

NEWS TODAY

Swiss Physicists Create the First Fully Mechanical Qubits

Mechanical qubits can address the issues of quantum error and shorter lifetime in virtual qubits (those made using electromagnetics) that hinder realising the potential of Quantum Computers.

- **Qubits** (Quantum bits), used by quantum computers to encode data, exhibit **high sensitivity** and may cause **calculation errors referred as quantum errors**.
 - ⊕ Traditional computers use bits (either 0 or 1) for information storage
- This quantum error may worsen as the size of quantum computers increases.

About Quantum Computers

- **Based on Quantum Mechanics:** Quantum mechanics describe how subatomic particles behave differently from macrolevel physics.
 - ⊕ Quantum mechanics explains how **extremely small objects simultaneously** have the characteristics of both particles and waves (a disturbance or variation that transfers energy). Physicists call this the **“wave-particle duality.”**
- **Utilises two key principles of quantum physics:**
 - ⊕ **Superposition:** Each qubit can represent both 1 and 0 simultaneously.
 - ⊕ **Entanglement (i.e., correlation of qubits):** Qubits in a superposition can be correlated with each other; i.e., the state of one (whether it is a 1 or a 0) can depend on the state of another.

Initiatives for promoting Quantum Computing in India

- **National Quantum Mission (2023):** To establish India as a **global quantum leader**.
- **Quantum Enabled Science & Technology (QUEST):** A research program to build quantum capabilities.
- **MeitY Quantum Computing Applications Lab (QCAL):** For providing access to quantum computers, tools, and resources to researchers and developers.
- **Quantum Computer Simulator (QSim) Toolkit:** provides a platform for researchers to explore quantum computers that are difficult to obtain.
- **Quantum-backed Green Hydrogen production technology** developed at BHU, Varanasi.

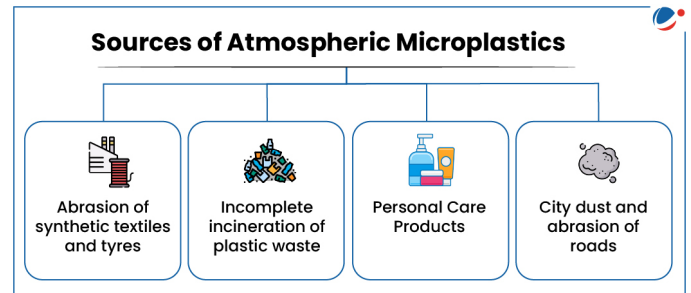
New research reveals that microplastics in the atmosphere could be affecting weather and climate

Study demonstrated that microplastics act as **ice nucleating particles**, which are **microscopic aerosols** that facilitate the formation of ice crystals in clouds.

- Any kind of **defect in the water droplet**, whether that's **dust, bacteria or microplastics**, can give ice something to form – or nucleate – around.
- Such tiny structure or defect can trigger the water droplet to **freeze at warmer temperatures**, thus **affecting cloud formation**.
 - ⊕ Clouds form when water vapour **condenses on tiny floating particles** and turns into liquid water droplets or ice crystals.

Impact of microplastics in Atmosphere

- **Precipitation Patterns:** In a polluted environment with many more aerosol particles, like microplastics, available water is **distributed among many more aerosol particles**, forming smaller droplets.
 - ⊕ This results in **less rain and heavier rainfall when it rains**.
- **Global Warming:** Amount of liquid water versus the amount of ice is also important in **determining to what extent clouds will have a warming or cooling effect**.
- **Other Impacts:** **Weather forecasting, climate modeling and aviation safety** by influencing how atmospheric ice crystals form clouds.



Initiatives taken to reduce Microplastics

Global

- Global Partnership on Plastic Pollution and Marine Litter
- UN Environment Assembly's Resolution to End Plastic Pollution and forge an International Legally Binding Agreement
- IAEA's NUTEC Plastics

India

- Ban on Single Use Plastic
- Plastic Waste Management Rules, 2016
- KVIC's Project REPLAN (Reducing Plastic from Nature).

Fourth edition of 'An Eye on Methane: Invisible but not unseen' Report launched

Report has been published by United Nations Environment Programme's (UNEP) International Methane Emissions Observatory (IMEO).

- ▶ IMEO, a core implementing partner of Global Methane Pledge, provide open, reliable, and actionable data on methane emissions.
- ▶ IMEO collects and publishes data through rigorous industry reporting via the Oil and Gas Methane Partnership 2.0 (OGMP 2.0), from satellites via the Methane Alert and Response System (MARS), from global methane science studies, and from national emissions inventories.

Key Findings of Report

- ▶ **Global Warming:** Human-caused methane emissions are responsible for roughly one-third of the planet's current warming.
- ▶ **Emissions from Oil and Gas Sector:** UNEP's OGMP 2.0, which require its members to report their emissions, covers only 42% of global production.
- ▶ **Emissions in Steel Supply Chain:** Production of metallurgical coal for steel production accounts for one-tenth of energy sector methane emissions and can be mitigated at a minimal cost.
- ▶ **Poor Response to Emissions:** Through MARS, IMEO alerts countries of major emissions but only 1% of such alerts received any substantive response.

About Methane

- ▶ Methane is a major greenhouse gas and 86 times more potent than CO₂ in the short term but easier and faster to mitigate.
- ▶ It is also a Short-Lived Climate Pollutant (SLCP) having an atmospheric lifetime of 12 years.
 - ⊖ It acts as a precursor for toxic air pollutant tropospheric ozone, contributing to respiratory problems, crop losses etc.
- ▶ Over 60% of methane emissions come from human activity including agriculture, fossil fuels, and waste.

Initiatives taken to reduce Methane Emissions

- ▶ **Global:** Global Methane Pledge, Climate and Clean Air Coalition, Global Methane Alliance etc.
- ▶ **India:** National Innovations in Climate Resilient Agriculture (NICRA) project, National Livestock Mission, Gobar-Dhan Scheme, New National Biogas and Organic Manure Programme etc.

ICRIER published policy brief - Rationalising the Public Distribution System (PDS) in India

Highlighting the persistence of leakages in the PDS grains, the study suggests ways to rationalize the system to ensure food and nutritional security.

Key Findings

- ▶ **PDS Leakage: 28% of allocated grains** supplied by Food Corporation of India (FCI) and State Governments fail to reach the intended beneficiaries.
 - ⊖ This amounts to a financial loss of about Rs. 69,108 crores.
- ▶ **Efficacy of recent reforms:** Linking ration cards with Aadhaar and installation of PoS machines in 95% of Fair Price Shops (FPS) has increased efficacy of distribution but has not eliminated leakages.
- ▶ **Regional variations:** States like Bihar and West Bengal have made significant improvements in plugging PDS leakage, however, high leakages persist in North-eastern states of Arunachal Pradesh, Nagaland and Gujarat.
 - ⊖ One factor for higher leakages, particularly in North-eastern states, is lack of digitalisation of PDS system.

Recommendations

- ▶ **Effective targeting of beneficiaries:** Reducing the coverage of population covered under PDS (from present 57%) to the bottom 15% for free food distribution, while the rest could be given grains at 50% of MSP.
- ▶ **Shift towards Direct Benefit Transfer (DBT):** DBT minimizes leakage, reduces administrative costs, and empower citizens with flexibility in dietary choices.
- ▶ **Transforming FPS into Nutrition Hubs: A Food Coupon Approach** can be implemented in select FPSs to tackle the issue of siphoning off of grains.

About Public Distribution System (PDS)

- ▶ By coverage, it is the world's largest food distribution program.
- ▶ Operated under joint responsibility of Centre and States:
 - ⊖ **Centre (through FCI):** Procurement, storage, transportation and bulk allocation of food grains.
 - ⊖ **States:** Operational responsibility including allocation within State, identification of eligible families, issuing of Ration Cards and supervision of FPSs.
- ▶ **Evolution of PDS:** Revamped PDS (1992), Targeted PDS (TPDS) (1997), Antyodaya Anna Yojana (AAY) (2000), National Food Security Act (2013), Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) (2020).

Reserve Bank of India issued 'Internal Risk Assessment Guidance' for Money Laundering/Terrorist Financing Risks'

Key Focus of guidelines

- Focus on a **data driven quantitative approach** to frauds.
- Stress on the **risk-based framework** in its entirety with compliance, due diligence, and continuous monitoring.

Relevance of Guidelines

- **Increasing Incidents:** RBI Annual Report 2023-24 shows that the **total number of fraud cases jumped from 13,564 in 2022-23 to 36,075 in 2023-24.**
- **Loss to global GDP:** The **United Nations Office on Drugs and Crime estimates** that between **\$800 billion and \$2 trillion** is laundered globally each year, which is **2-5% of the global GDP.**

Risks associated to financial system with ML/TF

- **Political:** Weakening countries and affecting stability.
- **Security:** Internal and external, terrorism and terrorist financing threats, including related to ISIL or Al Qaeda.
- **Economic: Credit Frauds** with bank's money used for illegitimate activities thereby circumventing finances for other economic sectors.
- **Social:** Affecting the social harmony, communal tensions, crimes.

Initiatives taken for ML/TF

Global

- ⊕ The International Convention against Transnational Organized Crime (2000; the Palermo Convention).
- ⊕ FATF anti-money laundering and counter-terrorist financing (AML/CFT) framework.

India

- ⊕ The Prevention of Money Laundering Act, 2002 (PMLA)
- ⊕ Financial Intelligence Unit (FIU-IND), Enforcement Directorate (ED).
- ⊕ Foreign Exchange Management Act, 2000, (FEMA).

DRDO successfully test-fired India's first 'Long-range Hypersonic Missile' off Odisha coast

The hypersonic missile has a range of over 1500 kms. Only US, Russia and China had this technology earlier.

Technologies demonstrated during test

- **Aerodynamic configuration** for hypersonic manoeuvres for stability and control.
- **Use of scramjet propulsion** for ignition and sustained combustion at hypersonic flow.
 - ⊕ A scramjet is a form of air-breathing jet engine that uses the vehicle's forward motion to compress incoming air for combustion and operates at hypersonic speeds.
- **Thermo-structural characterisation** to withstand extreme aerothermal environments during flights.
- **Separation mechanism** at hypersonic velocities.

Hypersonic Missiles

- These missiles can fly at speeds of **at least Mach 5** (five times the speed of sound).
 - ⊕ The speed of sound is Mach 1, and speeds between Mach 1 and Mach 5 are supersonic and speeds above Mach 5 are hypersonic.
- Hypersonic weapons can manoeuvre midway which when combined with their high speeds makes their detection and interception extremely difficult.

Other Missile Systems of India

- **Inducted:** AKASH (Surface to Air Missile Systems), BRAHMOS (Long Range Supersonic Cruise Missile), etc.
- **Advanced stage of induction:** NAG (Anti-Tank Guided Missiles), ASTRA (Air-to-Air Missiles), Agni (Long Range Ballistic Missile) etc.

DRDO (Defence Research & Development Organisation)

- Formed in 1958, it is the R&D wing of the **Ministry of Defence** for developing cutting-edge defence technologies and achieving self-reliance in defence.
- DRDO constitutes a network of around **41 laboratories** for aeronautics, electronics, combat vehicles, missiles, advanced computing and simulation, etc.

Also In News



First trilateral power transaction

Inauguration of **first trilateral power transaction from Nepal to Bangladesh** through the Indian Grid took place.

- The **tripartite power sales agreement** between NTPC Vidyut Vyapar Nigam, Nepal Electricity Authority (NEA) and Bangladesh Power Development Board was signed earlier.

About Agreement

- To **facilitate power transaction** from Nepal to Bangladesh, through Indian grid with an export of upto 40 MW of power.
- Commitment towards **greater sub-regional cooperation, including in the energy sector**, which would lead to increased **inter-linkages between the economies** for mutual benefit of all stakeholders.



Uniform Protection Protocol

Central Electricity Authority approves the Uniform Protection Protocol for users of Indian Grid for implementation on Pan India basis.

About Uniform Protection Protocol

- **Aim:** To ensure Grid stability, reliability, security and support India's vision for integration of 450 GW Renewable Energy into the National Grid by 2030.
- It addresses the **protection requirements** for thermal and hydro generating units etc.
- It will ensure proper **co-ordination of protection system** in order to **protect the equipment/system** from abnormal operating conditions, isolate the faulty equipment and avoid unintended operation of protection system.



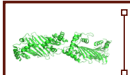
Ayushman Vaya Vandana Yojana

Over 10 lakh senior citizens have enrolled in the Ayushman Vaya Vandana scheme within three weeks of its launch.

- Notably, women account for around 4 lakh enrolments under the scheme.

About the scheme

- Launched in October 2024, it is part of the **Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (AB-PMJAY)**, aimed at providing free healthcare to senior citizens aged 70 and above.
 - ⊕ AB-PMJAY was launched in 2018 to achieve the vision of Universal Health Coverage (UHC).
 - ⊕ **Ayushman Vay Vandana cards** have been issued under the scheme covering treatments of a range of medical conditions.



APOBEC Family

Researchers provide evidence of **human-to-human transmission of Mpxv Clade Ia strain** of the virus, attributed to **APOBEC-induced mutations**.

- APOBEC-induced mutations can induce specific mutations in DNA.

About APOBEC

- **APOBEC** (apolipoprotein B mRNA editing enzyme, catalytic polypeptide-like) is a family of proteins having **diverse functions** in human health.
- They have an **intrinsic ability to bind to both RNA and single-stranded DNA**.
- They can **introduce changes (mutations) to the viral DNA** while it is being copied in the cells.
 - ⊕ By doing so, APOBEC proteins force mistakes, some of which can be **lethal to the virus**.



Bacterial Computer

Recently, researchers in Kolkata achieved a breakthrough in synthetic biology where they **engineered bacteria to perform mathematical and computational tasks**.

- This was done by **introducing Genetic Circuits** – biological systems that allow cells to interact and respond to each other by performing logical functions – in bacteria.
- Such engineered bacteria with different genetic circuits can be combined to act as **artificial neural networks**, capable of abstract mathematics.
 - ⊕ In such network, each engineered bacteria acts as a **"bactoneuron"**, functioning as an artificial neuron.
- **Potential Applications:** Early disease detection and treatment, enhancement in carbon sequestration through cell-based biocomputers, faster computing etc.



Pollinators

Researchers have **uncovered the transmission of pathogens** between managed western honey bees and wild pollinators, a process called **pathogen spillover and spillback**.

- Western honey bees are **often viral reservoirs** and can infect wild species, **threatening wider pollinator community**.

Pollinators

- Pollinators like honeybees, butterflies, birds, bats etc. travel from plant to plant carrying pollen in a vital interaction that allows **transfer of genetic material critical to the reproductive system of most flowering plants**.
- **Three-fourths of the world's flowering plants** and about 35% of the world's food crops depend on animal pollinators to reproduce.



Lake Kariba

A drought has drained **Lake Kariba** close to record lows, causing power shortage in the region.

About Lake Kariba

- It is the world's **largest artificial lake and reservoir** by volume.
- Kariba lake is located in **Central Africa** in the **Zambezi River basin between Zambia and Zimbabwe**.
- Its construction was started during 1950s when British ruled Northern and Southern Rhodesia (now Zambia and Zimbabwe).
- Kariba Dam provides **electric power to both Zambia and Zimbabwe** and supports a thriving commercial fishing industry in Africa.



Indian Ocean Dipole (IOD)

Study finds **mangrove dieback in Maldives** linked to sea level rise and extreme Indian Ocean Dipole.

About IOD:

- It is a **climate phenomenon** based on the **difference in sea surface temperatures (SSTs)** between the **Eastern and Western regions of the Indian Ocean**.
- It has **2 phases**:
 - ⊕ **Positive phase:** Warm waters are pushed to the **Western Indian Ocean**, while **cold deep waters are brought up** in the **Eastern Indian Ocean**.
 - ◆ The **high temperatures** along **coastal Africa** cause **heavy rains and droughts in Australia**.
 - ⊕ **Negative Phase:** Temperature and rainfall Pattern is **reversed**.
- Associated sea-level changes increase threats of **coastal flooding**.

Place in News



Nigeria (Capital: Abuja)

Indian Prime Minister conferred the **Nigerian national award - "Grand Commander of the Order of Niger"**

Political features:

- Located on the **Western coast of Africa**, it is a **multi-ethnic and culturally diverse federation**.
 - ⊕ It is the **most populous country in Africa**.
- **Boundaries:** Niger (North), Chad (North-east), Cameroon (East), Benin (West), Gulf of Guinea (Atlantic Ocean) (South).

Geographical Features:

- **Physiography:** Several extensive plateaux (Jos Plateau, Udi Plateau); mountains (Mount Dimlang); lowlands (Sokoto plains, Chad Basin etc.)
- **Major Rivers:** Niger, Benue
- **Major Lakes:** Lake Chad (freshwater lake bordering Nigeria, Chad and Niger)
- **Vegetation:** Rainforests, swamps and Savannah grasslands.
- It is the **largest oil and gas producer in Africa**.

