  - ♦ **Cash Reserve Ratio (CRR):** Minimum cash reserves banks must hold.
  - ♦ **Statutory Liquidity Ratio (SLR):** Percentage of net demand and time liabilities (NDTL) to be maintained in G-Secs.

- ♦ **Bank Rate:** Long-term borrowing rate influencing credit expansion.
- **Qualitative Tools** (indirect regulation of credit flow):
  - ♦ **Credit Rationing:** Restricting lending to certain sectors.
  - ♦ **Moral Suasion:** Persuading banks to follow RBI guidelines.
  - ♦ **Selective Credit Control (SCC):** Controlling credit for speculative activities.
  - ♦ **Margin Requirement:** Adjusting the collateral needed for loans.

Source: ET

## SPACE DEBRIS

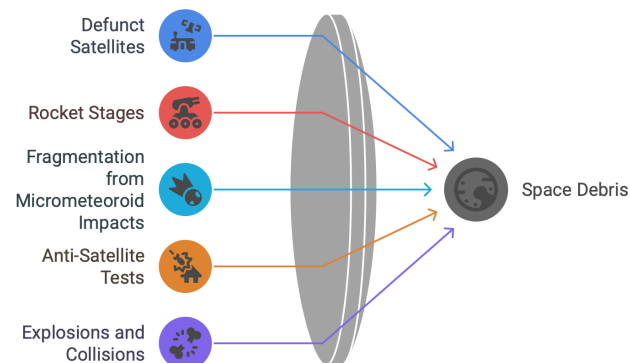
#### Context

- A 500-kg metal object, believed to be space debris, crashed in Kenya, highlighting concerns about accountability and regulatory gaps in space governance.

#### About Space Debris

- It includes non-functional satellites, abandoned rocket stages, and smaller fragments from previous space missions.
- The **UN Committee on the Peaceful Uses of Outer Space (UN-COPUOS)** defines space debris as all man-made objects, including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional.
- According to NASA, millions of pieces of debris orbit the Earth, ranging from tiny paint flecks to large satellite remnants.

#### Factors Causing Space Debris

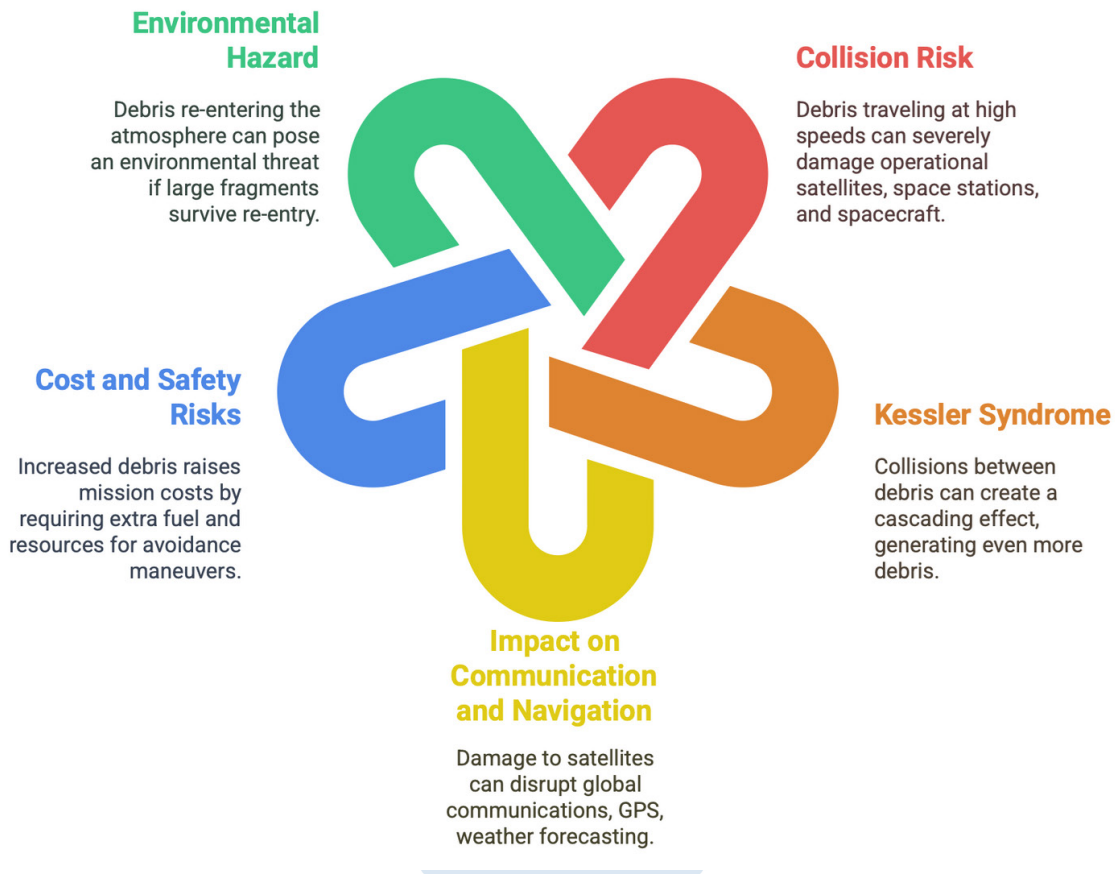


#### Examples

- **2022: Chinese Long March 5B** rocket fell into the **Indian Ocean**, sparking concerns about **uncontrolled re-entry**.

- **2023: Parts of a SpaceX Falcon 9 rocket** were discovered on a sheep farm in Australia.
- **February 2024:** Debris from a Russian satellite disintegrated over the United States, alarming residents.

### Threats from Space Debris



### International Laws on Space Debris Responsibility

- **United Nations Office for Outer Space Affairs (UNOOSA):**
  - ♦ **Outer Space Treaty (1967):** It does not specifically address space debris, it emphasizes that nations are responsible for activities conducted in outer space, **including by private entities** under their jurisdiction.
    - **Article VI** of the treaty emphasizes that states bear responsibility for their space objects.
  - ♦ **Liability Convention (1972):** It introduces the concept of ‘**absolute liability**’ for damage caused by space objects on Earth.
    - Under this framework, launching states are automatically responsible for any harm caused by their debris, without the need to prove negligence.

### India's Initiatives in Space Debris Management

- ISRO adheres to internationally accepted space debris mitigation guidelines recommended by

the **UN-COPUOS** and the **Inter-Agency Space Debris Coordination Committee (IADC)**.

- **ISRO System for Safe and Sustainable Space Operations Management (IS4OM):** To focus on spaceflight safety and debris mitigation.
- **Network for Space Object Tracking and Analysis (NETRA):** For Space Situational Awareness (SSA) capacity building.
- **Debris-Free Space Missions (DFSMS) Initiative (2024) by ISRO:** It aims to achieve debris-free space missions by all Indian space actors, both governmental and non-governmental, **by 2030**. The initiative focuses on:
  - ♦ Avoiding Debris Generation;
  - ♦ Collision Avoidance;
  - ♦ Post-Mission Disposal;

### Challenges in Holding Countries Accountable

- **Difficulty in Tracing Ownership:** Identifying the exact origin of debris is challenging, especially for small fragments.



- **Bureaucratic and Political Hurdles:** Diplomatic processes for compensation can be slow and politically sensitive.
- **No Penalties for Uncontrolled Re-entry:** While the Liability Convention requires countries to pay for damages, it does not penalize them for allowing uncontrolled re-entries to happen.

#### Mitigation and Future Solutions

- **International Cooperation:** Strengthening international cooperation like the **United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS)** and developing standardized procedures for debris removal can enhance accountability and enforcement.
- **Mandatory End-of-Life Plans:** Space missions should include clear deorbiting strategies to minimize debris risks.
- **Technological Innovations:** Investing in technologies for active debris removal, such as the **ADRAS-J mission by Astroscale**, can help mitigate the risks posed by space junk.
- **Liability Insurance:** Countries and private companies could be required to have insurance policies covering potential damage from space debris.
- **National Regulations:** Implementing and enforcing national regulations that align with international treaties can ensure that countries take responsibility for their space activities.

Source: TH

## ISRO SUCCESSFULLY CONDUCTS PHTA FOR SEMI-CRYOGENIC ENGINES

#### Context

- The Indian Space Research Organisation (ISRO) recently successfully conducted the **Power Head Test Article (PHTA)** on a **semi-cryogenic engine (SE2000)**.

#### Power Head Test Article (PHTA)

- **Purpose of PHTA:** Validates the integrated performance of critical subsystems, including: Gas generator, Turbo pumps, Pre-burner, Control components.
- **Significance of PHTA:** Essential for the development of ISRO's semi-cryogenic engine.

#### Cryogenic Stage in Launch Vehicles

- A cryogenic engine/cryogenic stage is the **last stage of space launch vehicles** which makes **use of cryogenics** to store its fuel and oxidiser as liquids instead of gas.

- In space, there is a **lack of air, including oxygen**, which means it is **impossible to burn anything**.
  - ♦ To fix this, **rockets carry their own oxygen, known as an oxidiser**, mixed with fuel to burn it in space.

#### Cryogenics

- Cryogenics is the **study of materials and processes at extremely low temperatures**, typically below  $-150^{\circ}\text{C}$ .
- It primarily involves the **use of cryogenic fluids** such as liquid nitrogen (LN2), liquid oxygen (LOX), and liquid hydrogen (LH2).
- **Applications in Various Fields:** Space, Medical, Food Preservation, Industrial gases, Superconductivity etc.

#### Semi-cryogenic Engine

- **Propellants:** **Liquid oxygen (LOX)** and kerosene, making them **safer and less toxic** than **cryogenic engines using liquid hydrogen**.
- **Thrust:** Offer enhanced thrust of **2,000 kiloNewtons (kN)**.
- **Payload Capacity:** Semi-cryogenic engines **increase payload capacity of launch vehicles** due to the use of **lighter fuel (kerosene)**.

#### Difference between Cryogenic and Semi-cryogenic Engine

Feature	Cryogenic Engine	Semi-Cryogenic Engine
<b>Propellants</b>	Liquid Oxygen (LOX) and Liquid Hydrogen (LH2).	Liquid Oxygen (LOX) and Kerosene.
<b>Storage Temperature</b>	LH2 requires $-253^{\circ}\text{C}$ storage.	Kerosene can be stored at normal temperatures.
<b>Thrust</b>	Higher specific impulse, less dense.	Higher density impulse, more thrust per volume.
<b>Complexity</b>	More complex to handle and store.	Easier to handle and store.
<b>Reusability</b>	Lower reusability potential	Higher reusability potential due to simpler components.

### Next Generation Launch Vehicle

- The development of the Next Generation Launch Vehicle (NGLV) for the **Gaganyaan missions is on track.**
  - It is a human-rated launch vehicle with high payload capability and reusability.
  - It features a reusable first stage and can carry up to 30 tons to Low Earth Orbit (LEO).
  - The first and second stages of NGLV will use LOX engines, with a cryogenic upper stage.
- ISRO has successfully tested the recovery of the first stage of the NGLV.

Source: IE

- Implementation:** Ministry of Labour & Employment and managed by the Life Insurance Corporation of India (LIC).
- Eligibility:** Age: 18–40 years, monthly income ₹15,000 or less, not covered under EPF/ESIC/NPS.
- Contribution Structure:** monthly contribution ₹55 to ₹200, depending on the age of joining.
- Enrollment:** Through Common Service Centres (CSC) or the Maandhan portal.
- Implementation and Current Status:** 46.12 lakh enrollments (March 2025) across 36 States/UTs. Top 3 States are Haryana, Uttar Pradesh, Maharashtra.

Source: PIB

## NEWS IN SHORT

### SIX YEARS OF PRADHAN MANTRI SHRAM YOGI MAANDHAN YOJANA (PM-SYM)

#### In Context

- The **Pradhan Mantri Shram Yogi Maandhan (PM-SYM) Scheme** was launched in 2019 to provide pension security for unorganized workers.

#### Background

- India's unorganized sector contributes nearly **50% of the GDP**, employing millions in occupations like street vending, construction, agriculture, and domestic work.
- However, **financial insecurity after retirement remains a major concern**, to address this issue the **PM-SYM scheme was launched**.
- As of 2024, over **30.51 crore workers** are registered on the **e-Shram portal**. E-Shram portal is a flagship initiative by the Government of India to **support and empower the unorganized workforce**.
- Registered **workers receive a UAN linked to their Aadhaar**, enabling seamless access to benefits.

#### Pradhan Mantri Shram Yogi Maandhan (PM-SYM) Scheme

- About:** It is a voluntary and contributory pension scheme, ensuring a minimum 3,000 monthly pension after the age of 60 years.
  - Spouses receive 50% of pension if the subscriber dies after retirement.
  - Spouses can continue or exit the scheme if the beneficiary dies before 60.

### DOCTRINE OF REASONABLE CLASSIFICATIONS

#### Context

- The Supreme Court's ruling in **State of West Bengal v. Anwar Ali Sarkar (1952)** laid the foundation for the **"reasonable classification" test** under **Article 14 of the Indian Constitution**.

#### About

- The West Bengal state legislature passed the **West Bengal Special Courts Act 1950** to set up special courts for the speedy trial of certain offences particularly those related to communal violence and riots.
- The **Act was controversial** as it gave the government wide powers to establish and control the special courts.
- The Court held that the Act created an arbitrary classification between accused persons and thus offended the doctrine of equality before the law.

#### Article 14 of Constitution

- Article 14 says that the State shall not deny to any person **equality before the law** or the **equal protection of the laws** within the territory of India.
  - This provision confers rights on all persons whether citizens or foreigners.
- The word 'person' includes** legal persons, viz, statutory corporations, companies, registered societies or any other type of legal person.

#### Judgements related to Article 14

- In the case of **E.P. Royappa v. State of Tamil Nadu (1973)**, the Supreme Court of India expanded the scope of Article 14 of



the Constitution, establishing that it prohibits arbitrary state action, not just discriminatory treatment, and that state action must be rational and justifiable.

- **Ram Krishna Dalmia vs. Justice Tendolkar (1958)** held that Article 14 prohibits class legislation and not reasonable classification, which is done for legislative purposes.

Source: IE

## MISSION 300

### Context

- In 2024, the **World Bank Group and the African Development Bank** together launched Mission 300.

### About

- **Mission 300:** Aims to connect 300 million people to electricity in Sub-Saharan Africa by 2030.
  - ♦ The ambitious initiative builds on years of groundwork, much of it led by the **Energy Sector Management Assistance Program (ESMAP)**.
- **Goal:** Accelerate electrification while ensuring cleaner, diversified energy sources, economic growth, and job creation.
- **Current Challenge:** Nearly 600 million people in Sub-Saharan Africa lack electricity, making up **83% of the global unelectrified population**.
- **Key Focus Areas:**
  - ♦ Investment in generation, transmission, distribution, and regional interconnection.
  - ♦ Sector reform to ensure reliable, affordable, and quality power.

### India's Journey Towards Electrification

- **During Pre-Independence (Before 1947),** there was limited electrification in urban areas, post-Independence the focus was on rural electrification and state control over electricity.
- **In the 1980s, Rural Electrification Corporation (REC)** was formed to support rural electrification.
- **1990s:** Private sector participation increased; **Electricity Act 2003** restructured the sector.
- India has achieved **100% electrification by 2021**.
- **Challenges Overcome:** Initial issues included high connection costs, infrastructure gaps, and logistical hurdles.
- **Key Success (2017-2019):** In 18 months, **over 26 million households** were electrified, **setting a record for the fastest electrification drive**.

- **Relevance to Africa:** India's rapid progress offers **valuable insights** into how **Sub-Saharan Africa** can tackle its **energy access gap within a few years**.

Source: DD News

## TAJ TRAPEZIUM ZONE (TTZ)

### In News

- The Supreme Court directed **Dehradun-based Forest Research Institute (FRI)** to conduct tree census in the **Taj Trapezium Zone**.

### About Taj Trapezium Zone

- **Purpose:** It is a 10,400 sq. km **trapezoidal shape area** to safeguard the **Taj Mahal, Agra Fort, and Fatehpur Sikri (all UNESCO World Heritage Sites)** from the damaging effects of air pollution.
- **Establishment:** In 1996 by the Supreme Court to control pollution affecting the Taj Mahal.
- **SC Directive:** The Supreme Court mandated that industries within the TTZ switch from using coal and coke to cleaner fuels like natural gas.

Source: HT

## AGRICULTURAL INFRASTRUCTURE FUND (AIF) SCHEME

### Context

- Punjab has utilised 100% of the Rs 4,713 crore allocated to it by the Centre under the **Agriculture Infrastructure Fund (AIF) scheme**.

### What is Agricultural Infrastructure Fund (AIF)?

- AIF was launched with an aim to provide medium to long-term financing for agriculture **infrastructure projects at the post-harvest stage**.
  - ♦ The scheme is operational from **2020-21 to 2032-33**.
- Under AIF, provision for **Rs. 1 Lakh crore loan** has been made through lending institutions with an interest rate cap of **9%** on loans.
- Farmers, agripreneurs, primary agriculture cooperative societies, farmers producer organisations, start-ups, state sponsored public-private partnerships, state-agencies can apply for funds under this scheme.

### Key features

- **Viable Farming Assets:** The scheme now includes the creation of infrastructure for 'viable projects for building community farming assets'.

- **Integrated Processing Projects:** The list of eligible activities under AIF now includes integrated primary and secondary processing projects.
  - ♦ However, standalone secondary projects remain ineligible and will continue to be covered under Ministry of Food Processing Industries (MoFPI) schemes.
- **PM KUSUM Component-A Integration** with the AIF has been allowed by the government.
- **Interest Subvention:** Offers 3% interest subvention per annum on loans up to 2 crore.
- Credit guarantee coverage through Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE).



As of August 28, 2024, **Rs. 47,575 Crore** has been sanctioned for **74,508 projects** under AIF scheme



The Fund of **Rs. 1 lakh Crore** under the scheme will be disbursed till **FY2025-26**



Generated over **8.19 Lakh** rural employment opportunities in the agriculture sector

Source: IE

## CARBON INTENSITY

### Context

- Carbon intensity is a useful way to measure how much carbon a particular sector is emitting and how it has increased or decreased over time.

### About

- **Carbon intensity** measures how much **carbon dioxide (CO<sub>2</sub>)** is released to produce a unit of electricity or other activity.
  - ♦ The carbon intensity of electricity is measured in grams of CO<sub>2</sub> per **kilowatt hour (kWh)**.
  - ♦ **Example:** The carbon intensity of the steel sector can be measured as the number of tonnes produced per tonne of carbon dioxide emitted.
- An entire country's carbon intensity can be understood by **dividing the growth in GDP per capita** by the amount of carbon dioxide emitted.
- India's annual per capita carbon emission is only about one-third of the global average.

Source: TH

## RUELLIA ELEGANS

### Context

- A recent study has raised concerns about the threat posed by *Ruellia Elegans*, to the native biodiversity of Assam.

### About

- ***Ruellia Elegans***, commonly known as the **Brazilian petunia, Christmas pride, and wild petunia**, is a flowering plant native to wet tropical biomes.
  - ♦ The species derives its name from its elegant appearance.
- It is **native to Brazil** with bright **red trumpet shaped flowers**.
- It belongs to the **Acanthoideae sub-family** and is one of the four invasive *Ruellia* species in India, alongside ***Ruellia ciliatiflora*, *Ruellia simplex*, and *Ruellia tuberosa***.
- **India has six native species of *Ruellia*:** *Ruellia beddomei*, *Ruellia ciliata*, *Ruellia malabarica*, *Ruellia patula*, *Ruellia sibua*, and *Ruellia sivarajanii*.

### What are Invasive Species?

- Invasive plant species are **non-native plants** that spread aggressively and outcompete local flora for essential resources such as sunlight, water, and nutrients.
- They disrupt ecosystems by;
  - ♦ **Altering biodiversity** and displacing **native species**.
  - ♦ Contributing to the **decline or extinction of endemic plants**.



Source: TH