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A FUND CRUNCH IN THE US: A SCIENTIFIC OPPORTUNITY FOR INDIA

Context

- The United States, long hailed as the epicentre of scientific innovation and research, is currently witnessing a systematic erosion of its knowledge economy.

Crisis in the the USA

- **Funding Freezes:** The National Institutes of Health (NIH) and other US agencies have halted or cut funding for several international collaborative projects.
- **Institutional Uncertainty:** Universities are facing layoffs and lab shutdowns; tenure-track positions are being reduced.
- **Migration of Scientists:** Early-career researchers and even senior scientists are leaving the US for Europe, Asia, and Latin America.

Opportunity for Indian Diaspora

- **A Rich Talent Pool:** India-born scientists make up a significant portion of the US STEM workforce, with many contributing to major breakthroughs and winning global science awards.
 - ♦ E.g. Lasker, Breakthrough, and even Nobel Prizes.
- **Reversing Brain Drain:** India must expand pathways for permanent relocation, lab creation, and institutional leadership roles.

Global Response to the Crisis

- **France** launched the “Safe Place for Science” programme at Aix-Marseille University, aimed at providing a secure and supportive environment for scientists, particularly those facing uncertainties in their professional careers.
- **Germany and Switzerland** are offering long-term fellowships and research grants targeting displaced or dissatisfied scientists.
- **China** is increasing funding under “Talent Return” schemes to lure overseas Chinese researchers.

Initiatives taken by India

- **VAIBHAV (Vaishvik Bhartiya Vaigyanik)** fellowships were launched to connect overseas Indian scientists with domestic institutions.
- **The VAJRA (Visiting Advanced Joint Research) scheme** is a fellowship program that offers short-term positions for overseas scientists, including **Non-Resident Indians (NRIs) and Persons of Indian Origin (PIOs)**, to work in Indian research institutions.

- ♦ The scheme aims to foster international collaboration and leverage the expertise of overseas researchers for India’s research and development ecosystem.
- **Anusandhan National Research Foundation (ANRF)** aims to seed, grow and promote research and development (R&D) and foster a culture of research and innovation throughout India’s universities, colleges, research institutions, and R&D laboratories.
- **Philanthropic Engagement:** According to Indian Philanthropy Report 2025, private social sector funding reached **₹1.31 lakh crore in 2024**.
 - ♦ Foundations like Tata Trusts, Infosys Foundation, and Wipro Foundation are increasingly supporting R&D efforts.

What are the challenges?

- **Limited Research Infrastructure:** Many institutions lack cutting-edge labs, interdisciplinary ecosystems, and research autonomy.
- **Inadequate Start-up Grants:** India’s research start-up funding usually lags behind what is offered in the **US, EU, or China**.
- **Short-Term Vision:** Existing programmes focus more on visiting roles than on long-term institutional integration.
- **Bureaucratic Red Tape:** Complex approval mechanisms, lack of flexibility in research agendas, and delayed fund disbursement discourage talent relocation.
- India spends only **0.65% of its GDP on R&D** (as per NITI Aayog report), far below countries like China (2.4%) and the US (3.45%).

Concluding remarks

- The erosion of the US research ecosystem presents India with a historic opportunity to reposition itself as a global scientific powerhouse.
- By investing in infrastructure, autonomy, and talent, and by embracing its global diaspora, India can catalyse a transformation from importing knowledge to exporting innovation.

Source: IE

SAGARMATHA SAMBAAD

In News

- Union Minister for Environment addressed the **1st Sagarmatha Sambaad in Nepal**, presenting a five-point global action plan to protect fragile mountain ecosystems, with a focus on the Himalayas.

Key Highlights From the Address

- **“Sagarmatha”**, meaning ‘Head of the Sky’, symbolizes both the majesty and responsibility of protecting mountain ecosystems. **Sambaad (dialogue)** is named after the world’s tallest mountain **Sagarmatha (Mt. Everest)**.
- He emphasized the **shared cultural and ecological bonds** between India and its Himalayan neighbours.
- South Asia houses **25% of the global population**, contributing **only 4% to historical CO₂ emissions**. Yet, developing countries like India bear disproportionate impacts of climate change.
 - ♦ And, developed countries are falling short on climate finance, technology transfer, and capacity building.
- He called for transboundary cooperation under the **International Big Cats Alliance for species** like snow leopards, tigers, and leopards & also reiterated India’s progress under **Project Snow Leopard**.

Five-Point Global Action Plan Proposed by India

- **Enhanced Scientific Cooperation:** Strengthening research collaboration, and monitoring cryospheric changes, hydrological cycles, and biodiversity.
- **Building Climate Resilience:** Investing in climate adaptation measures, early warning systems for disasters like Glacial Lake Outburst Floods (GLOFs), and climate-resilient infrastructure in mountain areas.
- **Empowering Mountain Communities:** Ensuring that the welfare, needs and aspirations of local communities are at the heart of policy-making and their benefit from green livelihoods and sustainable tourism. Their traditional knowledge is an invaluable resource.
- **Providing Green Finance:** Making available adequate and predictable climate finance as per the UNFCCC and its Paris Agreement for mountain Nations to implement adaptation and mitigation strategies effectively.
- **Recognizing Mountain Perspectives:** Ensuring that the unique vulnerabilities and contributions of mountain ecosystems are suitably featured in global climate negotiations and sustainable development agendas.

Importance of Himalayas

- **Climate Regulator:** The Himalayas act as a barrier against cold Central Asian winds and influence the Indian monsoon, ensuring rainfall across northern plains.

- **Water Source:** They are the origin of major rivers like the Ganga, Indus, and Brahmaputra, supporting water and food security for over a billion people.
- **Biodiversity Hotspot:** Home to diverse flora and fauna, including endangered species like the snow leopard and red panda.
- **Cultural Significance:** Sacred in Hinduism and Buddhism, the region hosts many pilgrimage sites like Amarnath, Badrinath, and Kailash Mansarovar.
- **Strategic Importance:** Serving as a natural frontier with China, Nepal, and Bhutan, the Himalayas are vital to India’s national security.

Initiatives Taken to Protect Himalayas

- **National Mission on Sustaining Himalayan Ecosystem (NMSHE):** Part of India’s National Action Plan on Climate Change (NAPCC), it focuses on sustainable development, glacier monitoring, and biodiversity conservation in the Himalayan region.
- **Secure Himalaya Project:** Launched with UNDP support, it promotes conservation of high-altitude biodiversity and supports sustainable livelihoods in Himachal Pradesh, Uttarakhand, Sikkim, and Ladakh.
- **Project Snow Leopard:** Aims to protect snow leopards and their habitat through community-based conservation and scientific research in five Himalayan states.
- **International Big Cats Alliance (IBCA):** India-led initiative to foster global cooperation in protecting big cats like snow leopards and tigers across transboundary Himalayan regions.

Source: PIB

US REMITTANCE TAX PLAN RAISES CONCERNS

Context

- A U.S. bill proposes a **5% excise tax** on **any remittances** that originate in the US to any other country.

Proposed Bill

- **Tax Scope:** The Bill proposes the levy on all cross-border remittances made by non-citizens, including H-1B, L-1, and F-1 visa holders, as well as green card holders. US citizens and nationals are exempt from this.
 - ♦ **No minimum limit** has been set in the proposed bill, this means even small transactions will be taxed.

- ♦ **For non-resident Indians in the US**, the proposed tax will apply to any income they earn in the US from investments or stock options as well.
- **Tax Collection:** The provision requires that the tax be collected by remittance-transfer providers, who are responsible for depositing it every quarter with the treasury secretary.

What are Remittances?

- **Remittances** are a way to electronically send funds to people, often family, in another country.
 - ♦ Usually sent by individuals working in foreign countries, especially those employed in blue-collar or skilled jobs.
- **Impact:** Remittances are a significant source of income for many countries, contributing to their economic stability, supporting local economies, and sometimes helping to finance national trade deficits.
- **Modes of Transfer:** Remittances can be sent through banks, money transfer operators, or digital platforms.

Overseas Indians in US

- Nearly 54 lakh overseas Indians in the US, most of these individuals are in the US on temporary work visas like H-1B and L-1, or are green card holders who have not yet acquired citizenship.
 - ♦ **India is the largest recipient of remittances from the US**, receiving \$32.9 billion in 2023-24 with a 27.7 per cent share in the country's inward remittances (RBI).
- **As per the World Bank**, India has been the **top recipient of remittances since 2008**, with its share in world remittances rising from around 11 per cent in 2001 to about 14 percent in 2024.

Potential Impacts

- **Remittances have long been a critical source of income** for low- and middle-income countries, and have continued to exceed foreign direct investment (FDI) flows and ODA combined.
 - ♦ If the proposal gets approved, the **cost for Indians in the US sending money back home will rise**.
- Could discourage remittances to families in home countries.
- Transfer providers may face new **administrative and compliance responsibilities**.
- Might affect decisions on where to invest or hold assets, especially for those on temporary visas.
- Critics argue the tax constitutes **double taxation, as immigrants already pay U.S. taxes on their income**.

India's Remittances: Key Facts

- **India's remittances have more than doubled** from \$55.6 billion in 2010-11 to \$118.7 billion in 2023-24.
- Remittances from the U.S. and U.K. nearly doubled to **40% of total inward remittances in FY24**, up from 26% in FY17.
- The U.S. became the top source of remittances in FY21, contributing 23.4% followed by the UAE contributing 19.2%.
- Half of the remittances went to Maharashtra, Kerala, and Tamil Nadu. Other states like Haryana, Gujarat, and Punjab had smaller shares (below 5%).

Source: BS

NEARLY 300 MILLION PEOPLE FACED ACUTE HUNGER IN 2024: REPORT

Context

- The **Global Report on Food Crises (GRFC) 2025** provides consensus-based analysis on **acute food insecurity, acute malnutrition and population displacement in countries/territories** identified as having **food crises in 2024**.

About

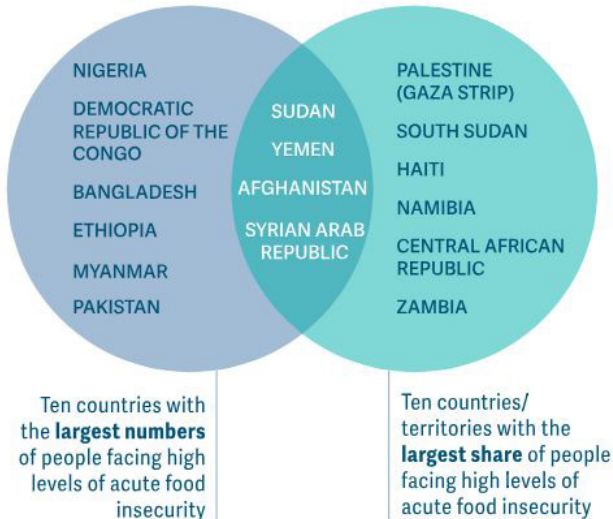
- The document is published annually by The **Global Network Against Food Crisis (GNAFC)** with analysis from the Food Security Information Network.
 - ♦ GNAFC is an **international alliance of the United Nations, the European Union, governmental and non-governmental agencies** working together to address food crises.
- It offers insights into immediate and medium-term risks to the food security and nutrition status of populations.
- Though, India was not selected among the 53 countries analysed for the report.

Terms Related to Food Security

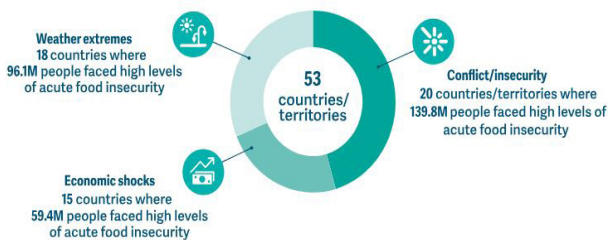
- **Food security** exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.
- **Acute food insecurity** occurs when any of the four pillars of food security — availability, access, utilization, stability — is disrupted.
- **A food crisis** is when acute food insecurity exceeds national response capacity and requires urgent external aid.

Major Findings

- **295 million people across 53 countries** faced acute hunger, 13.7 million more than in 2023.
- Even though there were some **improvements in 15 countries** including in Afghanistan, Kenya, and Ukraine, **deteriorating acute food insecurity in 19 others** outweighed those improvements.



- **Most Severely Affected**
 - ♦ The number of people facing catastrophic hunger **more than doubled between 2023 and 2024**, to reach 1.9 million — the highest on record since the GRFC began tracking in 2016.
 - ♦ High malnutrition rates were recorded in the **Gaza Strip, Mali, Sudan, and Yemen**.
 - ♦ **Famine** has been confirmed in **Sudan**, while **other hotspots** with people experiencing catastrophic levels of acute food insecurity include the **Gaza Strip, South Sudan, Haiti, and Mali**.
- **Major Drivers of the Crisis**
 - ♦ Conflict, forced displacement, climate change & other economic factors like inflations, fragile state economy.



UN & Partner Recommendations

- Evidence-driven, impact-focused interventions.
- Invest in local food systems and integrated nutrition services to build long-term resilience.

- Scale proven solutions, pool resources, and center affected communities in responses.

Source: DTE

GENE EDITING THERAPY USED TO CURE A RARE DISEASE

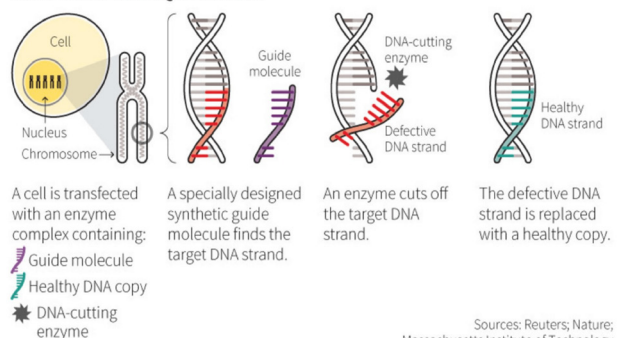
In News

- In a historic medical breakthrough, scientists in the United States have, for the first time, successfully used a personalized **CRISPR-based gene-editing therapy** to treat a rare genetic disorder **Carbamoyl Phosphate Synthetase 1 (CPS1) deficiency in an infant**.
 - ♦ CPS-1 Deficiency is a rare genetic metabolic disorder where the liver lacks an enzyme to convert toxic ammonia into urea, which is usually excreted through urine.

What is Gene Editing Therapy?

- **Definition:**
 - ♦ Gene editing therapy refers to the deliberate **alteration of DNA sequences** within the cells of an individual to treat or cure genetic diseases.
 - ♦ It involves modifying, deleting, or inserting specific genes at targeted locations in the genome to correct mutations or enhance cellular functions.
- **Types of Gene Editing Techniques:**
 - ♦ **CRISPR-Cas9:** Most widely used tool; cuts DNA at specific sites using guide RNA and Cas9 enzyme
 - ♦ **Zinc Finger Nucleases (ZFNs):** Uses engineered proteins to bind and cut DNA
 - ♦ **Base Editing:** Alters a single nucleotide without breaking DNA strands
 - ♦ **Prime Editing:** Acts like a 'word processor' to insert, delete, or replace DNA sequences
- **Mechanism:**

HOW THE TECHNIQUE WORKS



Sources: Reuters; Nature; Massachusetts Institute of Technology

Applications of Gene Editing Therapy

- **Medicine:** Treating genetic disorders like Sickle Cell Anaemia, Beta-Thalassemia, CPS-1 Deficiency.
- Engineering immune cells (CAR-T therapy) to target cancer
- **Agriculture:** Developing disease-resistant, high-yield crops
- **Veterinary Science:** Enhancing livestock traits

India's Progress in Gene Editing

- CSIR-Institute of Genomics and Integrative Biology (IGIB) is developing indigenous **CRISPR platform (IndiCRISPR)**.
- The Department of Biotechnology (DBT) is funding genome-editing research under the National **Biopharma Mission**.
- **Gene Therapy Guidelines (2020):** Issued to streamline ethical clinical application.

Challenges

- **Safety issues:** Off-target effects, immune reactions, unintended mutations.
- **Ethical concerns:** Germline editing (heritable changes), designer babies
- **Limited access:** High cost, availability limited to developed nations

Source: IE

HYBRID & PROXY WARFARE

Context

- Recently, the Union Defence Minister emphasized that **India's fight against terrorism** is now part of its **National Defence Doctrine**, reinforcing its commitment to eliminating **hybrid and proxy threats**.

Understanding Hybrid Warfare

- It is designed to destabilize adversaries without direct military confrontation. It involves a **mix of kinetic (traditional military operations) and non-kinetic (extends beyond usual military operations) tactics**, including:
 - ♦ **Cyber warfare:** Attacks on critical infrastructure, financial systems, and government networks.
 - ♦ **Disinformation campaigns:** Manipulating public perception through fake news and propaganda.
 - ♦ **Economic coercion:** Trade restrictions, sanctions, and financial manipulation.

- ♦ **Proxy conflicts:** Supporting insurgent groups or non-state actors to destabilize adversaries.
- The **Russia-Ukraine conflict** is a prime example, where cyberattacks, drone warfare, and economic sanctions have played a crucial role.

Understanding Proxy Warfare: Indirect Conflict Through Third Parties

- Proxy warfare **involves state or non-state actors** supporting armed groups or insurgencies to achieve strategic objectives without direct involvement.
- India has consistently faced **cross-border terrorism**, with Pakistan-backed groups engaging in proxy conflicts.
- **Pakistan's Proxy War Against India:**
 - ♦ **Cross-Border Terrorism** targeting Indian security forces and civilians.
 - ♦ **Drug and Weapon Smuggling** into Punjab, aiming to create internal disturbances.

India's Response to Hybrid & Proxy Warfare

Key Insights on India's Hybrid Warfare Strategy

Aspect	Current Threats	Preparedness Measures
Cyber Warfare	State-sponsored attacks (e.g., Chinese malware, Pegasus)	CERT-In, Defence Cyber Agency, Cyber Security Policy
Information Warfare	Fake news, disinfo campaigns, deep fakes	PIB fact-check unit, Draft Digital India Bill (2023)
Terrorism / Proxy Warfare	Cross-border terrorism, insurgent funding	NIA, UAPA strengthening, FATF compliance
Military Doctrine	Gray zone ops, maritime salami slicing	Theatre commands, tri-service exercises, DSA
Legal/ Institutional Gaps	No unified hybrid warfare law or body	Need for national hybrid warfare policy

Strengthening Cyber Defenses: Enhancing cybersecurity infrastructure to prevent cyber espionage and attacks.

- **Military Modernization:** Investing and Strengthening cyber defenses, AI-based warfare, electromagnetic warfare, and space-based security.
- **Institutional Reforms:** Like Chief of Defence Staff (CDS), Integrated Battle Groups (IBGs) and Military Theaterisation etc.
- **Intelligence Agencies:** Research and Analysis Wing (RAW), Intelligence Bureau (IB), and National Technical Research Organisation (NTRO).
- **Strategic Partnerships:** Collaborating with global allies to counter misinformation and economic coercion.
 - ♦ Example: Quadrilateral Security Dialogue (QUAD)

Source: PIB

SC BANS RETROSPECTIVE ENVIRONMENT PERMITS

Context

- The Supreme Court invalidated **retrospective environmental clearances**, emphasizing that development cannot compromise environmental protection.

Retrospective environmental clearances

- These are approvals granted to industrial or infrastructure projects after the commencement of operations or construction, bypassing the legal requirement of prior environmental assessment.
- The **Environment Impact Assessment (EIA) Notification of 2006**, under the **Environment (Protection) Act, 1986**, mandates prior EC before commencing any project that may affect the environment.

Supreme Court Ruling

- The Court invalidated the **2017 notification and 2021 Office Memorandum** that permitted such clearances, calling them illegal and contrary to constitutional mandates.
- The ruling cited **Article 21 of the Constitution**, which guarantees the right to live in a pollution-free environment.
- Highlighting **Article 48A and 51A(g) of the Constitution**, the judgment reaffirmed both state and citizen obligations to protect the environment.

Constitutional Safeguards

- **Directive Principles of State Policy (DPSP): Article 48A** of the Constitution directs the State to protect and improve the environment and to safeguard the forests and wildlife of the country.

- **Fundamental Duties: Article 51A(g)** enjoins citizens to “protect and improve the natural environment including forests, lakes, rivers, and wildlife, and to have compassion for living creatures.”

Significance of Supreme court ruling

- **Custodians of environmental rights:** The SC's decision is a classic example of judicial activism to uphold environmental justice.
- **Role of Polluter Pays Principle:** The ruling implicitly upholds the Polluter Pays Principle, as those who pollute without clearance cannot be legally protected.
 - ♦ It calls for environmental compensation mechanisms and project-specific reparations.
- **International Commitments:** India is a signatory to the Paris Agreement and the 2030 Agenda for Sustainable Development (SDGs).
 - ♦ Allowing ex post facto clearances goes against **SDG 13 (Climate Action)** and **SDG 15 (Life on Land)**.

Source: IE

NEWS IN SHORT

58TH JNANPITH AWARD

Context

- President Droupadi Murmu conferred the **58th Jnanpith Award** on Sanskrit scholar **Jagadguru Rambhadracharya** and Urdu poet and lyricist **Gulzar**.

About Jnanpith Award (also spelled Gyanpeeth Award)

- It is **India's highest literary honor, instituted in 1961** by the **Bharatiya Jnanpith**.
 - ♦ **Bharatiya Jnanpith** is a literary and research organization founded by **Sahu Shanti Prasad Jain and Smt. Rama Jain**.
- It is awarded for the work in **22 languages** recognized by the Constitution of India and, from 2013, in the English language.
 - ♦ Once a language receives the award, it becomes **ineligible for the next 3 years**.
- It is **awarded annually** to an Indian author for their outstanding contribution to literature.
- **The prize carries** a cash award, a citation, and a bronze replica of Vagdevi (Saraswati), the goddess of learning.

- The first recipient of the award was the **Malayalam writer G. Sankara Kurup** who received the award in 1965 for his collection of poems, **Odakkuzhal (The Bamboo Flute)**.

Source: PIB

RAJON KI BAOLI

Context

- The Archaeological Survey of India restored the 16th-century stepwell, Rajon ki Baoli.

About the Rajon ki Baoli

- Built around **1506** by the **Daulat Khan during the Lodi dynasty** (at the reign of the Ibrahim Lodi), Rajon ki Baoli stands as a testament to **Lodhi-era architecture and traditional water engineering**.
 - The name 'Rajon Ki Baoli' comes from the **masons (Raj Mistri)** who were living at the Baoli and using its water.
- This **four-tiered stepwell** was thoughtfully designed not only to store water but also to offer shade and rest to travellers.
- Its elegant arched colonnades, ornate stucco medallions with floral and geometric patterns, and finely carved stone elements reflect the artistic sophistication of the time.



About Lodi Dynasty (1451–1526)

- Ruled:** Delhi Sultanate (1451–1526)
- Dynasty Origin:** Founded by Bahlul Lodi, the first Afghan ruler of Delhi.
- Significance:** The last dynasty of the Delhi Sultanate before the rise of the Mughals.
- Territorial Reach:** Dominated Punjab, Jaunpur, Gwalior, and the Upper Ganga Valley.

Source: PIB

PM E-DRIVE

In News

- The Karnataka government has formally requested the allocation of electric buses under the **PM E-Drive initiative**.

About PM E-Drive

- Launch:** 2024
- Ministry:** Ministry of Heavy Industries.
- Aim:** To accelerate the adoption of electric vehicles (EVs) in India by providing demand incentives, supporting the establishment of charging infrastructure, and fostering the growth of the EV manufacturing ecosystem.
- Duration:** 2 years (2024 to 2026).
- Components:**
 - Subsidies (Demand Incentives):** Financial support for buyers of e-2Ws (electric two-wheelers), e-3Ws (electric three-wheelers) including e-rickshaws and e-carts), e-ambulances, e-trucks, and other emerging EV categories. These incentives are provided to reduce the upfront purchase price.
 - Grants for creation of capital assets:** Financial assistance for the deployment of e-buses, the establishment of a network of public EV charging stations for various vehicle categories, and the upgradation of vehicle testing agencies under the Ministry of Heavy Industries.
- The PM E-DRIVE scheme subsumes the **Electric Mobility Promotion Scheme (EMPS) 2024**.

Source: TH

SHINGLES VACCINE

Context

- A recent study highlighted that **shingles vaccination** can lower the development of cardiovascular conditions by 23%.

About Shingles

- It is a **viral infection that causes painful rashes and is caused by varicella-zoster virus (VZV)**, the same virus that causes chickenpox.
- Once a person has chickenpox, the virus stays in their body. The virus can **reactivate later in life and cause shingles**.
- Though, the people who never had chickenpox or didn't get chickenpox vaccine can get **infected with VZV from someone who has shingles**.
- These people can get the virus through:**
 - Direct contact with the fluid from shingles rash blisters.
 - Breathing in virus particles that come from the blisters.
- Vaccination:** The shingles vaccine, which prevents the reactivation of the varicella-zoster virus, is recommended primarily to individuals **over the age of 50 years**.

Source: IE

RBI SURPLUS TRANSFER TO THE GOVERNMENT

Context

- The central board of directors of the Reserve Bank of India (RBI) reviewed the Economic Capital Framework (ECF), to assess risk provisioning and surplus distribution.
 - It is estimated that in FY 2024–25, the RBI may transfer **₹2.5–₹3 lakh crore** to the central government, up from **₹2.11 lakh crore** in FY 2023–24.

How Does RBI Make Profits?

- Returns on foreign assets:** Investments in sovereign bonds, treasury bills, and deposits with foreign central banks.
- Interest income:** From holdings of rupee-denominated government securities, and lending to banks (like repo operations).
- Commission:** For managing public debt (central and state governments).

Policy on Surplus Distribution

- The “surplus” is the net of income over expenditure, and it is transferred to the Central Government under **Section 47 of the RBI Act, 1934**, after provisioning for: Bad debts, Depreciation, Staff benefits and Contingency reserves.
- While there is no explicit policy on surplus, recommendations have been made over the years:
 - Malegam Committee, 2013:** Advocated higher transfer of surplus to the government.
 - Jalan Committee, 2019:** Recommended maintaining a Contingency Risk Buffer (CRB) at **5.5–6.5%** of RBI’s balance sheet, with excess transferred as surplus.

Source: TH

NASA’S GRAIL MISSION

Context

- NASA’s Grail (Gravity Recovery And Interior Laboratory) Mission** has unveiled significant differences between the moon’s nearside and farside.

Major Findings

- Asymmetrical Lunar Interior:** GRAIL data revealed that the Moon’s interior structure is not uniform.
 - The nearside, which always faces Earth, has a warmer, more geologically active mantle compared to the farside.
- Tidal Deformation:** The Moon undergoes tidal deformation due to Earth’s gravity.

- The nearside flexes more, indicating a softer, hotter mantle, which supports the idea of thermal asymmetry.
- Volcanic Origins of Surface Differences:** Ancient intense volcanism on the nearside led to accumulation of radioactive, heat-generating elements (like thorium and titanium).
 - This volcanism formed vast mare plains on the nearside, contrasting with the rugged highlands of the farside.
- Enhanced Gravitational Map:** The GRAIL mission provided the most detailed gravitational map of the Moon to date.
 - Supports future development for the upcoming lunar missions.

GRAIL Mission Overview

- Agency:** NASA
 - Launch Date:** September 10, 2011
 - Orbit Start:** December 31, 2011
 - End of Mission:** December 17, 2012 (controlled crash into the Moon)
 - Spacecraft:** Two identical satellites named Ebb and Flow.
 - Goal:** Map the Moon’s gravitational field with unprecedented precision to better understand its internal structure and geological evolution.
- ### Significance
- Better gravity maps **enhance navigation, landing precision, and safety for rovers and astronauts.**
 - Techniques used can be applied to other moons like Enceladus (Saturn) and Ganymede (Jupiter), aiding the search for extraterrestrial life.
 - Reinforces the Moon’s role in stabilizing Earth’s rotation** and driving ocean tides, which are vital for life and climate.

Source: TOI

125 YEARS OF KODAIKANAL SOLAR OBSERVATORY

In News

- The department of posts released a commemorative stamp marking the **125th anniversary of Kodaikanal Solar Observatory.**

About Kodaikanal Solar Observatory

- It was established in 1899 by the **Indian Institute of Astrophysics** and is located at the southern tip of the **Palani Hills in Tamil Nadu.**
- It was set up to **study the Sun and its influence on Earth’s climate**, especially the Indian monsoons.

- The observatory was established in response to the **devastating Great Drought of 1875–1877**, which, along with a global famine, killed nearly 50 million people.
- The **Famine Commission** of the time recommended setting up a solar observatory to understand the potential link between solar activity and rainfall patterns.
- **Charles Michie Smith, a physicist**, was tasked with identifying a suitable location. Kodaikanal was selected due to its clear skies, low humidity, and minimal fog, ideal for solar observations.
- A landmark scientific discovery made at KoSO was the **Evershed Effect in January 1909**. This phenomenon is the apparent radial flow of gases observed in the penumbra (outer region) of sunspots on the Sun.

Other Major Indian Space Observatories

- **Indian Astronomical Observatory (IAO) (Hanle, Ladakh):** It is one of India's premier facilities for optical and infrared astronomy. It is also managed by the Indian Institute of Astrophysics.
- **Mt. Abu Infrared Observatory (MIO) (Aravalli Range):** It is operated by the Physical Research Laboratory (PRL). It specializes in infrared observations of celestial bodies.
- **Giant Metrewave Radio Telescope (GMRT) (Pune):** It is one of the world's largest low-frequency radio telescopes. Operated by the National Centre for Radio Astrophysics (NCRA), it consists of 30 steerable parabolic dishes and uses the SMART (Stretch Mesh Attached to Rope Trusses) design concept.

Source: IE

AKASHTEER

Context

- Akashteer played a pivotal role in the recent conflict following Operation Sindoor, wherein India targeted 9 terror camps in Pakistan and Pakistan-occupied Kashmir (PoK).

About the Akashteer

- Fully indigenous automated Air Defence Control and Reporting System developed by **Bharat Electronics Limited (BEL)**.
- Designed to **intercept and neutralize** incoming enemy aircraft, drones, and missiles with high precision.
- **Integrates multiple radar systems** such as: Tactical Control Radar (REPORTER), 3D Tactical Control Radars, Low-Level Lightweight Radar and Akash Weapon System radar.

Key Features

- Enables real-time coordination between control rooms, radars, and ground defence guns.

- Automates detection, tracking, and engagement — reducing manual error and **minimizing friendly fire**.
- Functions as part of India's **C4ISR** framework: Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance.
- Interoperable with **ISRO satellites and NavIC GPS**, enhancing situational awareness and precision.
- **Vehicle-based and mobile**, enabling rapid deployment and adaptability in high-threat zones.

Strategic Significance

- Represents a seismic shift in India's warfare strategy — from passive defence to proactive retaliation.
- Offers autonomous, low-level airspace monitoring and effective control of ground-based air defence weapons.
- Enhances tri-services synergy (Army, Navy, Air Force) through seamless digital integration.

Source: PIB

WORLD ANTI-DOPING AGENCY (WADA)

Context

- National Anti-Doping Agency (NADA) India with support from the Ministry of Youth Affairs & Sports, hosted the World Anti-Doping Agency (WADA) Intelligence & Investigations (I&I) Workshop in New Delhi.

About

- This workshop was part of the Capability and Capacity Building Project, a key initiative focused on strengthening WADA's Global Anti-Doping Intelligence and Investigations Network (GAIIN).
- It brought together intelligence and investigations experts from across the globe to share knowledge, strengthen cooperation, and enhance the global anti-doping system.

World Anti-Doping Agency (WADA)

- WADA is a **Swiss private law, not-for-profit Foundation**. WADA was established in **1999** as an international independent agency to lead a collaborative worldwide movement for doping-free sport.
- It was created as a result of a joint initiative by the **International Olympic Committee (IOC)** and various governments.
- **Headquarters:** Montreal, Canada
- **Seat:** Lausanne, Switzerland

Source: PIB